Supporting maritime spatial Planning in the Eastern Mediterranean (SUPREME)

# SUPREME

**Supporting Maritime Spatial Planning in the Eastern Mediterranean**

# CASE STUDY FRAMEWORK

*Addressing MSP Implementation in Case Study Areas (C.1.3.8.)*

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# CASE STUDY FRAMEWORK

Following the Case Study fiche and the project methodology as the WP LP in this document, we propose a basic outline of the Case study to achieve comparable project results. The framework is oriented towards several *building blocks* that generally steer the process of case study reporting, but the focus stays on flexible approach from every project partner in accordance with their legal spatial planning framework, according to the adaptive approach proposed within the Deliverable 1.1.2.

Following *building blocks* chapters in the overall CS framework are based on previous methodological steps which are proposed to be tested within the MSP Case study areas:

# A. RELATION TO THE SPATIAL PLANNING FRAMEWORK

The implementation of Directive 2014/89/EU has been transposed in Italy through the Legislative Decree 17 October 2016 n. 201. An Inter-Ministerial Coordination Table (TIC) has been designed to work on the elaboration of guidelines on MSP, adopted by Decree of the President of the Council of Ministers of 1 December 2017, providing that a Technical Committee is in charge of defining the maritime spatial plans for each maritime area identified (Western Mediterranean Sea; Adriatic Sea; Ionian Sea and Central-Western Mediterranean Sea). The Italian Ministry of Transport has been designed as the Competent Authority of the MSP implementation. In particular its functions is related to: initial recognition of the Acts and Orders of the Maritime Authority, the planning and management processes at regional, national, European or international level; forwarding to the European Commission and the other Member States a copy of the maritime management plans and related updating of Directive fulfilment; transmission to the European Commission of the information set out in the Annex to Directive 2014/89/EU and the related amendments; reporting annually to Parliament on the activities carried out in pursuit the objectives set out in the above mentioned Decree; monitoring, with the Technical Committee, the state of implementation of maritime spatial management plans; ensuring the consultation and the active participation of the public in the processes of processing; reviewing the proposals for management plans and forward to central and decentralized administration; publication on website of maritime spatial management plans; supporting transboundary cooperation among Member States for MSP implementation.

# B. CASE STUDY WITHIN THE SPATIAL PLANNING FRAMEWORK

## B.1. BOUNDARIES

The definition of boundaries for North Adriatic Case Study have been elaborated considering needs and priorities emerged from the Initial Assessment, as well as existing knowledge on: (i) maritime uses and economic domains; (ii) ecological features; (iii) legal jurisdictions and borders; (iv) governance and (v) trans-boundary and cross-border issues. The definition of boundaries of the case study area is essential to foster a proper analysis on human uses, ecological processes, synergies and conflicts, governance continuity, and define recommendations to establish appropriate strategies and plans.

The Initial Assessment phase allowed to point out some key needs and priorities for maritime spatial planning and land-sea interaction aspects in the Case Study area. The boundaries have been drawn

according to the scope of the project (e.g. to support the implementation of Maritime Spatial Planning in EU Member States with a concrete cross-border initiative) and the activities to be developed. In consequence, boundaries have been drawn, on one side, to be representative of local conditions and policies.

The study area, therefore, was chosen based on the following considerations:

- the three Italian North-Adriatic regions (Emilia Romagna, Veneto and Friuli-Venezia-Giulia) are currently intensively occupied by various maritime activities, such as maritime and coastal tourism, maritime transport of goods and passengers, fishing and aquaculture (among the main producers of mussels in Italy), research and exploitation of hydrocarbons, energy and communication pipelines, military activities, together with several coastal and marine protected areas (Natura 2000 sites, Marine Protected Areas, Biological Protection Zones, restocking areas with artificial reefs). Most of these activities are growing in the coming years with a possible increase in conflicts with other uses and pressures on the environment.

- the transnational context of the area which influences the management of marine resources exploitation (e.g. fishstock) and the sharing of the marine space (e.g maritime transport routes), as well as cross border influences/pressures affecting the activities and the marine components of the case study area and that derive from the maritime activities carried out by neighbouring countries.

- the results of relevant scientific projects (e.g. Adriplan, Ritmare) and the involvement of local stakeholders highlighted various real or potential conflicts between uses of the sea in the area and between uses and environment, evidencing the need for planning on-going and future maritime activities to solve or anticipate such conflicts in the case study area.

The boundaries have been considered in a flexible and permeable way. In fact, it is evident how many of the uses present in the area are unavoidably influenced by what happens outside the considered boundaries and within the adjacent areas. Therefore, the spatial planning should reflect on such aspects. Examples of uses influenced by cross-border and transboundary dynamics are fishing (the area is part of the much larger GSA17 - GFCM), maritime transport, extraction of hydrocarbons and sand for coastal nourishment, etc.

Such transboundary influences have transnational connotations (e.g. the management of fish stocks and maritime traffic main routes), and MSP has to consider them and support a shared management regime among neighbours. This in compliance with the Directive and art. 11 of Legislative Decree no. 201/2016, which calls for "Cooperation with Member States and third countries" in their maritime spatial planning actions, in particular with Member States that share the sea basin, in order to ensure the coherence and coordination of respective plans for managing the maritime space of the region or marine sub-region.

In addition, boundaries define the domain of analysis of the area, including the possible areas of management at different levels. According to UNESCO-IOC (2009), two “types” of boundaries can be identified: “boundaries for analysis”, which are meant to include transboundary effects and to intercept external instances that might influence MSP in the case study; “boundaries of management”, on which planning proposals and implementation can be elaborated. The two types of boundaries can eventually coincide or the first can include smaller portions of areas defined as “boundaries for management”. The possible identification of focus areas will be driven by considerations in terms of intensity of uses in particularly crowded sub-areas and complexity in legal framework.

In conclusion, by considering the aforementioned characteristics of the case study area, the level of available knowledge related with it, as well as the requirement of MSP Directive, the chosen study area appears to be an excellent test bench for the application of the local MSP process. The case study and the related results will contribute to comply with Directive 2014/89 / EU as required by

Legislative Decree no. 201/2016, providing a concrete example and a good practice of implementing the MSP at the inter-regional level.

## B.1.1. Area description and administrative boundaries

Italy established a territorial sea of 12 nm from the baseline and the continental shelf extension outside of Italy's territorial waters to the median line with Croatia, Slovenia and Montenegro. The area of analysis is identified in the Northern Adriatic Sea, along the coasts of Emilia Romagna, Veneto and Friuli-Venezia-Giulia regions. It includes the territorial waters and the continental shelf area (jurisdiction is only on the seafloor and sub-seafloor) until the median line of demarcation with Croatian and Slovenian waters. Internal waters (i.e. marine waters on the landward side of the baseline, in which coastal states have full jurisdiction; Maes, 2008) are also part of the case study analysis.

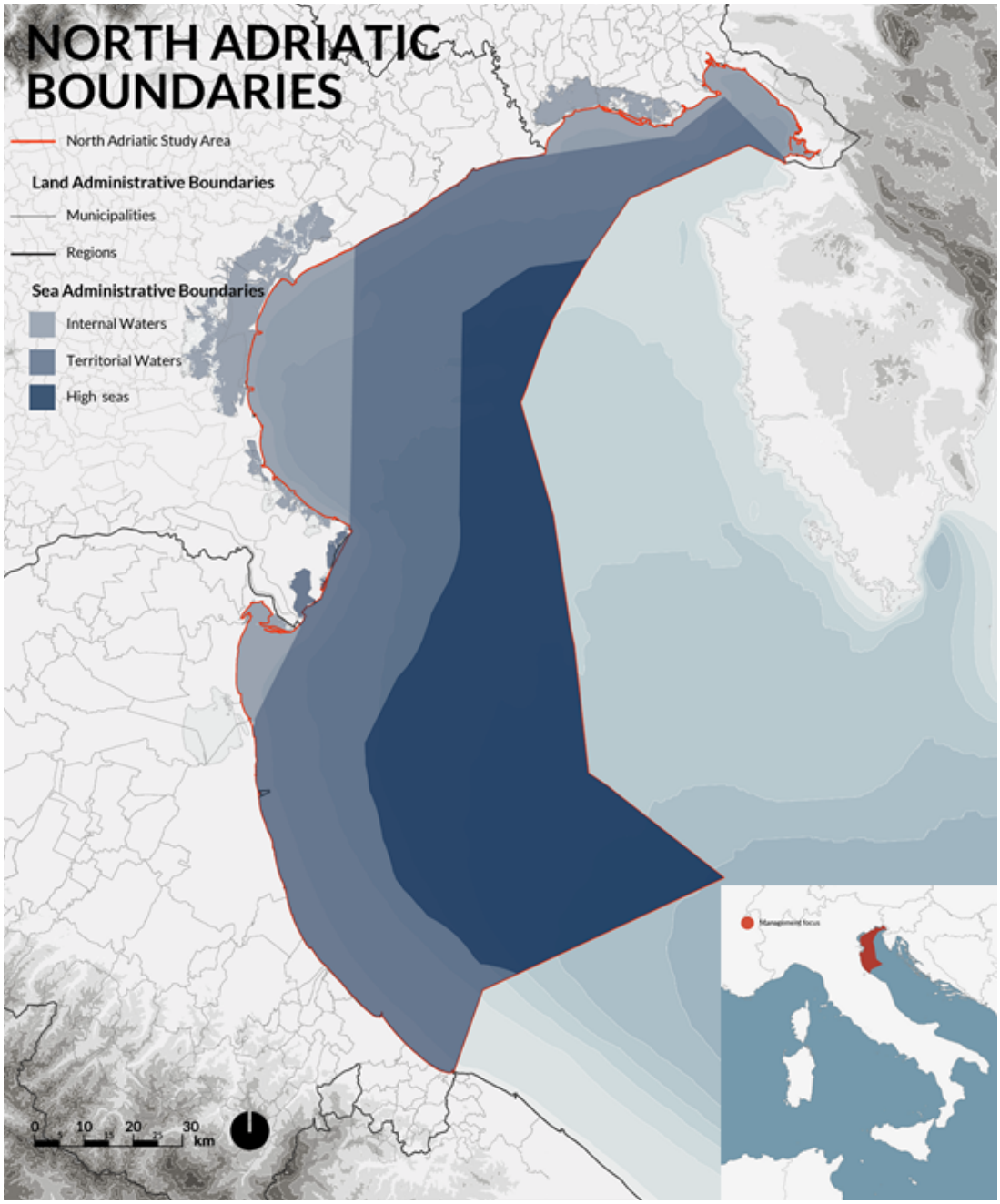


*Figure B.1.1 1: Case study area*

The Italian State exercises its jurisdiction on the seabed and subsoil and on the water column up to the territorial waters (12 nautical miles from the baseline) and only on the seabed and the subsoil from the territorial waters boundary up to the limit of the platform established by the 1968 treaty between Italy and Yugoslavia (then moved to Croatia, Montenegro and Slovenia). The study area (15229 $km^2$) comprises about 13.6 % (2076 $km^2$) of inland waters (between the shore line and the baseline), 47.2 % (7183 $km^2$) of Italian territorial waters, where most of the maritime activities are concentrated, and 39.2 % (5970 $km^2$) of the high seas.

European and national (Italian) legislation and a number of management frameworks apply to the considered area.

According to art.2 and art.3 of the Directive 2014/89/EU:

- The Directive shall apply to marine waters of Member States, without prejudice to other Union legislation. It shall not apply to coastal waters or parts thereof falling under a Member State's town and country planning, provided that this is communicated in its maritime spatial plans.

- 'Marine waters' means the waters, the seabed and subsoil as defined in point (1)(a) of Article 3 of Directive 2008/56/EC and coastal waters as defined in point 7 of Article 2 of Directive 2000/60/EC and their seabed and their subsoil.

The competences of the States, of the Regions and of the Municipalities overlaps in the coastal area and in territorial waters.

Ordinary regions (as Veneto and Emilia-Romagna) have responsibilities (related to maritime activities) for: maritime networks and ports (small); administration of maritime and riverine properties (when used for touristic purposes); protection of environment, establishment and management of reserves at regional level; management and protection of inland waters; navigation in inland waters; fisheries in inland and estuarine waters (conservation of species, fishing licences, aquaculture); prevention of pollution in inland, estuarine and coastal waters. Friuli Venezia Giulia, as one one of five autonomous regions with special statute, has additional responsibilities for fisheries, aquaculture and maritime transport.

## B.1.2. Permeability of boundaries for human activities

Several human uses within the case study area are regulated by national and international sectoral plans and regulatory frameworks. Their possible management within a cross-regional spatial planning will have to consider several possible influences derived from other anthropogenic or environmental causes from outside the case study borders.

In particular, the results of the Italian country fiche outline that:

MARITIME TRANSPORT: marine traffic raises important issues for MSP, since it interacts with a variety of uses carried out and settled in the maritime space, ranging from interactions with fisheries both in the coastal and offshore zones to the recent challenges associated with large offshore infrastructure projects (e.g. marine wind farms and hydrocarbon extraction plants). The trends in the development of maritime shipping activities seem to lead to an increased density of traffic in Adriatic Sea during the next years, as well as important changes in the nature of traffic. In consequence, the management and planning for maritime transport should take in account the strong influence derived from the other shipping and cruise ports in the wider area (e.g. ports of Koper, Rijeka, Ancona, Bari, Brindisi, Taranto).

FISHERIES: Fish stocks in the whole Adriatic Sea are generally fully exploited or overexploited. This condition is leading to heavy risks of collapse of the stocks, urging the needs of proper regulation of the exploitation of the resources and sustainability of the used gears. Scientific assessments on major fish stock confirm a situation of excessive exploitation in Italian North Adriatic waters. Considering that the Adriatic Sea is probably the largest area of occurrence of shared stocks between regional and international fleets in the Mediterranean, the target fish stocks are often shared among each Adriatic country fleets. The issues related to shared stocks and their management may lead to transboundary conflicts for fish resources both at inter-regional and international level, especially when common fishing grounds became overexploited and in absence of an adequate protection of recruitment and spawning areas of target species, reducing local plan effectiveness on stocks restoration.

ENVIRONMENTAL PROTECTION: the commitments of the WFD, MSFD, H&B Directives (GES, FCS and Targets) and other national and European Community relevant environmental protection obligations, based on the Ecosystem-Based Management approach and aiming to reduce impacts and pressures on species, habitats and ecosystems, foster the need to enhance the network of Marine Protected Areas and Natura 2000 sites, and move towards the target of protecting the 10% surface coverage by 2020 of the Adriatic Sea. In consequence, an adequate planning and effectual governance system, taking in account ecological processes in a wider area (e.g. connectivity, population dynamics, seasonality, vulnerabilities), also supporting sustainable development of activities and reducing conflicts with other uses could facilitate a thorough environmental management at the CS spatial scale.

The CS area is highly influenced and linked to the characteristics and dynamics of the coastal area that underlies it, with strong interactions between natural phenomena or land-based human activities. The coherence and integration between the planning of marine and terrestrial spaces are important and should be achieved through consistency of policies, plans and decisions. These interactions should be accurately taken in account, in order to assess their cumulative impacts and potential conflicts and synergies.

## B.1.3. Environmental permeability of boundaries

The case study area is characterized by shallow waters and receives a large amount of freshwater from numerous rivers, the majority of which comes from the Po river, in the north-western corner and shallowest part of the Adriatic basin. The North Adriatic basin, extending between Venice and Trieste towards a line connecting Ancona and Zadar, is only 15 metres deep at its north-western end, and it gradually deepens towards the southeast, reaching an average bottom depth of about 35 m. The smooth Italian coast (with very few protrusions and no major islands) allows the Western Adriatic Current's smooth flow, which is composed of a relatively freshwater mass on the surface and bottom colder and denser water masses.

The complex Adriatic oceanographic features (surface and bottom circulations, hydrology and typical winds regulating water masses circulation) play a crucial role in determining the ecological and coastal configuration. The numerous rivers discharging into the basin plus underground freshwater seeping into the sea along the eastern coast affect both the sedimentation and the circulation in the CS area. This effect is particularly evident with the Po River, that determines the low salinity and the dense water and also models the coast, conferring average low slopes and high sedimentary ranges to the Italian coasts and determining the type of communities present. The interaction of sea level changes and sediments supply or removal may cause variations of sedimentary shorelines along the north-western Adriatic coast, heavily influencing not only the CS area but also the whole basin.

It is also evident that the northern Adriatic Sea can respond faster than other basins to environmental (e.g. climate change) and anthropogenic (e.g. diffusive pollution) anomalies, generating serious criticalities over time for maintaining biodiversity, protecting habitats and species and conserving food webs. From the phenomena of hypoxia and dystrophic events with consequent mucilage blooms, to the introduction of non-indigenous invasive species up to thermal anomalies, the consequences of climate changes can heavily influence the outcomes of proposed management plans, either directly (e.g. direct mortality of high valuable fish species) and indirectly, (e.g. temporal and spatial shifts in species life cycles due to changes in the abiotic conditions of the area).

# C. ANALYSIS OF THE CASE STUDY AREA

## C.1. ENVIRONMENTAL DESCRIPTION, SECTORAL STATUS AND TRENDS

### C.1.1 Environmental description

The considered area features Italian Adriatic coastal and marine water to the midline, from Friuli-Venezia-Giulia Region to the Emilia-Romagna southern boundary. The area falls within the Marine Strategy Framework Directive subregion "Adriatic Sea". The Adriatic Sea is a semi-enclosed basin that communicates with the Ionian Sea through the Otranto Strait. Its northern part is the largest shelf area of the entire Mediterranean, with a very smooth coastal area and a gentle sloping bottom. The Adriatic coastal landscapes host a diversity of geomorphological features: cliffed and rocky coasts, coastal plains, deltas, wetlands, dunes and lagoons. Deltas and narrow coastal plains generally occupied by wetlands and lagoons define the landscape of the north-western coastal area, including the Po Delta. Italian Northern Adriatic coasts are relatively low, smooth and regular. The seabed sediments are predominantly sandy–muddy, influenced by riverine supplies, in presence of rocky bottoms featuring bioconstructions in the northern areas.

**Seagrass meadows** constitute a key habitat in the context of coastal areas for its diffused distribution, as well as for its fundamental ecological role being habitat of nursery, protection and foraging for several marine organisms. Two genus of seagrasses have been listed in the case study area, *Posidonia oceanica* and *Cymodocea* spp. *Posidonia oceanica* is the predominant forming habitat seagrass species in the Mediterranean Sea. These plants form vast underwater meadows between zero and 50 m depth in the open sea. In the Mediterranean Sea, the Gulf of Trieste represents the northern distributional boundary of *Posidonia oceanica* (L.) Delile. The more extensive meadow of *P. oceanica* is located near Capodistria, on the Slovenian coasts of the Gulf of Trieste, while on the Italian side P. oceanica was defined as sparse and limited since 1938 (Benacchio, 1938; Simonetti, 1968). At the end of the 60's it was strongly reduced. At present, the residual Northern Adriatic colonies of *P. oceanica* (total area covered ca. 5 ha) are located in a limited area in front of the Grado lagoon at a depth ranging from 3 to 4.5 m. According to Cainer (1993-94), these formations do not represent a *Posidonia* meadow status, being isolated lumps of limited dimensions within dense *Cymodocea nodosa* meadows.

The seagrasses are located in front of the Grado lagoon and the whole area is naturally subject to high sedimentation and hydrodynamic condition (tides currents). The biodiversity associated to this habitat is relatively high if compared to the neighbouring Grado and Marano lagoons (Fig. C.1.1 1).

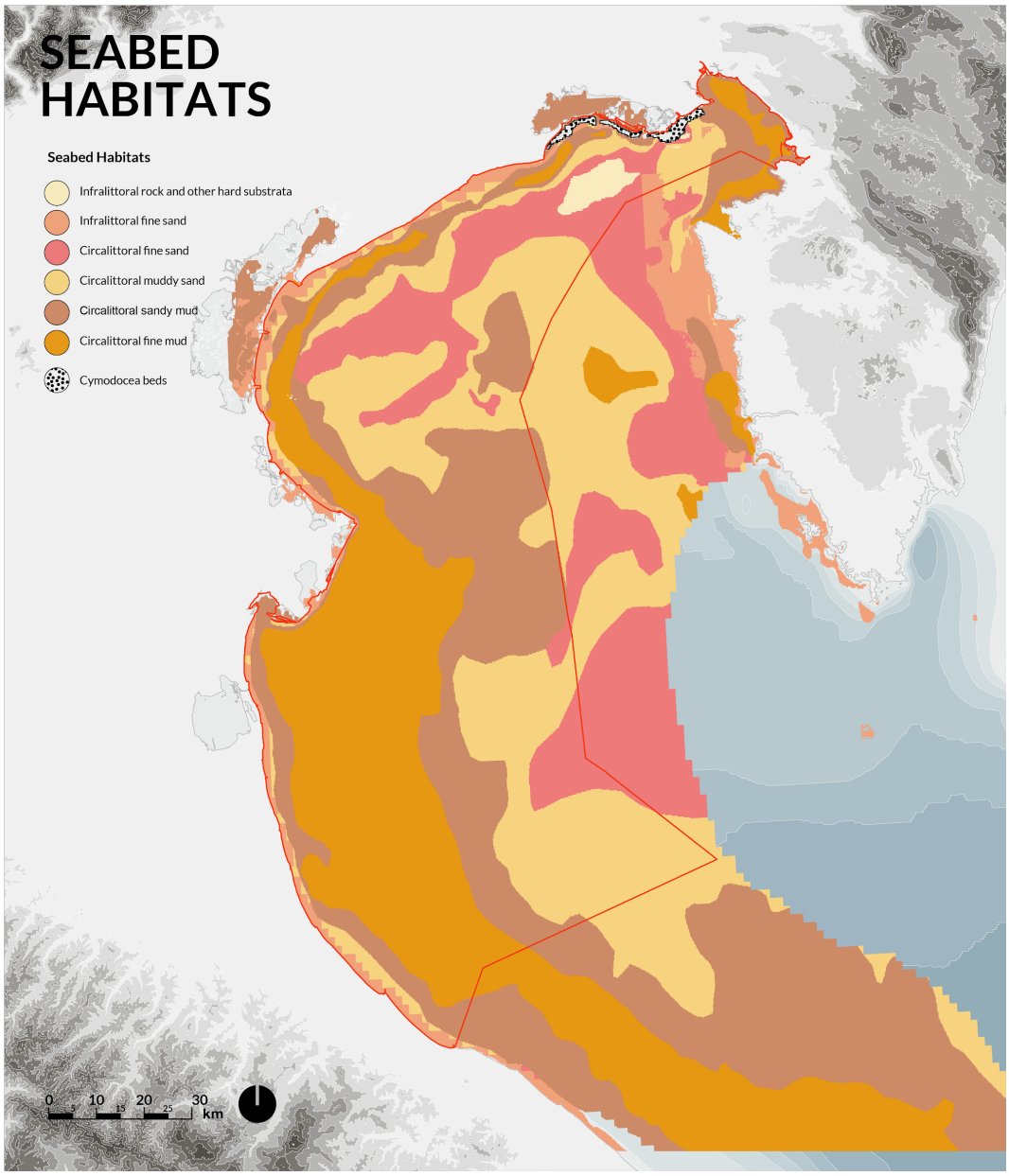



*Figure C.1.1 1: Environmental components*

Other highly important benthic habitats are those formed by calcareous bio-constructions such as **coralligenous** and **maërl beds**. Bioconstructions such as coralligenous assemblages are typical Mediterranean underwater seascapes, comprising coralline algal frameworks that grow in dim light conditions (Ballesteros, 2006). Because of their extent, biodiversity and production, coralligenous rank among the most important ecosystems in the Mediterranean Sea, and it is considered of great significance both for fisheries and carbon regulation. Coralligenous assemblages are directly threatened by specific human activities such as trawling or the exploitation of the red coral by prohibited gears. It seems also to be subjected to indirect effects and be vulnerable to climate change impacts (e.g. heat waves and acidification). These threats affect the stability of this ecosystem and strongly mortgage its future maintain.

Maërl beds are another specific type of representative calcareous bio-constructed habitat with high ecological importance in the Mediterranean region. Maerl beds are formed by an accumulation of unattached calcareous red algae (Rhodophyta) growing in a superficial living layer on sediments within the photic zone (Barberà et al., 2003). The European Commission's 'Habitats Directive' mandates the conservation of two of the main European maerl-forming species, *Phymatolithon calcareum* and *Lithothamnion corallioides*. European maerl grounds suffer a variety of anthropogenic perturbations including direct exploitation through extraction, fishing impacts and chemical pollution by organic matter and excess nutrients. Both coralligenous and maërl beds main threats are trawling, artisanal and recreational fishing, anchoring, invasive species, global warming, waste water discharges, aquaculture, changes in land use and coastal infrastructure construction and urbanization, recreational activities (e.g. scuba diving), non-indigenous mucilaginous and filamentous algal aggregates.

The coralligenous habitat shows a great biodiversity and abundance variability, in relation to the morphology of the outcrops, distance from the coast, depth and geographical location (Fig. C.1.1 2). The northern Adriatic Sea is scattered with hundreds of rocky outcrops, locally called *tegnùe*or *trezze*, mainly concentrated between the Po Delta and the Gulf of Trieste. The reefs have a rocky base (local calcareous sediments cemented by seeping methane), which hosts the growth of calcareous bio-concretions and are surrounded by sedimentary bottoms. The distance from the coast range from 0.5 to 21 km and depths from 7 to 25 m. These rocky outcrops display a wide range of morphologies, which, together with environmental factors and human pressures, influence the habitat complexity and biodiversity. The assemblages developing over these structures are similar to those reported for coralligenous outcrops in Mediterranean, but they have some striking differences that make *tegnùe* unique. More than one thousand taxa inhabit the northern Adriatic sublittoral biogenic reefs. The main groups are mollusks, coralline algae (e.g. Peyssonneliaceae), polychaetes, crustaceans, sponges and fish. The outcrops are characterized by a rich biodiversity and low coverage, with a high spatial and temporal variability on a small to medium scale. The high variability in the number of species and coverage recorded on the different outcrops may be related to different distances from the coast, topography, light availability and depth, with the lowest values found on the outcrops close to the Venice lagoon and the highest offshore the Gulf of Trieste. Offshore outcrops subject to low turbidity and eutrophication feature assemblages similar to those of other typical Mediterranean coralligenous habitats, even if diversity, both in terms of algal and encrusting layer coverages, is generally lower. These differences may be attributable to the high environmental variability in the physico-chemical and trophic parameters of the water column, the reduced extension of the outcrops, the surrounding muddy sediments. Due to their rarity, origin and role to concentrate a large number of rocky bottom species, rare in the Northern Adriatic, these formations need an greater knowledge about their extent, species composition and structure. Further, monitoring programs are essential to better understand the rank and role of pressures that gravitate on this weak habitat. This knowledge is essential for a suitable management that guarantees their protection. Finally, spatial data on physical, hydrological and chemical conditions and extent of the seabed significantly affected by human activities for the different substrate types should be assessed.

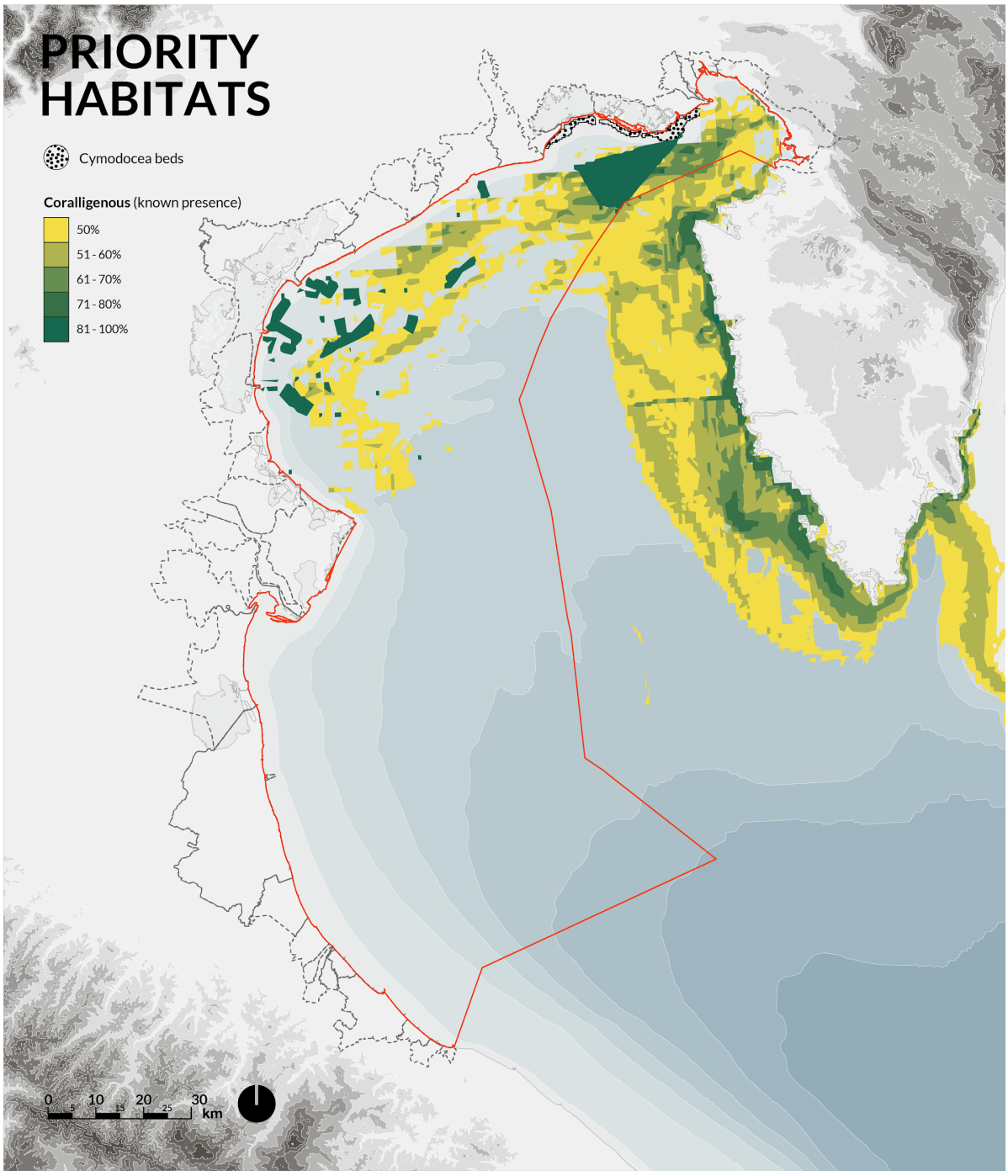



*Figure C.1.1 2: Bioconstructions in the CS area (modelled data from MEDISEH-MAREA project).*

In the Northern Adriatic no exhaustive and quantitative studies about the distribution of maerl and rhodoliths exist, making it difficult to highlight temporal and spatial patterns of changes. From Venice to Grado the Habitat maerl and rhodoliths are characterized by a total of 12 taxa, found both as fossil and living thalli. The majority of taxa belong to the coastal detritic (DC), while *Lithophyllum racemus* (Lamarck) Foslie is characteristic of coarse sands and fine gravels under bottom currents (SGCF). In the assessed area the distribution of this habitat ranges from 9 to 24m. Studies carried out in 1989 highlighted the predominance of fossil thalli and a gradient of biomass from Grado to Venice. On the

contrary, more recent studies show evidence of the presence of a living facies of maerl and rhodolites in a number of sites offshore the Grado lagoon. In particular, the sandy seedbeds of this area result characterized by the rhodolith *L. racemus*, while on the pelitic sandy sediments the two species characteristic of the maerl association, *Lithothamnion corallioides* (P.L. Crouan & H.M. Crouan) P.L. Crouan & H.M. Crouan and *Phymatolithon calcareum*(Pallas) W.H. Adey & D.L. McKibbin, along with *Lithothamnion minervae* were detected. Previous studies highlighted the predominance of fossil thalli. On the contrary, recent studies show evidence of the presence of a living facies of maerl and rhodolites in a number of sites offshore the Grado lagoon.

While benthic habitats host strictly bottom dependent ecosystems, **pelagic habitats** include the water column features and their associated organisms. Aside from all the key ecosystems previously identified, there are species of particular relevance for their key role in the ecosystem functioning, their high sensibility to specific impacts and in most cases for showing a highly migratory behaviour and therefore a wide and heterogeneous spatial distribution. This group of animals include seabirds, cetaceans, reptiles, elasmobranchs, fishes and other invertebrate species.

The case study area waters fall within an areas meeting the EBSA criteria, off the coasts of Italy, Slovenia and Croatia. The area is roughly delimited by the 9m isobaths, encompassing the area above the straight line linking Ancona (Conero) and the island of Ilovik, with an average depth of 35 m and strongly influenced by the Po river plume. The whole area is important for several threatened species. It hosts a population of the highest density of **bottlenose dolphin** (*Tursiops truncatus*) in the Mediterranean. Other species - the striped dolphin (*Stenella coeruleoalba*), the fin whale (*Balaenoptera physalus*), the sperm whale (*Physeter macrocephalus*), Risso's dolphin (Grampus griseus), Cuvier’s beaked whale (Ziphius cavirostris) and the long-finned pilot whale (*Globicephala melas*) - are considered visitors or vagrant individuals, while the dramatic decline in numbers of the short-beaked common dolphin (*Delphinus delphis*) in the past 40 years has led to regional extinction with only vagrant individuals recorded occasionally (Fig. C.1.1 3; Fortuna et al., 2015).

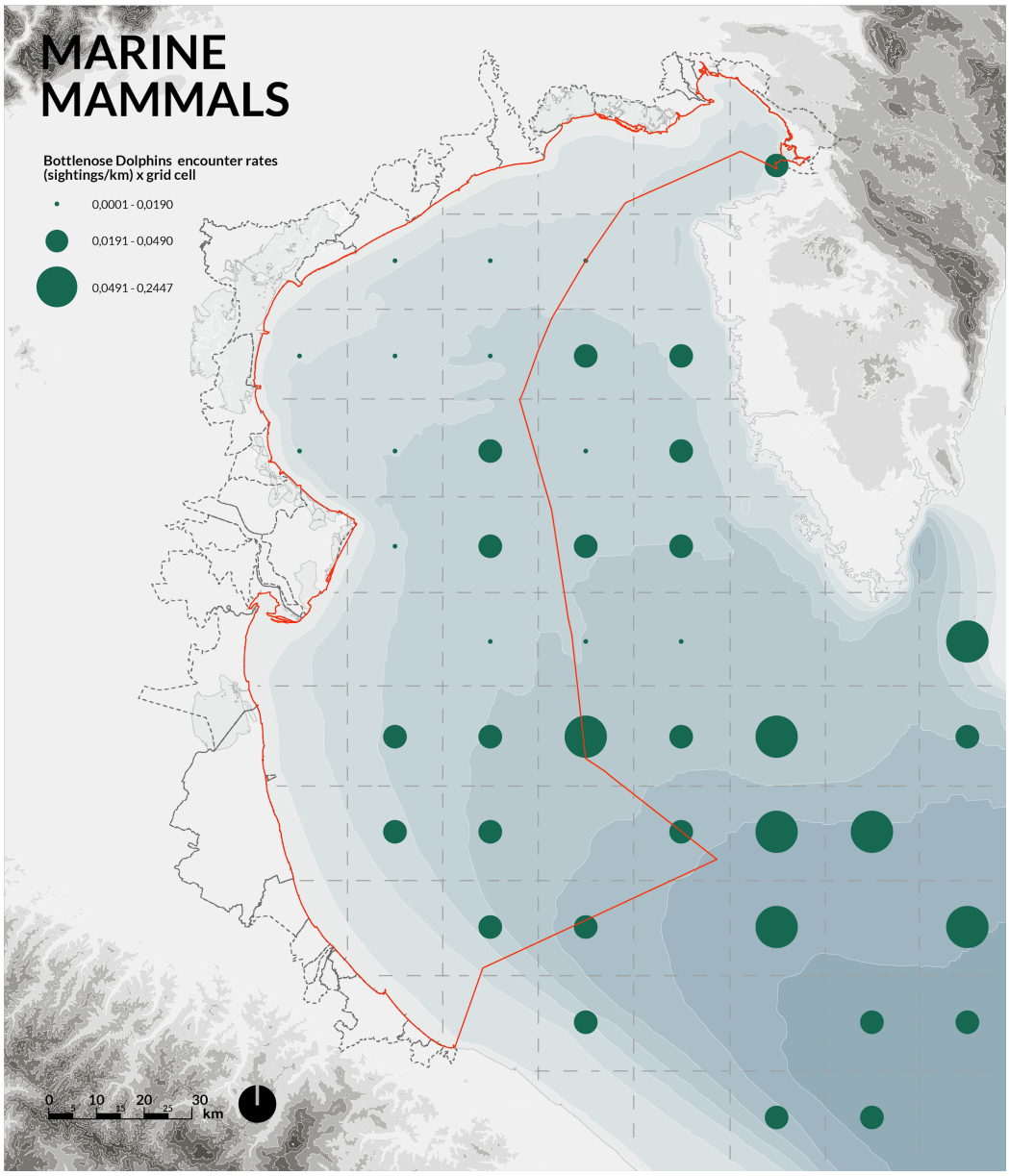



*Figure C.1.1 3: Bottlenose dolphins (Tursiops truncatus) encounter rates in the CS area (data from Fortuna et al. 2015).*

The area is one of the most important feeding grounds in the Mediterranean of the **Loggerhead turtle** (*Caretta caretta*) (Fig. C.1.1 4). The loggerhead turtle movements in the Adriatic Sea include the adult breeding migration from foraging (e.g. the Po delta area in spring and summer) to breeding grounds (e.g. Croatian islands) and vice-versa, seasonal migrations of both adults and juveniles with southward movements from the northern Adriatic when temperatures fall in the cold season.

Genetic diversity indexes indicate that the Adriatic Sea area receives individuals mostly from the Greek rookeries followed by western Turkey, and Crete, Cyprus and Eastern Turkey rookeries. No Atlantic rookery contribute. This indicates that eventual pressures exerted on the aggregation areas of the North Adriatic Sea would provoke a strongest impact on the status of the populations belonging to these rookeries, most specifically the Greek ones.

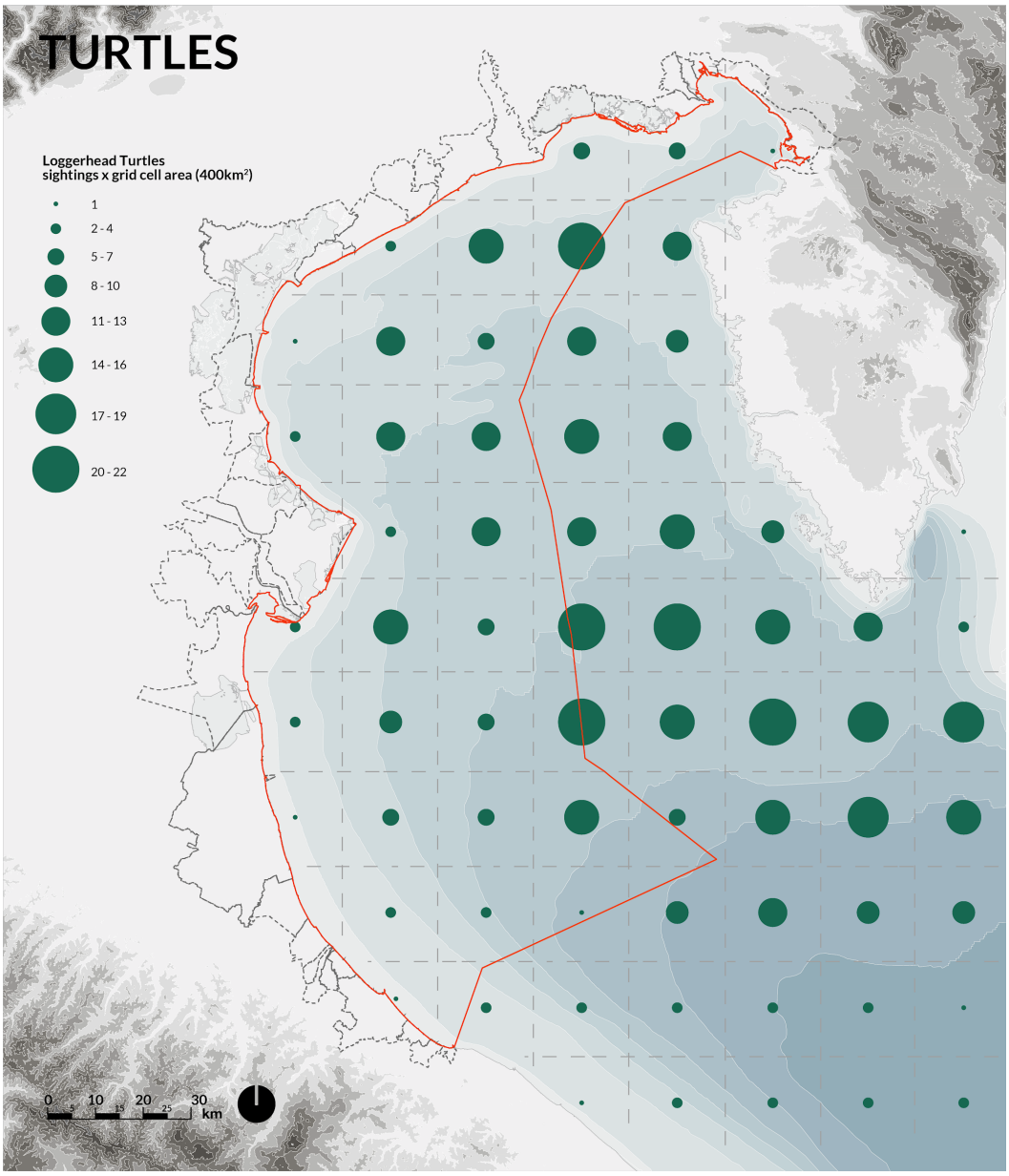



*Figure C.1.1 4: Loggerhead turtles (Caretta caretta) encounter rates in the CS area (data from Fortuna et al. 2015).*

The area also features and high density of **essential fish habitats (EFH)** of fish (e.g. important spawning grounds for anchovies, pilchards, mullets, sole and pelagic sharks) and invertebrate species (e.g. crustaceans, molluscs, etc.), with commercial interest (Fig. C.1.1 5). As for the whole Eastern Mediterranean area, the situation of fish stocks is away from sustainable fishing levels and far from the target of exploiting stocks at maximum sustainable yield (MSY) by 2020. Scientific assessments on major fish stock (e.g. within the Italian National Triennial Fishing and Aquaculture Programme 2017-2019) confirm a situation of excessive exploitation. The state of overexploitation is not homogeneous in the geographic sub-area (GSA 17) and involve species potentially targeted by various fishing gears and featuring different ecological behaviors. In example, the trend in anchovies (*Engraulis encrasicolus*) landings from 1975 to 2016 for the Italian Northern and Central Adriatic (Italy GSA17-18) shows a maximum in the 1978-1980. In 1986-1987 the catch collapsed to the

historical minimum, and then started to increase again reaching a new peak in 2007. The average fishing mortality for ages 1-2 is in a constant increase from the 1980 and, after a slight decrease in the 2013, reached its maximum in the 2016. The spawning and the recruitment stock biomass show a descending trend, with periodic fluctuations but a constant decrease.

Considering sardines (*Sardina pilchardus*), the trend in landings from 1975 to 2016 in GSA17 and 18 started decreasing in the late eighties reaching a minimum in 2006. Biomass (tonns) assessment from acoustic surveys carried out from 2004 to 2016 confirmed evidences of a declining trend during the last 6 years.

According to data collected during SoleMon surveys (Scarcella et al., 2014), Common sole (*Solea solea*) juveniles (age class 0+) aggregates inshore along the Italian coast, mostly in the area close to the Po river mouth. Age class 1+ gradually migrates offshore and adults concentrate in deepest waters, South West offshore Istria. Results suggest an overfishing situation for the *S. solea*stock, with an extremely high fishing mortality.

SoleMon data for common cuttlefish (*Sepia officinalis*) indicates that individuals aggregates in the northern sector of GSA 17, with seasonal migrations. Spawning occurs in shallow, inshore waters between April and July. Cuttlefishes are usually lay eggs on seagrasses and dense algal canopies (e.g. in the Venice lagoon). Since in the Northern Adriatic these habitats have experienced a marked reduction caused by human activities, the scarcity of natural substrates encourages the deposition of eggs on artificial substrates, including traps. Stock assessments on biomass show a stable trend from 1972 to 2002, and a steep decrease in 2003-2013. In the last 3 years, the biomass recovered a little but is still below the BMSY.

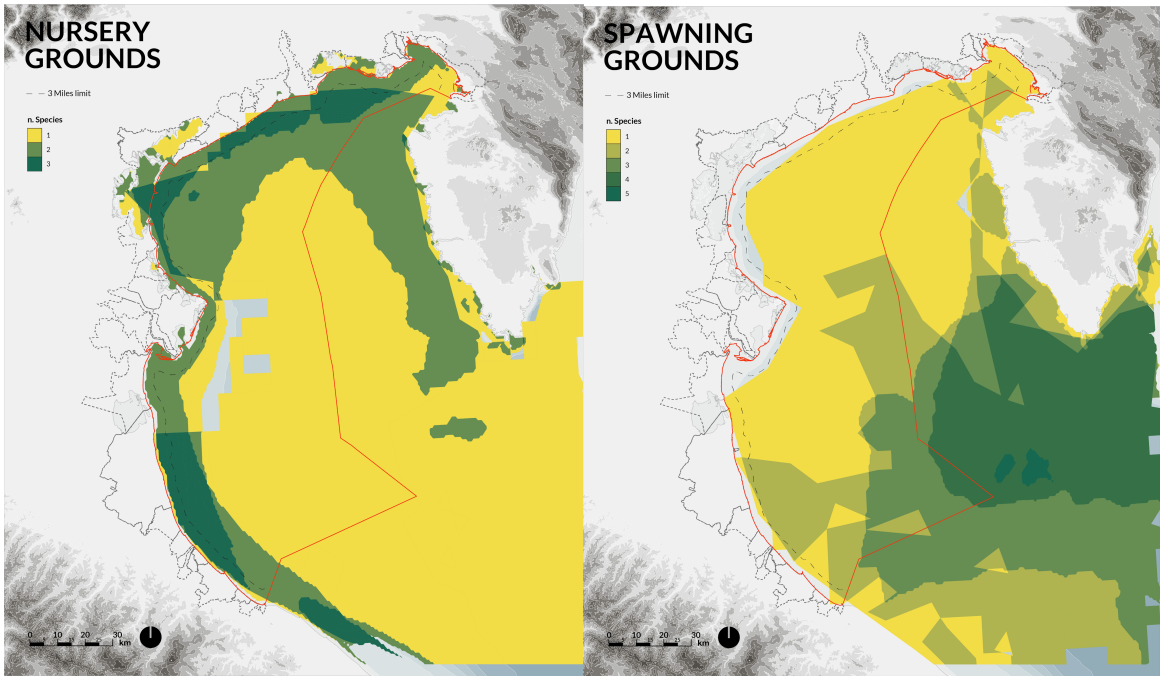



*Figure C.1.1 5 a and b: Recurrence of essential fish habitats in the CS area (data from ADRIPLAN project).*

The marine environment of the Northern Adriatic Sea is increasingly subject to the risk of altered phenomena, due to multiple and diverse natural pressures on natural resources and ecosystem services. Threats to marine ecosystems may arise from the effects of climate change, commercial fishing,

introduction of non-indigenous species associated with maritime or aquaculture activities, pollution from transport or release of chemicals, or coming from the land due to accidental spills of hydrocarbons, the use of fertilizers in agriculture, untreated wastewater, waste or the introduction of thermal or acoustic energy. The anthropogenic pressures on marine environment are clustered (cfr. Annex III) in three main themes: BIOLOGICAL (e.g. *Extraction of species, Non indigenous species* and *Microbial pathogens)*–which is linked to the qualitative descriptors (2) and (3); PHYSICAL (e.g. *Physical loss, Physical damage* and *Interference with hydrological processes)* - which is linked to the qualitative descriptors (6) and (7); SUBSTANCES, LITTER AND ENERGY (e.g. *Underwater noise, Marine litter, Contamination hazardous substances* and *Nutrient and organic matter enrichment)* - which is linked to the qualitative descriptors (5), (8), (9), (10) and (11).

In the Adriatic Sea a total of 47 non indigenous species (NIS), belonging to 8 main taxonomic groups (algae and phanerogams; cnidarians; polychaetes; bryozoans; mollusks; decapod crustaceans and stomatopods; ascidians; fishes), are detected. 24 of these NIS (51%) are considered to be invasive according to the definition of IAS in the TG2 report of the Marine Strategy. The cumulative number of NIS shows a gradual and relatively slow increasing trend until the decade 1972-1982. Identified knowledge gaps, are related to the low availability of data and to the consequent difficulties in impacts evaluation, as well as the information gaps on main introduction vectors.

The *physical loss* within the assessment areas, is only due to the sealing (PPLE). The PPLE is generally restricted to the coastal zone, due to the presence of coastal protection systems and ports; submarine cables and pipelines, wrecks, oil and gas platforms, recurrent defense operations and subsea wells are more discontinuously distributed seaward. In general, the info gaps are associated to the lack of geospatial data related to substrata type (substrata data affect only 20%of AA), causing problems on the use of indicators. Moreover, available data on the nature of the substrate are often available at an inadequate scale for MSFD (low confidence). In few coastal areas, however, available data are more detailed (high confidence). As regards the *Physical damage,* the main known pressure is “abrasion”. Abrasion is due to fishing and anchoring zone. Fishing mainly occurs between 3 nm from the coast (or from 50 m deep) to the midline of the Adriatic Sea. Another important pressure is "change in siltation" present mostly on the seabed affected by man-made structures (ports) and by waste disposal (presence of dumping sites). Change in siltation is represented also by man-made structures (coastal defense).

The *Nutrient and organic matter enrichment* is closely related to the phenomenon of eutrophication. The processing of available data, in particular the data related to concentrations of nutrient and chlorophyll indicators, allowed to highlight how the High Adriatic, especially the areas in front of the Po Delta and the Emilia-Romagna coast, are most at risk with regard to eutrophication. Despite the general picture of the last 10 years, there is a reduction in the trophic level of the Adriatic, there are episodes of intense microalgal blooms triggered and sustained predominantly by the nutrient inputs of the Padano basin and hypoxia/anoxia events in the bottom waters.

## C.1.2 Sectoral status and trends

***Maritime transport***

According to the National report "V Rapporto sull'economia del mare" (2015)[1] among the industrial activities of the maritime cluster in Italy, maritime transport is in first place in terms of production value with 11.8 billion euros and also for labour productivity with 339 thousand euros/employee (year 2013). From the employment standpoint, there is an important contribution of maritime transport with 34,725 direct employees followed by logistics and auxiliary activities that revolve around ports that account for 27,611 direct employees (year 2013).

According to the data from the 5th Sea Economy Report prepared by the "Federazione del Mare" together with Censis the Italian maritime cluster, shipbuilding is confirmed to represent one of the most dynamic sectors of the Italian economy, contributing to the national gross domestic product with 32.6 billion euros (2.03%) and employing approximately 2% of the country's workforce (471 thousand people, considering direct employment and workers in allied industries).

Italy maintains its European leadership in cruise sector (with 6.2 million passengers and 4,600 port calls) and in the construction of passenger ships and luxury motor-yachts (Tab. C.1.2 1).

*Table C.1.2 1 - Number of Shipyard and on number of employees in this sector related to the case study area*

| Shipyard | Prov. | *Region* | Shipyard surface in sq.m | Employees |
|---|---|---|---|---|
| Fincantieri – ATSM | TS | *Friuli* | 46.149 | 15 |
| Fincantieri - Monfalcone | GO | *Friuli* | 822.500 | 1443 |
| Cantiere Navale Visentini | RO | *Veneto* | 240.960 | 53 |
| Cantiere Navale Vittoria | RO | *Veneto* | 21.396 | 58 |
| Fincantieri - Marghera | VE | *Veneto* | 379.000 | 1019 |
| Mancini S.a.s di Mancini Giancarlo & C. | VE | *Veneto* | 1.800 | 5 |
| Cantieri Navali Boschetti | FC | *Emilia-Romagna* | 1.346 | 6 |
| Naviravenna | RA | *Emilia-Romagna* | 36.206 | 58 |
| Rosetti Marino | RA | *Emilia-Romagna* | 65.000 | 36 |

The structure of Italian shipbuilding is increasingly polarizing between a great global leader in the sector - Fincantieri - and a group of medium-small yards, whose competitiveness is based on production models lean and flexible, as well as unquestionable technological skills, and on a positioning in market niches characterized by reduced size products and the ability to provide customized services to one particularly demanding customers.

[1] http://www.federazionedelmare.it/pubblicazioni-della-federazione/pubblicazioni-della-federazione/48-iv-rapporto-sull-economia-del-mare-2

The Northern Adriatic is an area highly impacted by human uses and anthropogenic pressures (Gissi et al., 2017), where both fishery and maritime traffic are extremely intense. More specifically the Gulf of Trieste is one of the most urbanized and industrialized areas in the northern Adriatic, with intense maritime traffic experienced at multiple ports as Trieste, Monfalcone and Koper (Bajt, 2014).

The northern part of the Adriatic Sea, indeed provides the cheapest maritime route from Asia, via Suez, to Europe and the northern Adriatic ports of Koper, Rijeka, Trieste, Venice and Ravenna are located in close proximity to each other. Due to their geographical characteristics they hold a special position in the European ports system, operating in a relatively close system in which the market and customers are limited and therefore the ports are forced to cooperate (e.g. through NAPA) while at the same time competing with each other. The last trends show how during the last years all the ports of the region had an average increase of 7% on a yearly basis of container transport. The most rapid growth of container was recorded at the Port of Koper, at an average of 14% per year, and where 600,441 TEU was reached in 2013 (fig. 2).

The national policy related to the shipping is being implemented taking into account the National Strategic Plan for Ports and Logistics that represents an important step towards the approved Italian ports reform (ref. Decreto Legislativo 4 agosto 2016, n. 169). Moreover, in March 2010, the North Adriatic Ports Association (NAPA) was established by the port authorities of Trieste, Ravenna, Venice, Koper and Rjeka with the aim of collaborating in the development of shipping activities in the area. In the area the most relevant transboundary interactions of shipping, besides the environmental pressures and economic competition of the activity, are related to operational, administrative and custom procedures, safety and security taking into account also international regulations and the policies and strategies of the EU. In particular, the legal framework of the maritime transportation sector in the Adriatic Sea is not homogenous. However, Croatia, Italy and Slovenia, as Member States of the EU, are bound to the European legal framework, which includes Directive 2002/59/EC (as modified by Directive 2009/17/CE) that established the SafeSeaNet mechanism to harmonize the monitoring of traffic and the information exchange.

For what concerns the specific objectives of the Port Authority of Venice (AdSP Mare Adriatico Settentrionale) and the Port Authority of Trieste (AdSP Mare Adriatico Orientale) the Triennial Operative Programmes (2018-2020; 2017-2019) define the framework of planning for the next period of the ports. The plans define the Port Authorities priorities in terms of development and planning in accordance with the Italian port reform.

The ports of Venice and Trieste are considered as a “junction” for the European TEN-T corridors specifically the Baltic-Adriatic corridor which connects Austria and Slovenia to the port of the Northern Adriatic and the Mediterranean Corridor which connects eastern and western Italy.

The port of Venice has in plan of enlarging the terminal of Seaway of the Sea in Fusina in accordance with the European policy of strengthening the corridors connection with the ports of Igoumenitsa and Patrasso in Greece. Moreover, there is the plan of creating a fishing port in Treporti (TBC).

The port of Trieste mainly focuses on the strengthening of its leader position in the movement of goods in Italy mainly due to its proximity with eastern Europe and its role in the New Silk Road programme with China. Main development will be made to the rail infrastructures and the management of the “last-mile” connections with the port. Connection with the multi-hub of Duisburg (Germany) will be strengthened.

Figures below shows the density of maritime traffic and the quantity of goods (on the left) and passengers (on the right) taken up and set down for the harbours in the North Adriatic Case Study area (referred to year 2017, source: assoporti[2])

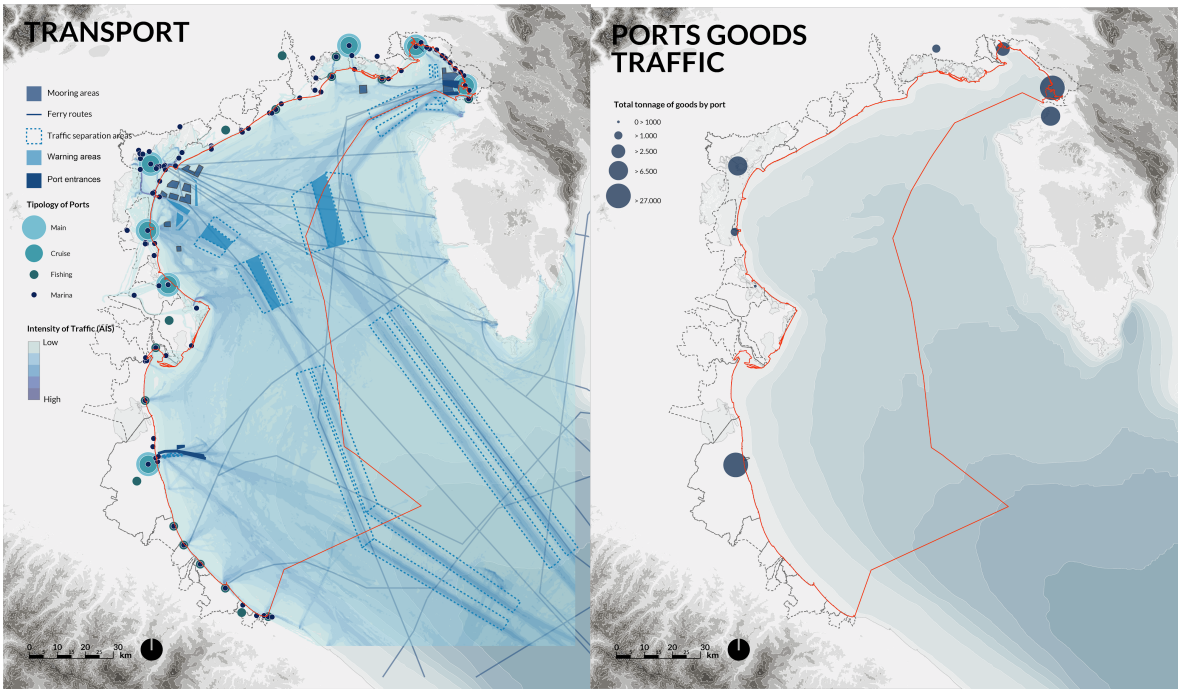



*Figure C.1.2 1 a and b: Density of maritime traffic and the quantity of goods (on the left) and passengers (on the right) taken up and set down for the harbours in the North Adriatic Case Study area*

The ports in the TEN-T network need to have by 2025 bunkering infrastructures for LNG and in the port of Venice is in programme the realization of LNG facilities especially regarding a coastal deposit and the distribution of LNG through bunkers.

2 http://www.assoporti.it/sites/www.assoporti.it/files/statistiche/AdSP_movimenti_portuali_2017_agg_20apr2018.pdf

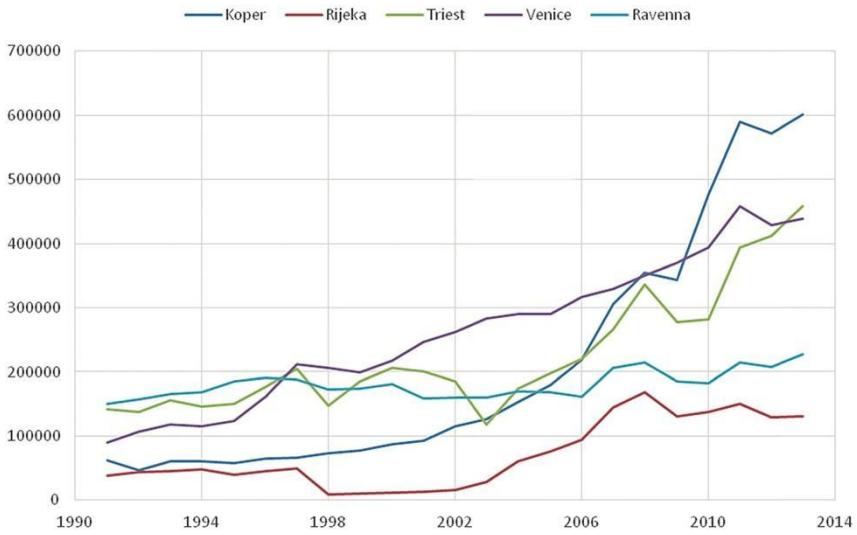



*Figure C.1.2 2: Containers throughput in 1000 TEU in period 1990-2013 at North Adriatic Ports. Source: (Twrdy and Batista, 2014)*

The intensive maritime transport activity in the Adriatic-Ionian region implies a various array of pressures on the environment: ships and port emissions, risks of accidents, acute pollution events, underwater noise, and the introduction of alien species through ballast water discharges (EC, 2012).

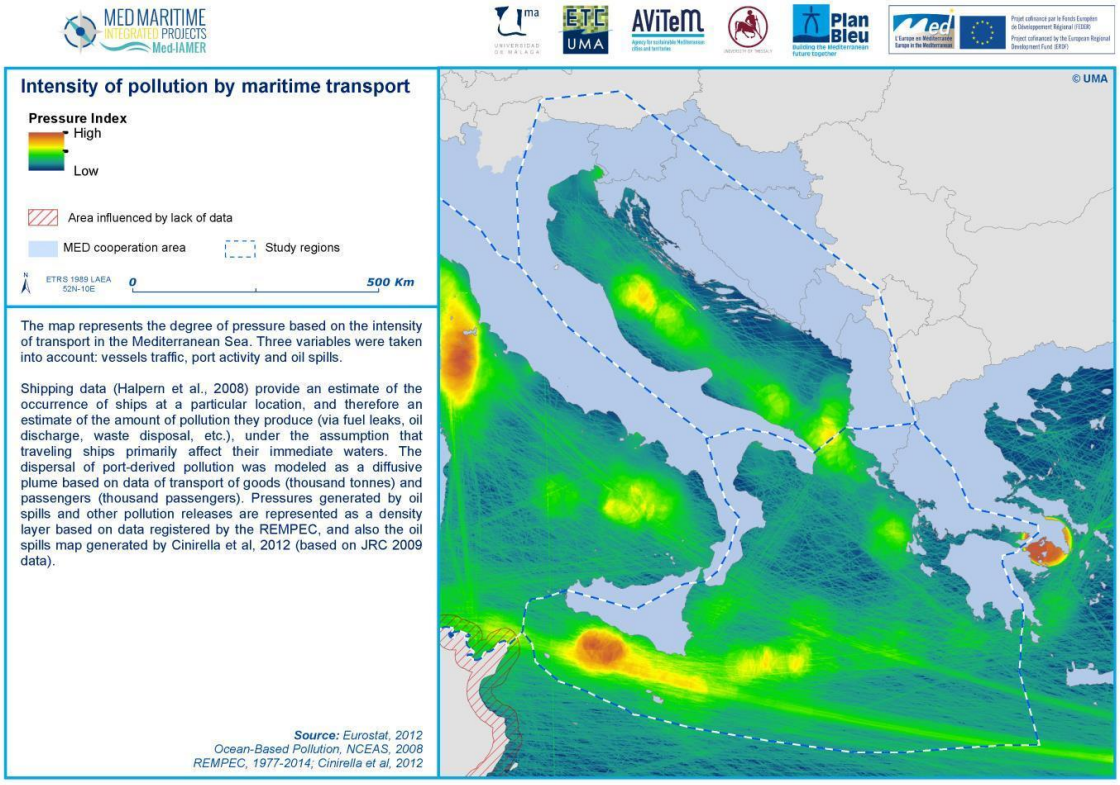



*Figure C.1.2 3: Intensity of pollution by maritime transport in the Adriatic Ionian Region. Source: Med-IAMER, 2014*

Moreover, the estimated annual quantity of oil and oil products carried by ships in the Gulf of Trieste is more than 35 million tons. For these reasons concentrations of hydrocarbons in the marine environment are higher near the expected sources (i.e. harbours) and still elevated in the adjacent offshore areas. This is more pronounced and evident in the northern part of the Gulf of Trieste near the ports of Koper and Trieste (Bajt, 2014).

Regarding the intensity of traffic in the area and the risks of accidents IMO has recorded that frequency of accidents the Adriatic Sea is recorded at a five times higher level than the world average, a fact mostly due to speed boats and yachts accidents which in the area are summed to the limited space. Traffic Separation Schemes (TSS) have been already established in the Northern Section of the Adriatic Sea covering respective solutions in the Eastern Part and the Western Part.

For what concerns other types of pressures produced by maritime transport activities, underwater noise is recognized as an important form of pollution with relevant transboundary nature and of international concern and the main source of underwater noise is maritime transport (Codarin & Picciulin, 2015). Moreover, shipping emissions of pollutants are currently increasing and will most likely continue to do so in the future due to the increase of global-scale trade (Bajt, 2014) and the introduction of harmful aquatic organisms and pathogens through ships ballast waters and sediments is an increasing concern in the Adriatic Sea (fig. 4; Med-IAMER, 2014).

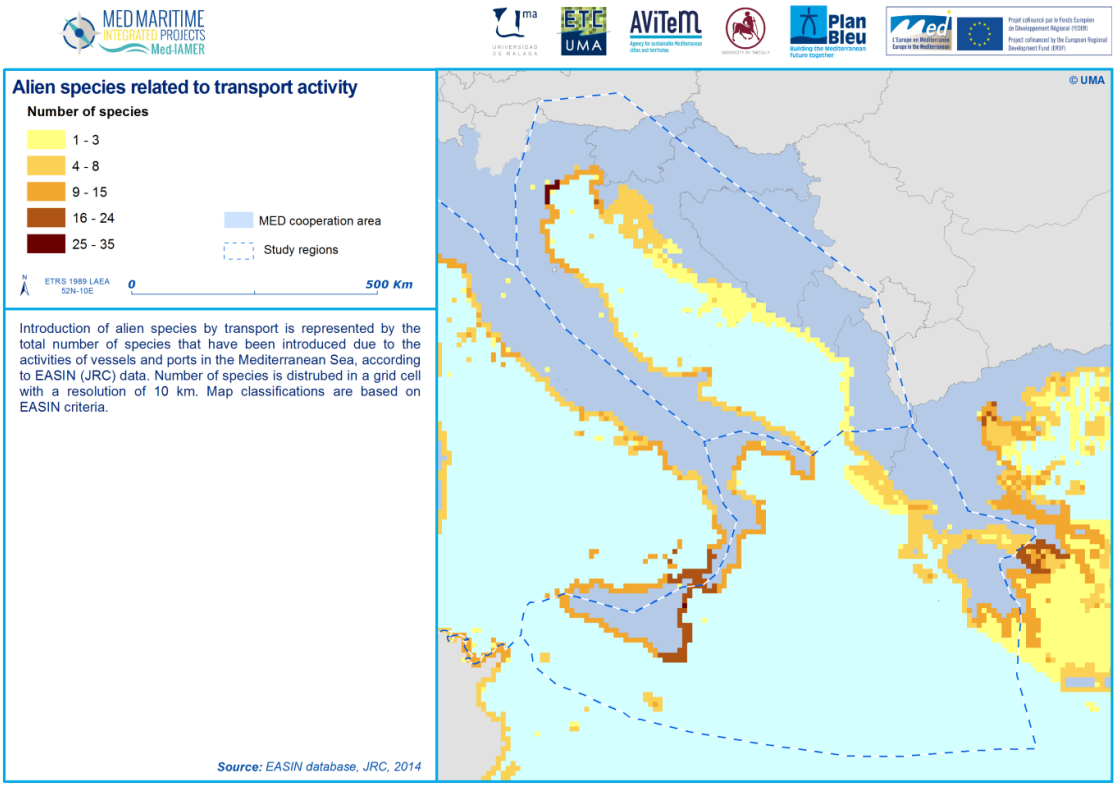



*Figure C.1.2 4: Alien species related to transport activities in the Adriatic Ionian Region. Source: Med-IAMER, 2014.*

Moreover, it is reported that one of the main anthropogenic causes of death for large cetaceans like fin whale and sperm whale in the Mediterranean is boat collision (Panigada et al., 2006). A report by

Panigada et al. (2006) suggests that 16% of stranded fin whales in the Mediterranean have died because collision with ships. In addition, the boats that are involved in collisions are mostly ferries, cargo and fast ferries (catamarans). Boat collision with Cetaceans in the Adriatic are seldom reported and not common generally. The source of potential concern could be the dramatic increase of leisure boat traffic during summer months particularly in the coastal areas.

Similarly, collision with fast moving vessels, is of concern for sea turtles (Demetropoulos & Hadjichristophorou, 2000). In a number of areas with a high intensity of fast traffic a number of turtles injured through collision have been reported (Camiñas & de Málaga 2004). This is of particular importance in areas with a higher abundance of sea turtles, such as the areas adjacent to nesting beaches in the period of mating and nesting (Demetropoulos & Hadjichristophorou, 2000). Boat collision in the Adriatic Sea is most notable along north and western part (Casale et al. 2010) and with the increasing traffic in the area of the Gulf of Trieste collisions are expected to grow.

Future trends forecast higher traffic density in the next years, due to the increasing phenomenon of naval gigantism, and the increasing importance of Ro-Ro and containers traffic, Short-Sea Shipping and of the Mediterranean economic exchanges. Therefore, traffic flows in Italian ports are expected to grow on average between +0.8 and +1.6 million TEU, compared to 2014. The traffic volume of non-containerized goods, including oil and other dangerous goods and liquefied natural gas (LNG), is also expected to increase significantly at the EU level and consequently in the North Adriatic. Moreover, the distribution of LNG will increase the traffic between bunkering facilities and bunkering areas. For these reasons the current environmental pressures from maritime transport activities and the probability of conflicts with other uses will increase in the next future. Consequently to the increasing of traffic in the area, bunkering and anchoring sites will need more space for development and it can be assumed that the current areas will be enlarged in order to fit the growing demand.

***Aquaculture***

The Italian North Adriatic Aquaculture is a key sector in the blue economy of Italy and one of main socio-economic activity in the study area. Emilia Romagna, Veneto and Friuli Venezia Giulia are the most productive regions for shellfish and finfish in Italy (MIPAAF, 2015).

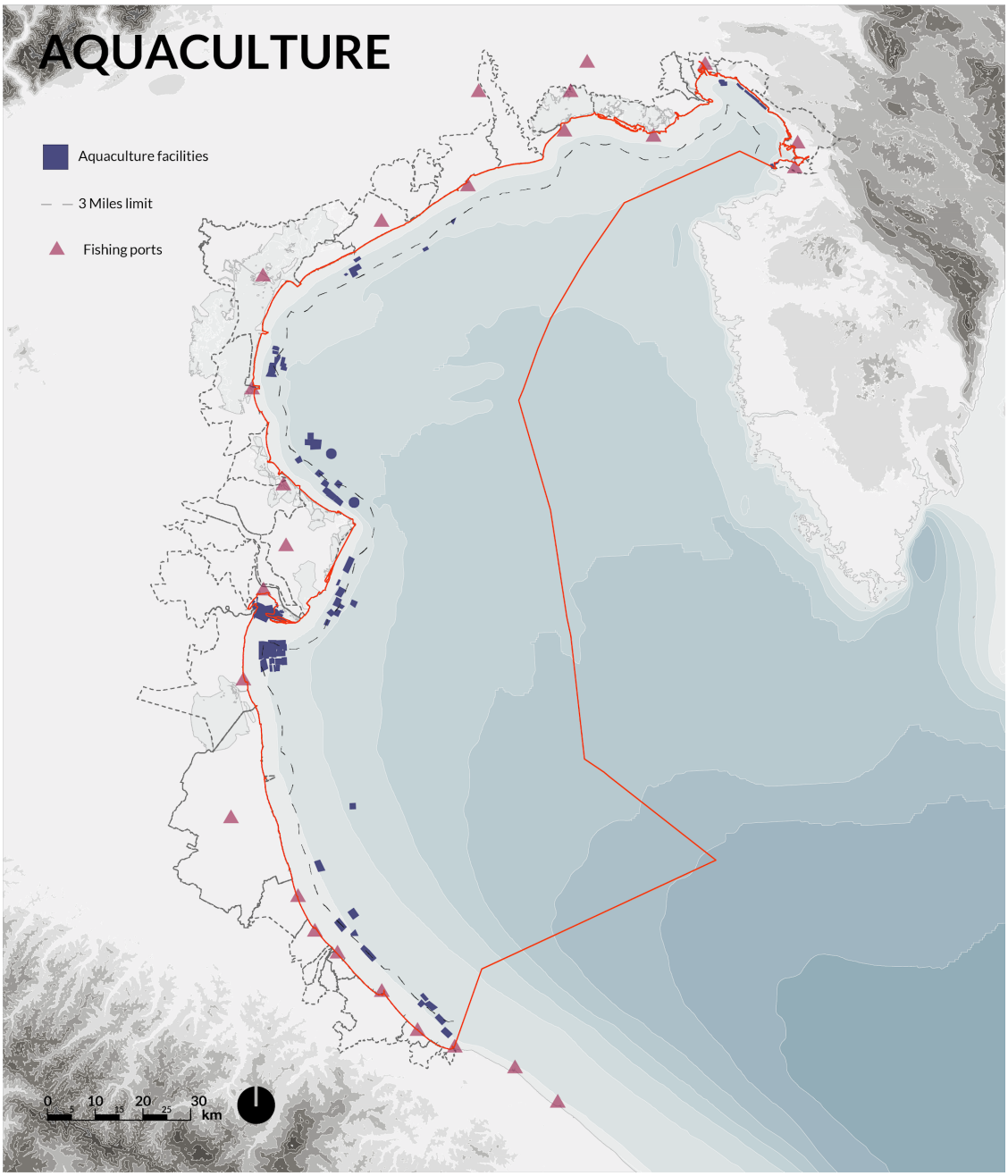



*Figure C.1.2 5: Aquaculture facilities in the CS area (2015)*

The aquaculture in Emilia Romagna and Veneto regions is mainly based on shellfish production, while in Friuli Venezia Giulia on finfish production. Emilia Romagna (45.7% of the national production) and Veneto (20.6% of the national production) regions represent the highest shellfish production in Italy (66% in total), in particular for clams (*Tapes philippinarum*, mainly in transitional waters) and mussels (*Mytilus galloprovincialis*, mainly in marine waters). Emilia Romagna produces 40,000 tons/year, followed by Veneto with 18,000 tons/year. Friuli Venezia Giulia is mainly based on finfish aquaculture (trout farming) with 14,000 tons/year (26% of the national production) of production but it also produces 4,000 tons/year of shellfish (2013 data from MIPAAF, 2015).

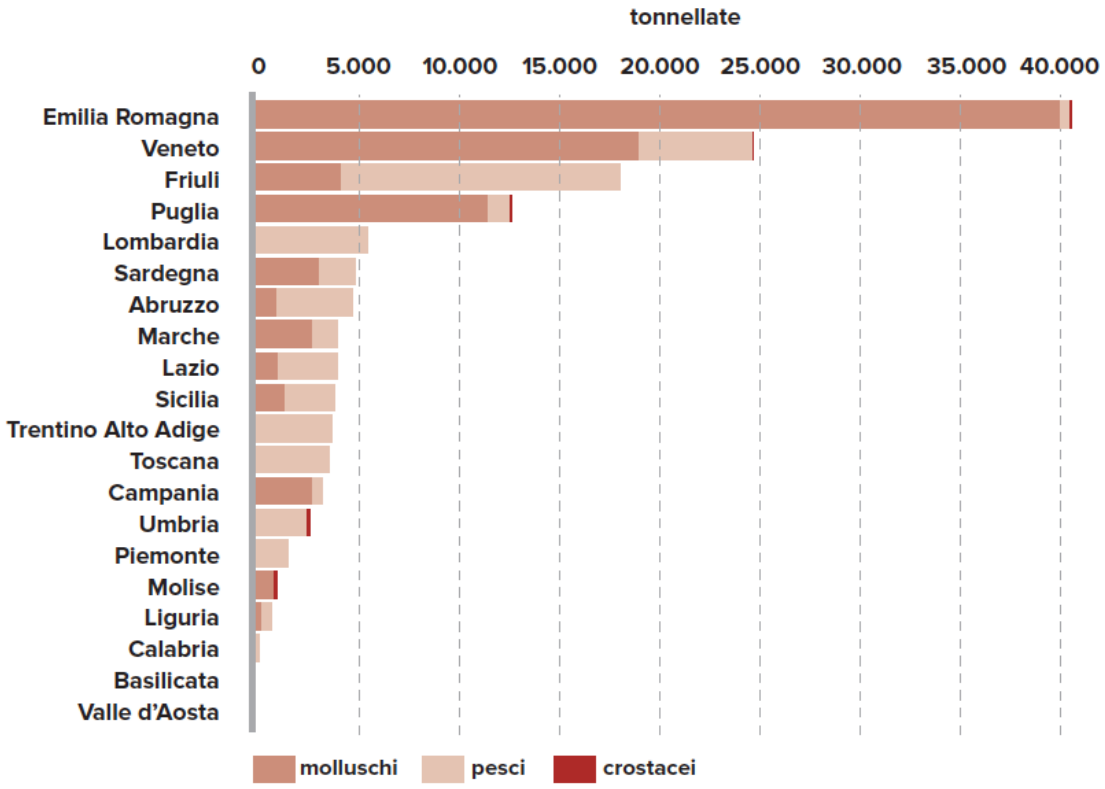


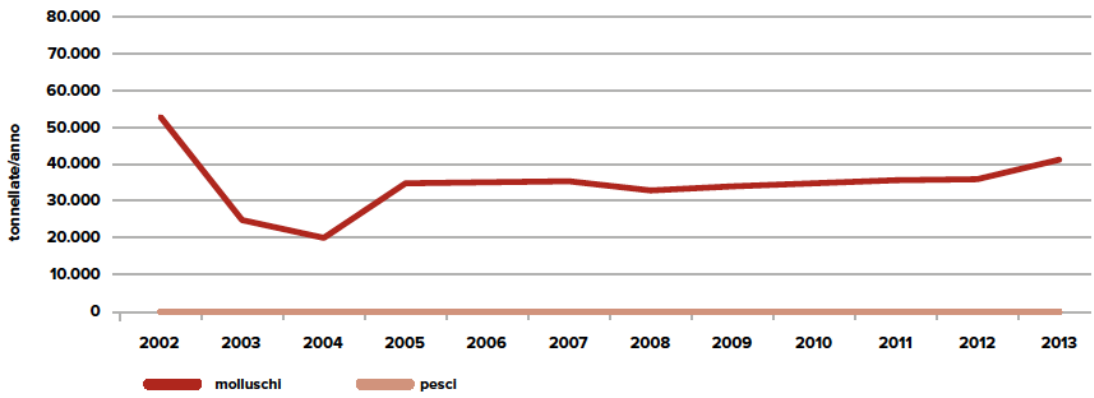

*Figure C.1.2 6: Aquaculture production in Italy per region and per productive sector - 2013 (MIPAAF, 2015)*

Concerning the total number of companies involved in the aquaculture production in all the three regions, 3109 active units were registered in 2016, among which over 91% are operating only in the marine waters. In the last ten years, the number of companies increased by 78.9%. Those operating in marine waters increased by 91.9%, while fish farming companies fall by 7.3%. Veneto is the leading region with 1610 companies registered in 2016. In Emilia-Romagna region, 1362 companies were active in 2016, showing an annual increase of 76.4%. The number of companies of aquaculture operating in Friuli-Venezia Giulia is much smaller: 137 companies registered, increasing by 65.1% respect to 2005.

*Table C.1.2 2 - Number of aquaculture enterprises of the three regions (Distretto di Pesca Nord Adriatico - Analisi della filiera dell'acquacoltura - 2016, Osservatorio Socio Economico della Pesca e dell'Acquacoltura - Veneto Agricoltura)*

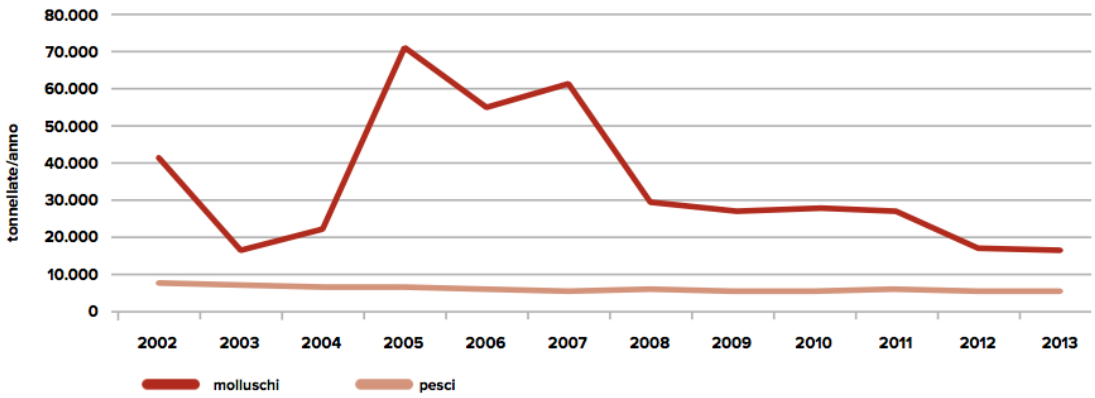
| Enterprise typology | Emilia-Romagna | Veneto | Friuli Venezia Giulia |
|---|---|---|---|
| Aquaculture *(uncategorized)* | 23 | 63 | 10 |
| Marine Aquaculture | 1287 | 1461 | 86 |
| Freshwater Aquaculture | 52 | 86 | 41 |
| TOTAL | 1362 | 1610 | 137 |

Concerning the current trend of the sector in the study area, a general decrease of production from 2002 to 2015, is revealed: from more than 180.000 tons in 2003 to about 140.000 tons in 2015.




| | Trend di Produzione (var%) | | | |
|---|---|---|---|---|
| | 2011/2013 | | 2002/2013 | |
| Molluschi | +10,87 | | - 22,38 | |
| Pesci | - 13,61 | | - 20,95 | |
| Addetti | 1.749 | | | |
| Numero Impianti | 145 | | | |
| Specie | Mitilo, Vongola, Pesce gatto, Cefalo, Persico trota, Carpa, Orata, Gambero di palude, Spigola, Anguilla, Storione, Trota, Gamberetto maggiore, Ostrica, Mazzancolla, Gambero di fiume, Tinca, Salmerino | | | |
| Tecnologie | vasca, valle, bacino, sospensione, sul fondo | | | |
| PRODUZIONE VOLUME (t) | 41.035,8 | PRODUZIONE VALORE (€) | 84.722.698 | |

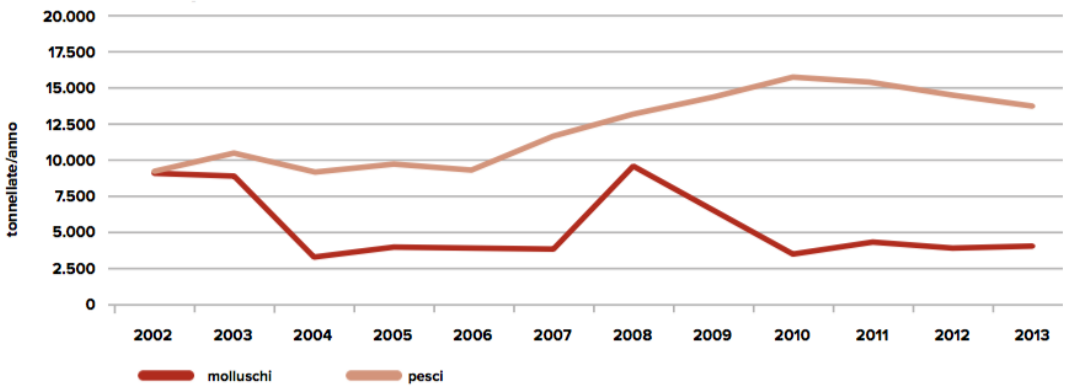
*Figure C.1.2 7: Production and productive trend in Emilia Romagna (MIPAAF, 2015)*




| | Trend di Produzione (var%) | |
|---|---|---|
| | 2011/2013 | 2002/2013 |
| Molluschi | - 32,38 | - 54,57 |
| Pesci | - 11,32 | - 32,32 |
| Addetti | 2848 | |
| Numero Impianti | 192 | |
| Specie | Vongola, Mitilo, Trota; Storione, Pesce gatto, Carpa, Cefalo, Anguilla, Persico spigola, Spigola, Orata, Salmerino, Lucio, Tinca, Gambero di fiume, Mazzancolla | |
| Tecnologie | vasca, recinto, bacino, sul fondo, sospensione | |

| | | | |
|---|---|---|---|
| PRODUZIONE VOLUME (t) | 24.390,4 | PRODUZIONE VALORE (€) | 91.701.442 |

*Figure C.1.2 8: Production and productive trend in Veneto (MIPAAF, 2015)*




| | Trend di Produzione (var%) | |
|---|---|---|
| | 2011/2013 | 2002/2013 |
| Molluschi | - 9,32 | - 53,58 |
| Pesci | - 8,66 | + 47,65 |
| Addetti | 139 | |
| Numero Impianti | 77 | |
| Specie | Trota, Mitilo, Vongola, Orata, Spigola, Salmerino, Persico, Cefalo, Ombrina, Persico spigola, Anguilla, Mazzancolla | |
| Tecnologie | vasca, gabbia, valle, bacino, sospensione, sul fondo | |
| PRODUZIONE VOLUME (t) | 17.981,9 | PRODUZIONE VALORE (€) 50.246.265 |

*Figure C.1.2 9: Production and productive trend in Friuli Venezia Giulia (MIPAAF, 2015)*

The main production is represented by mussel farming offshore, which is carried out on innovative long lines (wooden breeding systems are still used, in particular in the Venice lagoon and in the Sacca di Scardovari not included in the study area).

In Emilia-Romagna region the production areas are concentrated along the coast (Sacca di Goro, out of Lido delle Nazioni, out the coast of Forlì/Cesena, Ravenna and Rimini), Figure C.1.2 10 clearly shows that the production of mussel farming been constantly growing in the last fifteen years, with exception of two drops in 2004 (8397 tons) and 2015 year, both due to adverse weather conditions.

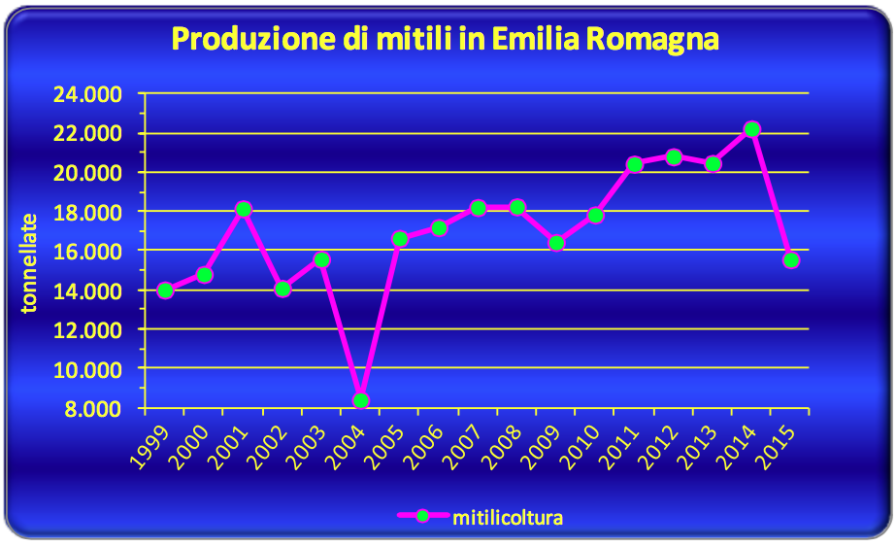



*Figure C.1.2 10: Mussels production of Emilia-Romagna region (Distretto di Pesca Nord Adriatico - Analisi della filiera dell'acquacoltura - 2016, Osservatorio Socio Economico della Pesca e dell'Acquacoltura - Veneto Agricoltura)*

In Veneto mussel farms are located along the coastline from Chioggia to Venice and out of Po delta area. The production of mussels in Veneto recorded 7063 tons (2015), resulting in a productive loss annual rate of -59.8%. This was due to an intense storm occurred between February 5 and 8, 2015, characterized by waves higher than seven meters, that destroyed most of the rows of the longline facilities offshore, causing 10000 tons of product loss. The production of mussels in the Po Delta area accounts for almost 88% of the regional total (fig. C.1.2 11). The loss of production detected at sea for the Venetian area is higher than that of the Po Delta.




*Figure C.1.2 11: Mussels production of Veneto region (Distretto di Pesca Nord Adriatico - Analisi della filiera dell'acquacoltura - 2015, Osservatorio Socio Economico della Pesca e dell'Acquacoltura - Veneto Agricoltura)*

Production from mussel farming in Friuli-Venezia Giulia is carried out typically in the Gulf of Trieste. The farmers report that the loss of production of the last five years is due to the reorganization of the rows of Punta Sottile and also to the maintenance of some of them, after an intense sea storm occurred in 2013 (Fig. C.1.2 12). The estimated production for 2016 was 2190 tons, with an annual loss of -2.7%, which however rises to -34.1% if compared to the peak of production in 2011 of 3321 tons. In 2015, 16 companies and 42 employees were involved in mussel farming in Trieste.

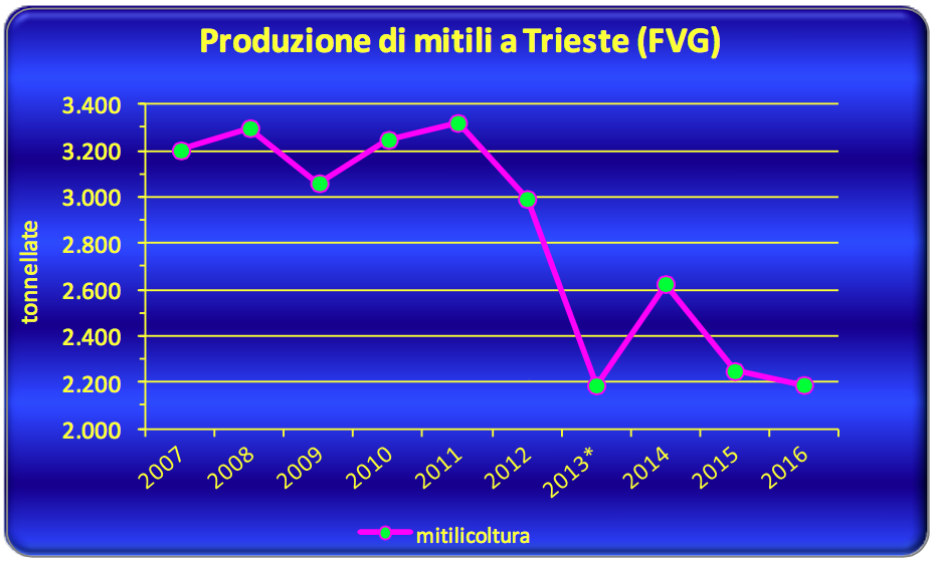



*Figure C.1.2 12: Mussels production of Friuli-Venezia Giulia region (Distretto di Pesca Nord Adriatico - Analisi della filiera dell'acquacoltura - 2015, Osservatorio Socio Economico della Pesca e dell'Acquacoltura - Veneto Agricoltura)*

Regarding the future trend of aquaculture substantial stability can be expected for clam farming and an increase of mussel farming. Also, in Emilia-Romagna, as in other Italian regions, it is trying to diversify mollusc farming with the introduction of oyster farming through the realization of hatches and new facilities.

**Relevant national and regional plans**

Regional policies support the future development of aquaculture, contributing to the implementation of the plans foreseen by the European Directive 2014/89 / EU, with the aim to improve both the quality of the ecosystems and the potential productivity of the sector, as well as increasing the structural investments permitted by public funding (EFF and national funds). European policies aim to support aquaculture rather than fishing, considering the severe depletion of fish resources. European Fisheries Fund have already allowed investments for several works addressed to decrease production costs and increase the efficiency on production (Barbanti and Perini, 2018).

The Aquaculture Structural Plan is a document prepared with an intense participatory activity, presenting the combined vision of the central administration, regions and stakeholders in various ways involved from the beginning in the preparatory process. The Plan introduces the sectoral context, the strategic vision to 2030 and identifies priority objectives and strategic actions.

**Classification of the aquaculture areas**

Emilia-Romagna, Veneto and Friuli-Venezia Giulia are the Italian regions in which mussels, clams and fish farms are more widespread. The real development of this sector, especially in the lagoons, occurred at the beginning of began in the early 1900s: it is from this that moment, in fact, that its

importance has has been grown over time, thanks to the increase of the profitability of the sector compared to the fishery one and of commercial demand for farmed products.

Fish products deriving from fishing and aquaculture, as destined for human consumption, have been always subjected to numerous issues linked to the production phases and to the certification of the product. Therefore a specific regulation that establishes the sanitary rules applicable to production and marketing of live bivalve molluscs (DL 530/92) and of fisheries products (DL 531/92) for direct human consumption has been required. The company self-control has also been introduced, according to the HACCP analysis, as a tool to prevent contamination. Today these decrees are flanked by community regulations (Reg. CE n. 852/2004, EC Reg. N. 853/2004, EC Reg. N. 854/2004), which broaden the subject in order to provide greater hygiene and food safety guarantees on products intended for consumer tables, trying to increase the responsibility of all operators in the food sector.

The level of contamination of the water in which the production takes place is fundamental in terms of hygiene and health. Bivalve molluscs are filtering organisms and feed on phytoplankton, which they obtain from the continuous filtration of seawater. The presence of water contaminated by a myriad of varieties of bacteria, viruses, chemical contaminants or biotoxins could be harmful both to the organisms fed and to the end consumer. In order to guarantee the food safety of this product, the regulation (EC regulation n.854 / 2004) defined the guidelines of the sanitary controls and, in particular, provided the following classification of the production areas, according to the microbiological requirements:

- Class A areas: production areas from which live bivalve molluscs can be collected and be directly destined for human consumption;

- Class B areas: production areas from which live bivalve molluscs can be harvested, but in order to be placed on the market for human consumption, they must first undergo a purification treatment or a natural housing in a center is required;

- Class C areas: forbidden production areas, from which live bivalve molluscs can be harvested small and then destined for the breeding cycle in zones A and B.

***Fisheries***

The Italian North Adriatic regions host old and important fishing traditions, and its fishing ports have always been a point of reference and innovation for sea fishing in Italy. The local fisheries sector features the following main activities:

- small-scale fisheries (SSFs), exerted mainly by fishing by vessels of less than 12 meters in length, mainly alternates passive fishing gears and depends on the seasonal successions and ecological features of target species. SSFs represent the most important sector in terms of number of fishing vessels, with over 600 units in GSA17 (MIPAAF National Program Data Collection 2016). The most commonly used fishing gears in the area are gillnets for soles (*Solea solea*) and mantis shrimps (*Squilla mantis*), trammel nets for turbot (*Scophthalmus maximus*), pots and/or fyke nets for cuttlefish (*Sepia officinalis*), basket traps for sea snails (*Tritia mutabilis*). The distribution of small-scale fishing effort in the study area is predominantly concentrated within 6-7 nm for all the set gears, with the exception of gillnets, hydraulic dredges for clams and purse seine seasonal operations off the coast of Emilia-Romagna and Friuli (Fig. C.1.2 13).

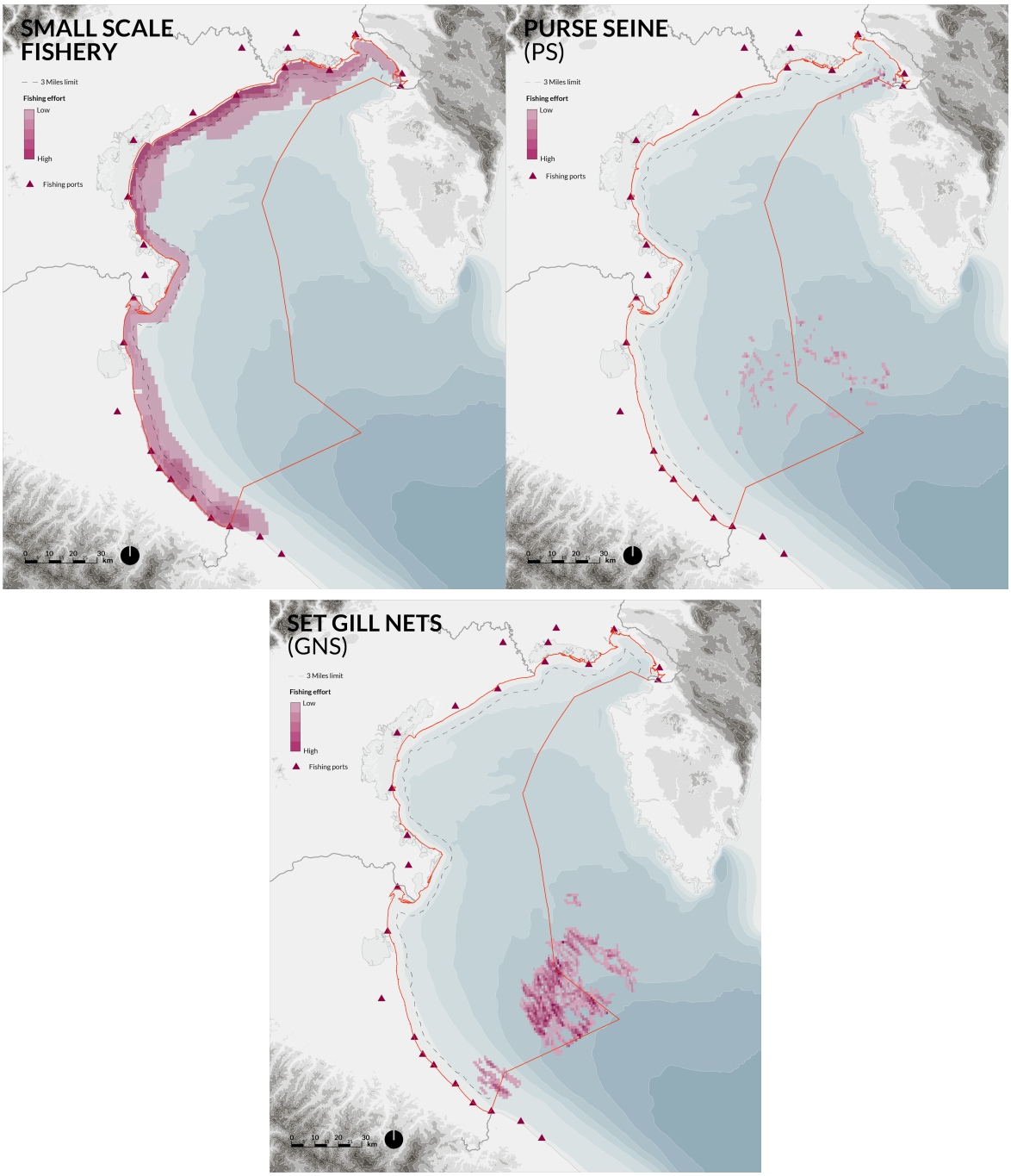



*Figure C.1.2 13 a, b and c: Small-scale fisheries effort (FAO-ADRIAMED data); offshore gillnets (from AIS) and purse seine operations (from AIS) (Tassetti et al. 2016; Fabi et al. 2017) in the CS area (year 2015).*

- trawling for demersal species, i.e. commercial bottom otter trawling (OTB), is legally practiced off 3 nautical miles and aimed at multi-species capture of demersal species. Although the captured and landed species include a large number of commercial species, the main targets are mantis shrimp (*S. mantis*), cuttlefish (*S. officinalis*), and red mullet (*Mullus barbatus*) (MIPAAF National Program Data Collection 2016).

- trawling fishing with “rapidi”, i.e. beam trawl (TBB) fishing, with an active fixed-mouth tool specific for benthic species such as sole (*S. solea*) and pectinidae (*Pecten jacobaeus* and *Aequipecten opercularis*).

- trawling for small pelagic species, i.e. commercial trawling along the water column towed by two vessels simultaneously (pelagic pair trawl, PTM), practiced by law off 3 nautical miles from the coast, for the almost exclusive catch, but important in quantitative terms compared to the other types of fishing, of anchovies (*Engraulis encrasicolus*) and sardines (*Sardina pilchardus*).

The distribution of the trawling effort, both on the bottom and pelagic, presents different coverages and intensities in the study area (Tassetti et al. 2016; Fabi et al. 2017; Ferrà et al. 2018). Bottom otter trawling (OTB) substantially covers the whole study area, except for the 3 nautical miles band within which it is forbidden, with greater intensity between 10 and 14 nautical miles in front of Emilia-Romagna coasts, offshore Veneto region and in the Gulf of Trieste and in international waters (Fig. C.1.2 14).

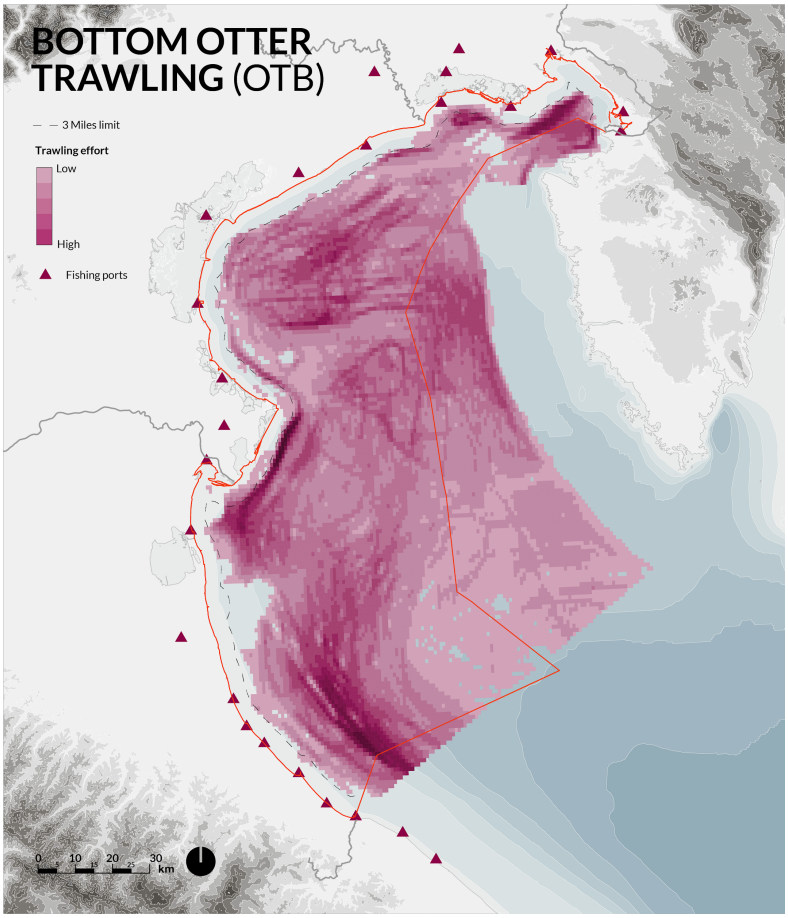



*Figure C.1.2 14: Bottom otter trawling (OBT) effort (swept km; 2015) (Tassetti et al. 2016; Fabi et al. 2017).*

“Rapido” trawl effort is concentrated mainly in the offshore and northern portion of the study area, and shows greater intensity outside the 6 nautical miles between Venice, Chioggia and the Po river delta, in the southernmost part of the Emilia-Romagna coasts and in international waters offshore the Po delta (Fig. C.1.2 15).

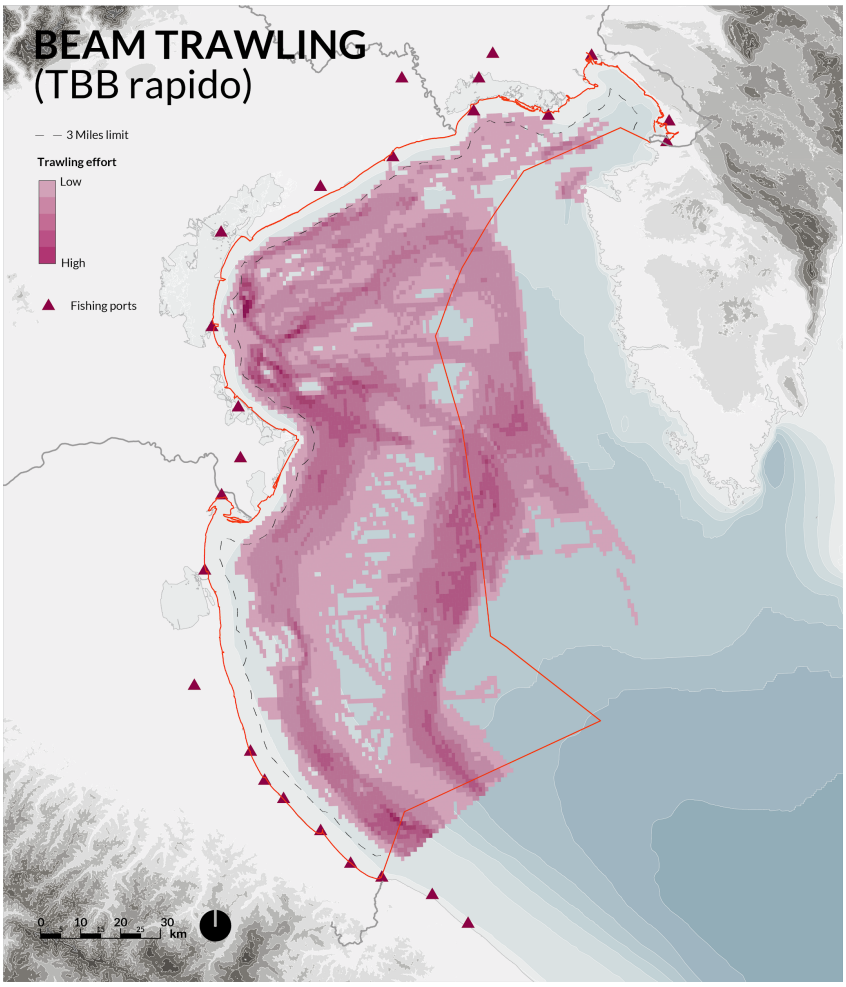



*Figure C.1.2 15: "Rapidi" beam trawl (TBB) fishing effort (swept km; 2015) (Tassetti et al. 2016; Fabi et al. 2017).*

Fishing with pair pelagic trawl, although less intense than the two other trawling techniques, is distributed over the entire study area off 3 nautical miles, with a greater intensity between 3 and 6 nautical miles of Veneto waters and in the southern part of the study area (Fig. C.1.2 16).

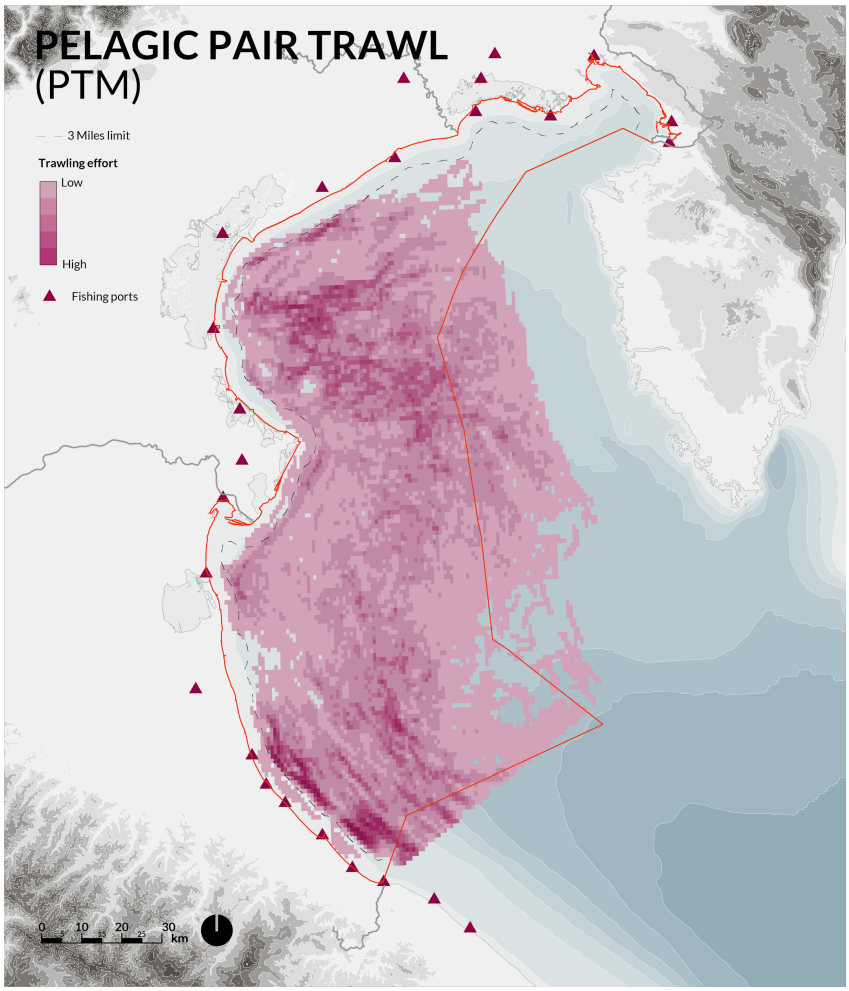



*Figure C.1.2 16: Pelagic pair trawl (PTM) effort (swept km; 2015) (Tassetti et al. 2016; Fabi et al. 2017).*

Considering 2016 data, small-scale fisheries clearly is the most relevant in the study area in terms of mean number of active vessels (Fig. C.1.2 17). The prevalence of this fleet segment was higher in Friuli-Venezia Giulia, followed by Emilia-Romagna and Veneto, accounting for 269, 258 and 198 vessels, respectively. The number of vessels belonging to the other fleet segments showed lower values. Among these, a significant number of active vessels was observed for bottom otter trawlers in Emilia-Romagna (61 vessels) and in Veneto (54 vessels), and 42 hydraulic dredges in Emilia-Romagna.

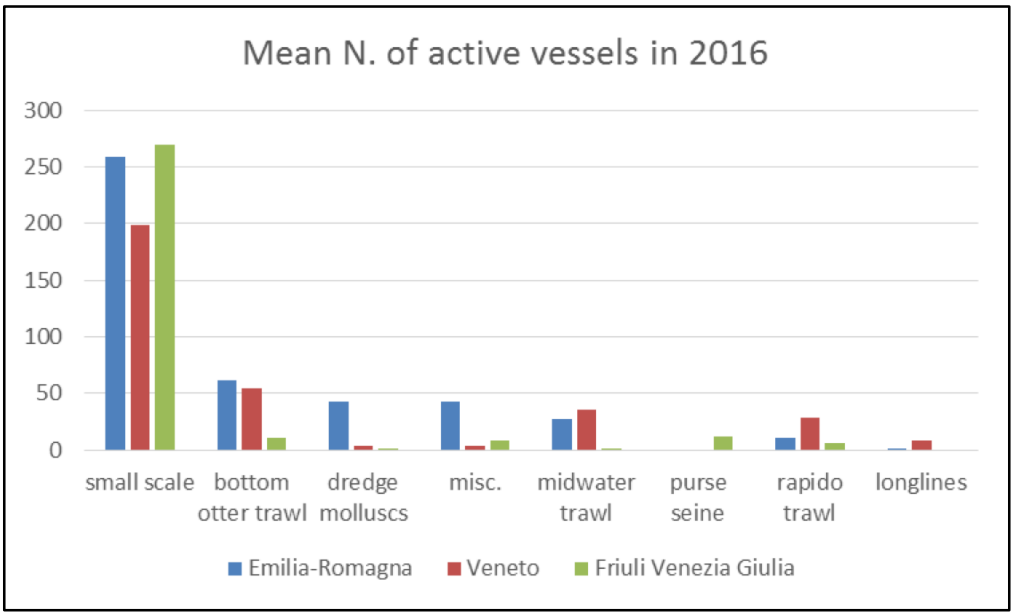



*Figure C.1.2 17: Number of vessels operating in each region subdivided by type of fishing activity.*

In terms of landing value, Veneto has the primacy not only in terms of abundances (Kg) (Fig. C.1.2 18), but also of incomes (€) (Fig. C.1.2 19), followed by Emilia-Romagna and Friuli-Venezia Giulia (71997028.72 €, 46259430.59 €, 18503741.79 €, respectively). While in Friuli-Venezia Giulia the most productive fishing activity is the small-scale fishery (9256614.81 €), in the other regions it emerges it is trawling (bottom, midwater and rapido).

In consequence of the most relevant regional fishing activities, also the venues connected to the specific target species changes between the three regions. In Emilia-Romagna the biggest income comes from *Squilla mantis* (10545695 €), followed by *Chamelea gallina*, *Sardina pilchardus*, *Engraulis encrasicolus* and *Solea solea.* In Veneto, the most important incomes are those from *Engraulis encrasicolus (*10969847 €), then *Sepia officinalis, Solea solea, Sardina pilchardus* and *Chamelea gallina*. In Friuli-Venezia Giulia the species that provide a higher revenue are quite different: *Sepia officinalis* (2216540 €) followed by *Sparus aurata*, *Callista chione*, *Dicentratus labrax* and *Solea solea*. Below is the percentage income for the main commercial interest species in the three different regions (Fig 20a, 20b, 20c).

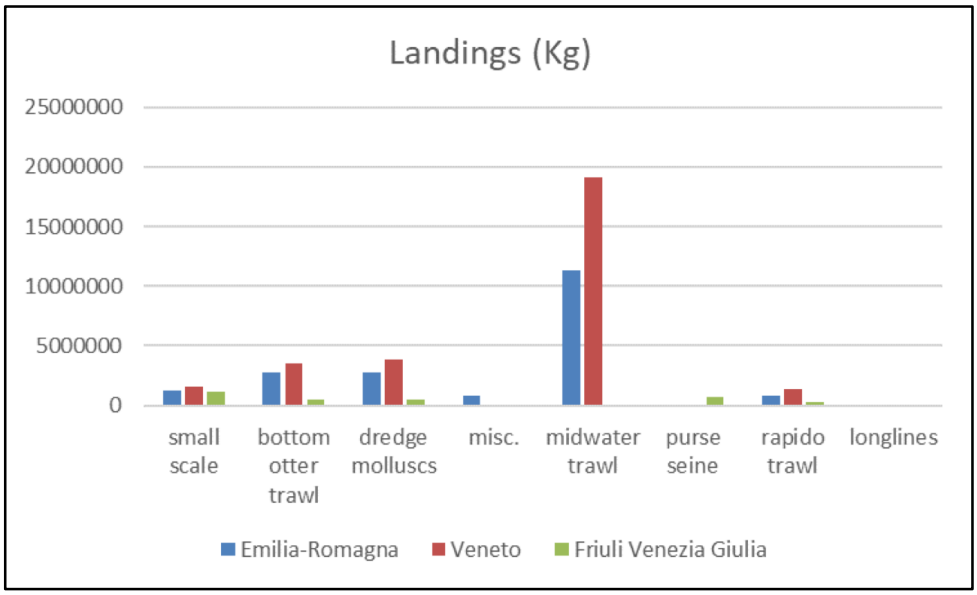



*Figure C.1.2 18: Weight landing value of each region divided by type of fishing activity.*

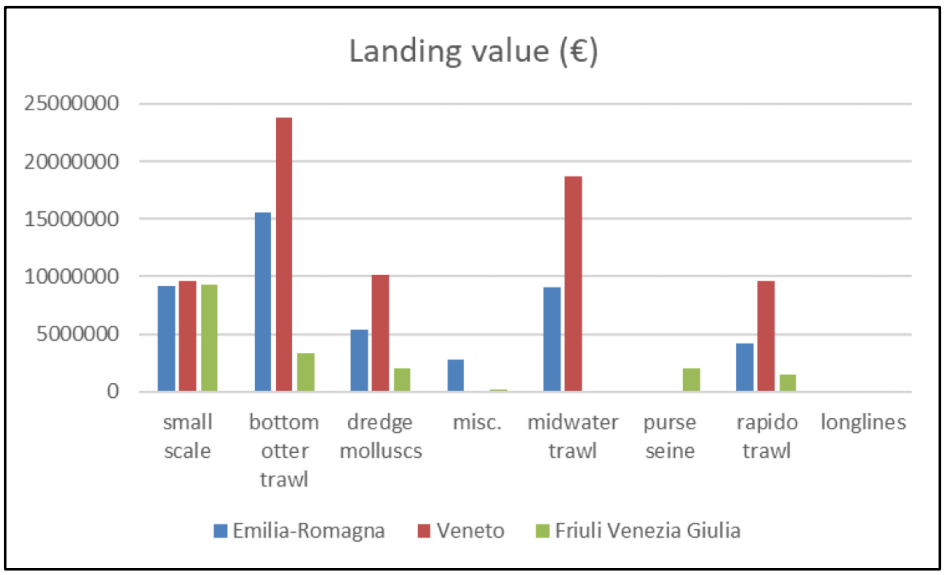



*Figure C.1.2 19: Economic landing value of each region divided by type of fishing activity.*

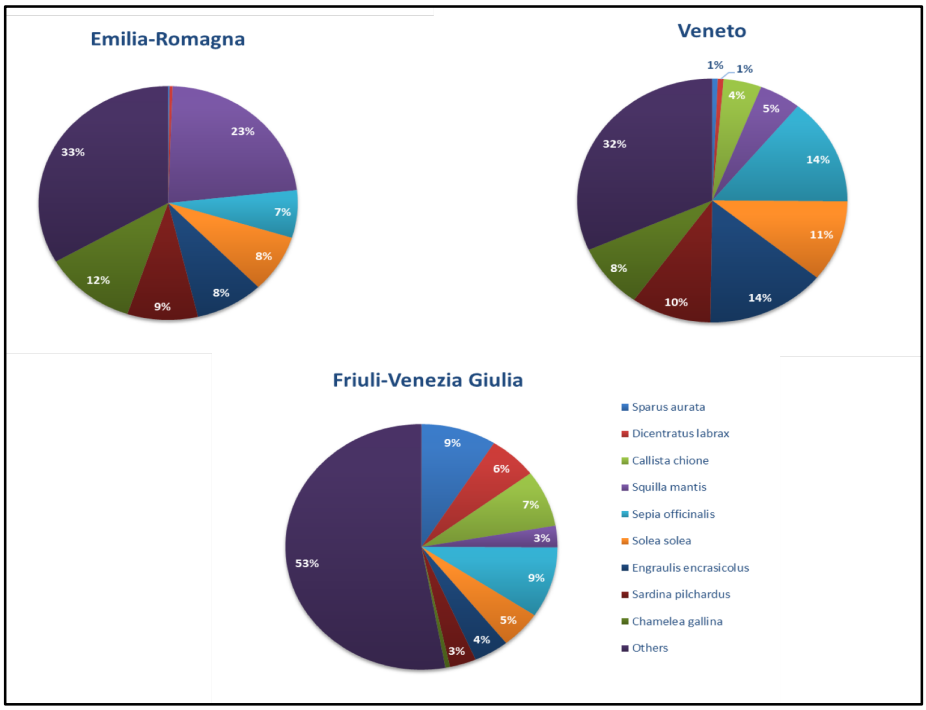



*Figure C.1.2 20 (a,b,c): Percentage income for the main commercial interest species of Emilia Romagna, Veneto and Friuli-Venezia Giulia*

Fishing with trawl nets, dredges, purse seines, boat seines, shore seines or similar nets above seagrass beds (e.g., *Posidonia oceanica*), coralligenous habitats and mäerl beds is prohibited (Reg. CE 1967/2006). This prohibition also applies to all Natura 2000 sites, all special protected areas and all specially protected areas of Mediterranean interest (SPAMI). The use of purse seines, boat seines or similar nets, whose use in fishing operations avoid the purse-line, the lead-line or the hauling ropes to touch the seagrasses beds, may be authorised within management plans provided for under either Article 18 or Article 19 of Reg. CE 1967/2006. The use of towed gears is prohibited within 3 nautical miles of the coast or within the 50 m isobaths where that depth is reached at a shorter distance from the coast.

Trawling activities (both bottom otter trawling, rapido trawling and midwater pelagic) are prohibited within 4 nm from the coast for vessels having LOA≤15m and 6 nm from the coast for vessels having LOA>15m from 31st July until 31st October (D.M. n°6908 del 20.07.2018). Trawling is also prohibited within a 500 meter radius from offshore platforms, cables and pipelines, in correspondence with ports, facilities of aquaculture and military polygons, and inside the Biological Protection Zones (BPZ). In BPZ "Ravenna", professional fishing activities using pots, gill nets and long lines, as well as recreational fishing with a maximum of 5 hooks per fisherman, are allowed, including fishing with collective vessels. Other three BPZs are located inside the study area. In the BPZ "Miramare", the use of gillnets and purse seine is allowed only for the capture of cuttlefish and mantis shrimps, while for recreational fishing the same rules of the BPZ "Ravenna" applies. Within the BPZ "Miramare" is located an MPA. Within the MPA, all the fishing activities are completely forbidden. In the BPZ and corresponding Natura 2000 SCI "Tegnue di Chioggia" all the professional fishing activities are forbidden; recreational fishing with a maximum of 5 hooks per fisherman is allowed only in the channels between the four rocky areas. In the BPZ "Caorle" an absolute ban for all forms of fishing is

in force. The SIC IT4070026 "Paguro" has a dedicated management plan. In particular, any kind of fishing is prohibited (recreative and professional).

***National and regional management plans for fishery***

In relation to the European regulatory framework, the main reference remains the Common Fisheries Policy (CFP), which has its legal basis in Articles 38 to 44 of Title III of the Treaty on the Functioning of the European Union (TFEU), together with the regulatory acts connected to it. Reformed starting from 1 January 2014 with Regulation (EU) 1380/2013, the CFP derives the obligation to manage the fishing sector in the European Union through multi-year plans (delegating greater responsibilities at regional and national level) formulated with an ecosystem approach and considering the precautionary principle, adopting a sustainability dimension also in the social and economic sphere, in line with the EU maritime strategies.

The new CFP and its regulatory framework intend to direct management policies towards the obligation to recover fish stocks at sustainable levels, through the increasingly widespread use of fishing practices capable of eliminating the waste of resources and the definition of new challenges/opportunities to create jobs and growth in coastal areas. In view of the new CFP, the achievement of these objectives is to be guaranteed also through the prohibition of discards at sea (which will gradually become operational in several phases by 2019), the possible attribution of new rights in the fishing sector, the development of aquaculture, support for small-scale fisheries, the increase of scientific research activities concerning the state of the stocks, and the assumption of responsibility in the waters of third countries through international agreements of the European Union.

In this context, Italy, in strict compliance with the agreements and commitments undertaken, wants to play an increasingly active role in order to better represent the Mediterranean specificities that are environmental and socio-political.

Starting from the experiences conducted so far and considering the limits of acceptability of the inevitable social and economic impacts of fishing restrictions, priority is given to the adoption of a new strategy focused on:

- the reduction of fishing effort with a further definitive withdrawal of capacity (from the EMFF funds), in addition to the continuation of the temporary arrest;
- spatial planning of fishing areas, with permanent or temporary closure of sensitive areas (ZTB, nurseries) to capture activities;
- the intensification of activities to combat illegal fishing (including by counting on the collaboration of national associations) and control on land at landing sites and on markets.

In 2018, on July 31 (until September 10), will start the closed season in the upper Adriatic from Trieste to Ancona. It should be specified that not all the fishing vessels will be blocked. In fact, only bottom otter and bottom beam trawling activity are prohibited for demersal species (e.g. mullet, sole, turbot, mantis shrimp, cuttlefish), as this type of fishing destroys the fish eggs; and the midwater trawl fishing technique (which have the main target anchovies and sardines). Therefore, around 50% of the regional fleet remains in port, while medium and small vessels equipped with fixed tools and traps, such as gill nets, pots, etc., are free to supply the fish market.

**Trends**

The trend of the fishing sector in the Italian North Adriatic in the period 2010-2015 has recorded a steady decrease, with a slight stabilization of the declining in the last couple of years. The maritime fleet has undergone a general and continuous reduction both in terms of number of vessels and engine power. The strong reduction in the profitability of the sector, stronger within the trawling sector if compared to the other fishing systems, has been caused above all by the decline of fish resources, the

increase in operating costs and the competition between sectors and markets at local and transboundary level, pushing the operators to abandon the fishing sector, using the incentives provided for the definitive withdrawal. The decreasing trend is in line with that registered at national level and pursued at EU level. Over the next few years, with the implementation of the European Maritime and Fisheries Fund (EMFF) - Operational Programme for Italy (FEAMP 2014-2020), a further reduction in industrial fishing capacity is expected. Measure to promote the role of sustainable small-scale fisheries in the area, given its important and peculiar socio-economic value for coastal communities, and to reduce the impacts of destructive industrial fishing techniques are provided within the EMFF.

### *Coastal and Maritime Tourism*

Coastal and maritime tourism, which includes a variety of tourism typologies, represents the main socio-economic driver of the study area with great potential for the future. Emilia-Romagna, Veneto and Friuli Venezia Giulia are the Italian regions with high maritime tourist intensity (Risposte Turismo, 2017). The study area is characterized by highly developed tourism sector (fig C.1.2 21), with great potentialities of synergies with other maritime activities, promoting a multiuse approach in the MSP process (Depellegrin et al. 2018a; Barbanti and Perini, 2018; Depellegrin et al., 2018b).

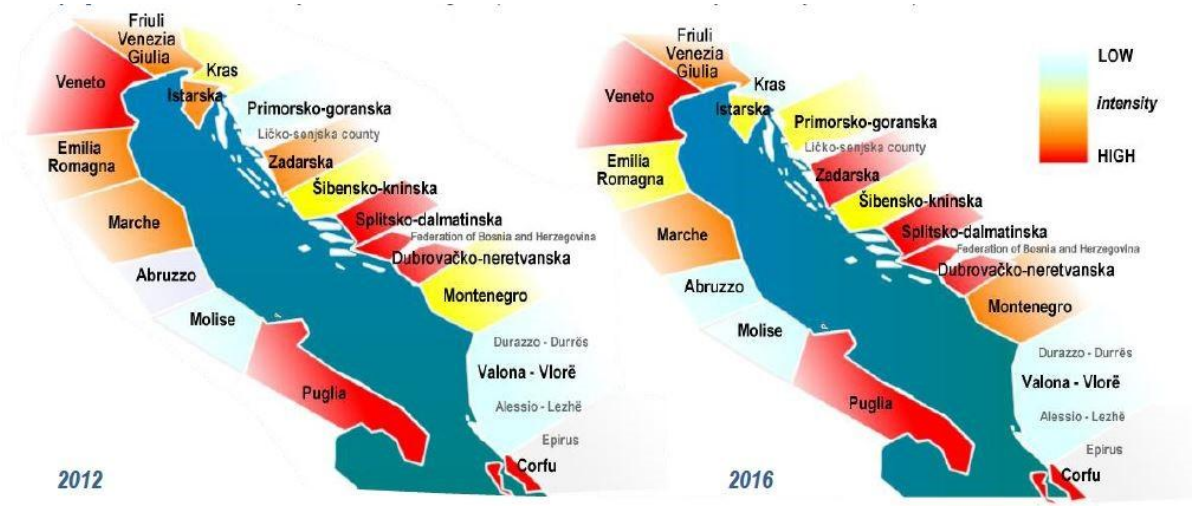



*Figure C.1.2 21: Tourism intensity [Risposte Turismo, 2017]*

### Coastal Tourism

The North Adriatic Sea is an important coastal tourism destination in the Mediterranean. The three regions of the Case study are the most visited, in terms of arrivals and nights spent, compared to the other regions of the Italian Adriatic coast.

| TIME | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| GEO | | | | | |
| Veneto | 62,352,831 | 61,536,258 | 61,863,257 | 63,257,174 | 65,392,359 |
| Friuli-Venezia Giulia | 8,802,721 | 7,842,377 | 7,606,911 | 7,915,817 | 8,304,550 |
| Emilia-Romagna | 37,383,182 | 36,449,540 | 35,384,389 | 36,551,788 | 37,836,805 |
| Marche | 10,925,958 | 11,017,961 | 11,354,343 | 12,144,715 | 12,097,530 |
| Abruzzo | 7,252,826 | 6,938,239 | 6,282,674 | 6,076,797 | 6,119,103 |
| Molise | 540,050 | 451,400 | 419,597 | 492,018 | 437,467 |
| Basilicata | 1,881,814 | 1,949,123 | 2,100,083 | 2,302,678 | 2,345,626 |
| Calabria | 8,358,186 | 8,002,838 | 7,762,931 | 8,151,234 | 8,512,415 |
| Sicilia | 14,273,969 | 14,490,861 | 14,866,938 | 14,510,708 | 13,690,967 |

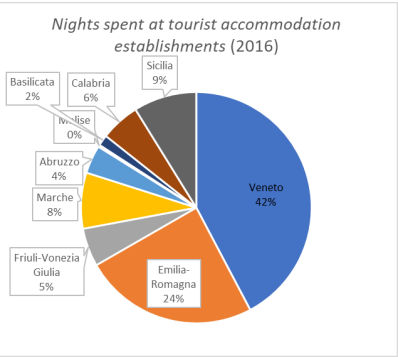



*Figure C.1.2 22: Nights spent at tourist accommodation establishments in the Adriatic Italian regions by NUTS 2 (EUROSTAT 2017)*

Concerning the coastal tourism, the figures 23a and 23b provides information about number of beds provided and arrivals at tourist accommodation establishments in the Case Study Area at NUTS3 level. (source: ISTAT)

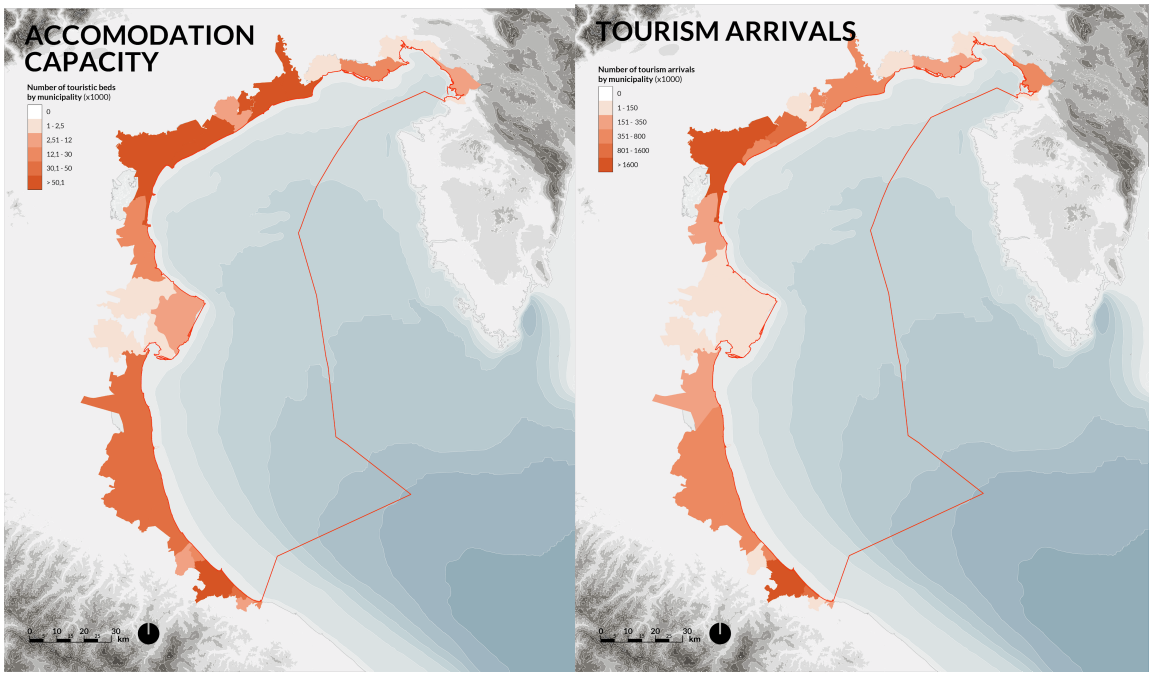



*Figure C.1.2 23 a and b: Number of beds in provided from accommodation facilities per municipality; Arrivals in accommodation facilities*

The three interested Regions have developed strategic plans regarding tourism sector:

- Tourism strategic Plan in Friuli Venezia Giulia
- Destination Management Plan (DMP), Veneto, l.r. n. 11/2013
- Plan APT services 2018 for Emilia Romagna

## Maritime tourism

Maritime tourism refers to sea-based activities such as boating, yachting, cruising, nautical sports as well as their land-based services (Ecorys, 2013). Maritime tourism can be divided in coastal, cruise and nautical tourism.

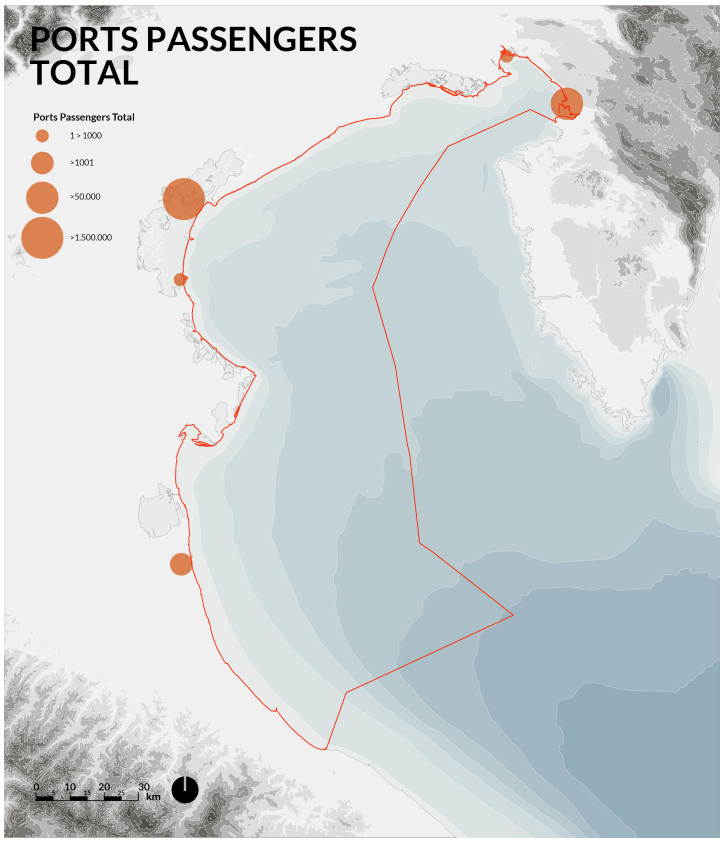
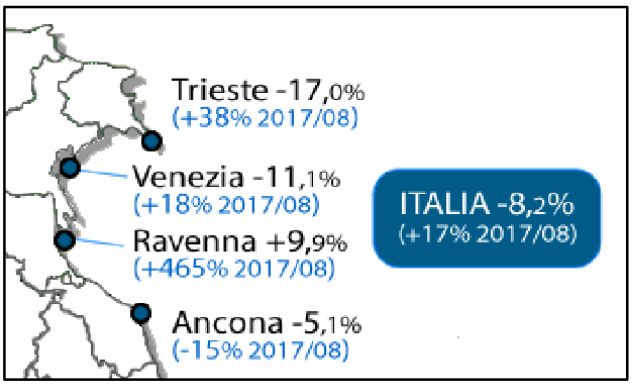



*Figure C.1.2 24: Cruise traffic for each North Adriatic Port Authority, 2017,passengers absolute values*[3]




[3] (Risposte Turismo (2018), Speciale Crociere.)

*Figure C.1.2 25: Growth of first 20 Cruise Italian North Adriatic ports per passenger movements, variations, 2017-2008 and 2017-2016*[4]

*Table C.1.2 3: Indexed growth of in the case study area ports, 2008-2017 (data not available for Ravenna Port)*

| year | 2008 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Port | absolute value | Indexed values (year 2007=1) | | | | | | | | | | absolute value |
| Venezia | 1.819.855 | 1 | 1,0 | 1,1 | 1,4 | 1,3 | 1,4 | 1,2 | 1,2 | 1,3 | 1,2 | 2.200.328 |
| Trieste | 87.789 | 1 | 0,1 | 0,2 | 0,3 | 0,8 | 0,8 | 0,5 | 1,5 | 1,7 | 1,4 | 121.219 |
| Ravenna | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

**Nautical tourism** consists mostly of boating and yachting activities. The Adriatic is one of the top nautical tourism destinations in the Mediterranean and therefore pressures from this sub-sector are significant.

*Table C.1.2 3: Recreational boating units registered in Peripheral Maritime Offices and those of the UMC to 31/12/2016*[5]

| Region | Registered units(*) | % of registered units on the national total | n. of berths | % of n. of berths on the national total | Registered units per 100 berths (crowding index) | Km of coast | n. of berths per km of coast |
|---|---|---|---|---|---|---|---|
| Veneto | 6.523 | 6,45 | 6.539 | 4,1 | 99,8 | 140 | 46,7 |
| Friuli Venezia Giulia | 4.125 | 4,08 | 16.712 | 10,6 | 24,7 | 94 | 177,8 |
| Emilia Romagna | 4.903 | 4,08 | 5.366 | 3,4 | 91,4 | 122 | 44,0 |

**Trend**

Seaside tourist flow is steadily increasing over the last 20 years in the study area. The tourism sector is characterized by highly positive dynamics at international level. In line with the international scenario, the tourism sector in Italy continued to register positive results, and 2015 was the sixth consecutive year of growth of international arrivals, up 4.4% on 2014. This significant growth also continued into the early months of 2016 (+5% on average) and it is estimated that this trend will remain globally positive – around 4% on average – up to 2030 (PST 2017-2022).

According to the national strategic plan "Turismo Italia 2020: Leadership, Lavoro, Sud", the sector should lead to the creation of 500.000 new jobs with an increase of €30 billion in GDP by 2020 and it is expected to grow by 2.3% per year, up to €83.4 billion - 4.7% of GDP - in 2024.

[4] **(**Risposte Turismo (2018), Speciale Crociere.**)**

[5] source: "Il Diporto Nautico in Italia Anno 2016, Ministero delle Infrastrutture e dei Trasporti Dipartimento per le Infrastrutture, i Sistemi Informativi e Statistici

The current policies in place (EUSAIR Action Plan, Barcelona Convention, Common Fishery Policy, MSFD (2008/56/EC) and WFD (200/60/EC)) act promoting a sustainable tourism development in the study area, by diversification of products and services, reducing seasonality, improving the quality and innovation of tourism offer and enhancing the sustainable and responsible tourism capacities of the tourism actors across the macro-region etc.

***Non-renewable energy generation - LNG FACILITIES***

Italy currently has 3 operational regasification terminals, 2 of them are off-shore (OLT near Livorno and Adriatic LNG near Rovigo). The only one in the Adriatic area is the Adriatic LNG of Porto Viro (Rovigo): connected to the national network at the Minerbio node through the gas pipeline Cavarzere (Venice) – Minerbio;

Located in the Adriatic Sea, about 15 kilometers off the Veneto coastline, the terminal is linked to the national distribution network through a pipeline. Lying on the seabed at a depth of about 29 meters, the platform has an overall length of 375 meters and width of 115 meters. The main bridge is located 18 meters above sea level.




*Figure C.1.2 26: Path of the pipeline connecting the terminal to the national distribution network. Source: https://www.adriaticlng.it)*

Daily operational data are available and in accordance with Article n. 19.4 of CE Regulation n. 715/2009. Data correspond to:

- Gas injected into the National Grid;
- LNG unloaded at the terminal;
- LNG stored in the terminal ‘s tanks.

The offshore gas pipeline planned in the Project of Common Interest (PCI) 6.5.4 and highlighted in the Initial Assessment is no longer considered one of the PCIs (Updated from THE UNION LIST OF PROJECTS OF COMMON INTEREST, 23.11.2017). However a future development of this activity is foreseen, as well as an increase of the LNG structures in the case study area (see the above information related with Maritime Transport).

### *Defence/Military Areas*

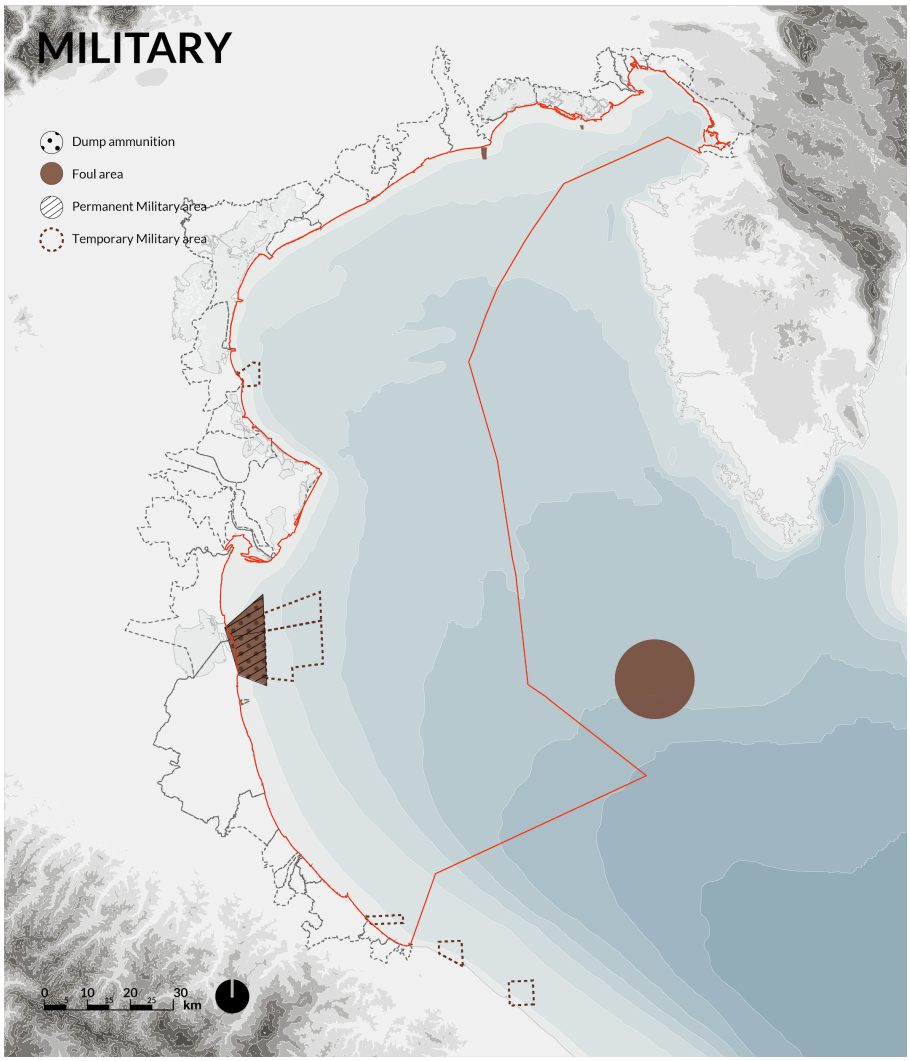



*Figure C.1.2 27: Military activities in the CS area.*

The Case study area host several areas dedicated to military activities and areas of possible presence of dumped unexploded ammunition. The main military area, and the only currently active, is the area for ground-sea shooting exercise "ECHO 346 Foce Reno" in Emilia-Romagna, between the Reno river mouth and Porto Garibaldi. The site represents a fundamental resource for the Italian Army, being the only firing range site in central and northern Italy in which it is possible to use specific types of weapons. The progressive closure of training centers in other Italian regions has meant that, in recent years, the use of this site has considerably intensified, with repercussions on other maritime uses.

### *Oil & Gas*

This activity is characterized from the presence of a marine area open to research and cultivation of hydrocarbons, the Zone A, which fall inside the North Adriatic Case study area.

This zone is located in the Adriatic Sea and extends to the parallel 44°00; it is delimited on the west by the coastline of the regions of Friuli-Venezia Giulia, Veneto and Emilia Romagna, and on the east by

the boundary lines between Italy and Slovenia and between Italy and Croatia. The Law of 9 January 1991, n. 9 "Norme per l'attuazione del nuovo Piano energetico nazionale" – established the following areas closed entirely to oil and gas exploration and exploitation: Gulf of Venice – in the belt of the sea extending from the parallel lying on the mouth of Tagliamento River, and the parallel lying on the mouth of the Po River Goro channel.

The A Zone covers approximately 13.300 sq. km. and represents about the 2% of the Italian continental shelf. With D.M. 9/08/2013 the marine area has been re-modulated and the area where new instances can be presented has been reduced by approximately 70%, from 13.300 $Km^2$ to 4.016 $Km^2$. Local competent office for mining activities is the Territorial UNMIG Office in Bologna.

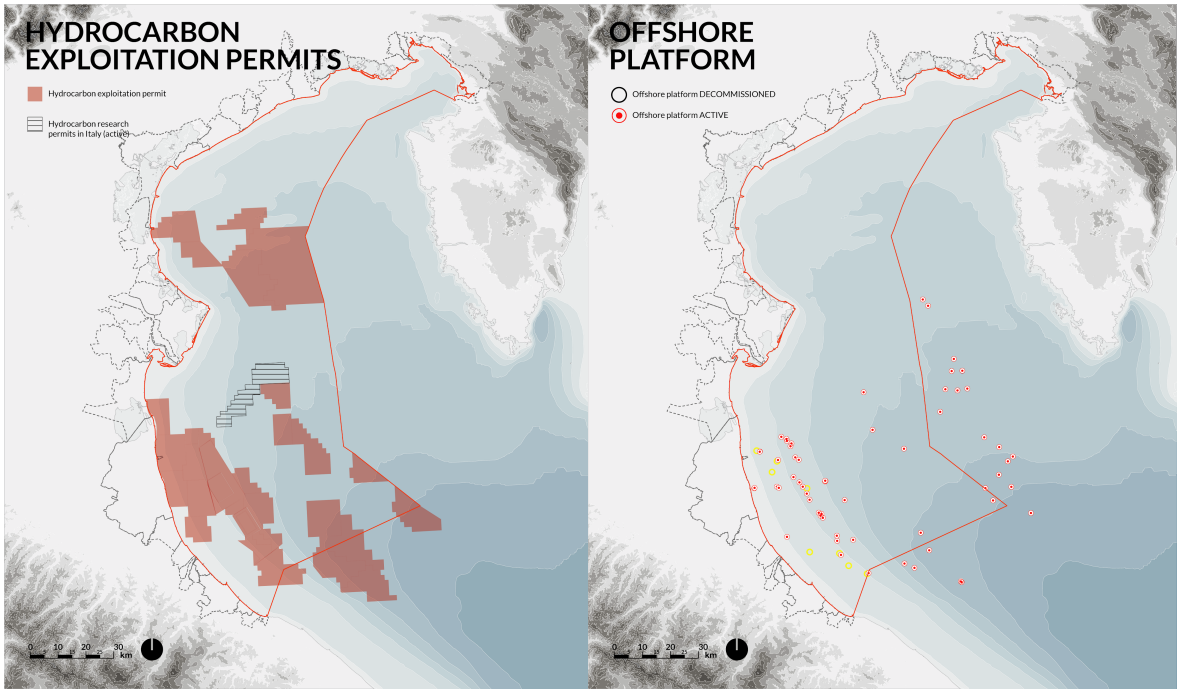



*Figure C.1.2 28: O&G concessions and platforms in the CS area.*

Web Gis available here (http://unmig.mise.gov.it/unmig/strutturemarine/carta.asp). Offshore exploitation platforms list available here (http://unmig.mise.gov.it/unmig/strutturemarine/elenco.asp). Last update on February 26, 2018.

***Coastal defence and flood protection and restructuring of seabed morphology, including dredging and depositing of materials***

Different studies on coastal erosion and offshore sand deposits have interested the area of the case study. The latest updates of the coast line variation referring to 2012 are reported below. Main source from TNEC Guide Lines[6].

*Figure C.1.2 29: coastal trends, artificial reefs and offshore sand deposits in the CS area.*

[6] MATTM-Regioni, 2017. Linee Guida per la Difesa della Costa dai fenomeni di Erosione e dagli effetti dei Cambiamenti climatici. Documento elaborato dal Tavolo Nazionale sull'Erosione Costiera MATTM-Regioni con il coordinamento tecnico di ISPRA, 309 pp.

***Coastline variation of Italian Peninsula from 1960 to 2012***

| | surfaces (sq.km) | | Surface balance (sq.km) |
|---|---|---|---|
| **Region** | Retreating | Advancing | |
| **EMILIA R.**[7] | 20 | 6,2 | -13,8 |
| **FRIULI V.G.** | 1,1 | 3,2 | 2,1 |
| **VENETO** | 17,9 | 7,5 | -10,4 |
| **tot** | 39,0 | 16,9 | -22,1 |

Due to the nature of the coast of the North Adriatic CS, presenting a morphology largely characterized by sandy beaches with minor slope, it is clear the need to evaluate sand deposits availability in order to manage the effects of the present erosion process. Here below, a table summarizing the volume of dredged sand in the Adriatic Sea in the period 1997-2017. Also the destination sites of such sediments are indicated.

**Sand dredged 1997-2017 (annex 1 pag. 304 TNEC Guidelines)**

| Sea | situated off-shore of | Title | Depth (m) | Dredging technique | Entity/Concession-holder | year | Dredged volume(m3) | Destination |
|---|---|---|---|---|---|---|---|---|
| Adriatic Sea | Tagliamento e Adige | | | Trailer/suction | Magistrato alle acque di Venezia | 1997 | 1.921.604 | Cavallino (VE) |
| Adriatic Sea | Tagliamento e Adige | | | Trailer/suction | Magistrato alle acque di Venezia | 1998 | 4.097.119 | Litorale di Pallestrina (VE) |
| Adriatic Sea | Tagliamento e Adige | | | Trailer/suction | Magistrato alle acque di Venezia | 2000 | 565.362 | Jesolo (VE) |
| Adriatic Sea | Tagliamento e Adige | | | Trailer/suction | Magistrato alle acque di Venezia | 2003 | 351.000 | Jesolo - Cortellazzo (VE) |
| Adriatic Sea | Tagliamento e Adige | | | Trailer/suction | Magistrato alle acque di Venezia | 2004 | 296.485 | Eraclea (VE) |
| Adriatic Sea | ERACLEA | JC | 20-25 | Trailer/suction | Regione Veneto | 2011 | 70.000 | Eraclea (VE) e Caorle (VE) |
| Adriatic Sea | ERACLEA | JC | 20-25 | Trailer/suction | Regione Veneto | 2012 | 70.000 | Eraclea (VE) e Caorle (VE) |
| Adriatic Sea | ERACLEA | JC | 20-25 | Trailer/suction | Regione Veneto | 2013 | 60.000 | Eraclea (VE) e Caorle (VE) |
| Adriatic Sea | Tagliamento e Adige | JC | 20-27 | Trailer/suction | Magistrato alle acque di Venezia | 2013 | 100.000 | Jesolo |
| Adriatic Sea | Tagliamento e Adige | JC | 20-28 | Trailer/suction | Magistrato alle acque di Venezia | 2014 | 92.875 | Jesolo e Cavallino |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 165.300 | Misano Adriatico (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 253.750 | Riccione sud (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 65.200 | 0 Igea Marina |

[7] https://www.arpae.it/cms3/documenti/_cerca_doc/quaderni_arpa/2016_arpa_slem_bassa.pdf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 27.000 | S. Mauro Pascoli - Savignano (FC) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 28.000 | Gatteo a Mare (FC) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 43.500 | Zadina (FC) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 176.100 | Milano Marittima nord (RA) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2002 | 41.000 | Lido di Classe - Foce Bevano (RA) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2007 | 149.000 | Misano Adriatico (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2007 | 105.065 | Riccione sud (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2007 | 105.787 | Igea Marina - Rimini nord (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2007 | 68.391 | Cesenatico nord (FC) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2007 | 90.108 | Milano Marittima nord (RA) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2007 | 107.128 | Lido di Dante (RA) |
| Adriatic Sea | Ravenna | A | 35 | Trailer/suction | Regione Emilia-Romagna | 2007 | 189.869 | Punta Marina (RA) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 219.000 | Misano Adriatico (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 188.686 | Riccione sud (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 171.047 | Igea Marina - Rimini nord (RN) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 128.331 | Cesenatico nord (FC) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 218.713 | Milano Marittima nord (RA) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 116.460 | Lido di Dante (RA) |
| Adriatic Sea | Ravenna | C1 | 40 | Trailer/suction | Regione Emilia-Romagna | 2016 | 229.125 | Punta Marina (RA) |

## Census of submarine sand deposits (annex 2 pag. 307 TNEC Guidelines)

| Region | Name | Name of sand deposit and general location | depth m | | Potential Mm3 | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | | max | min | theoretical | accessible | supposed | verified | |
| Emilia-Romagna | Area A0 | 43 km offshore | 34 | 34 | 6.12 | 6.12 | 3.57 | 3.57 | fine sand |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Emilia-Romagna | Area A1 | 43 km offshore | 36 | 36 | 12.82 | 12.82 | 6.13 | 6.13 | fine sand |
| Emilia-Romagna | Area A2 | 44 km offshore | 35 | 35 | 0.26 | 0.26 | - | - | fine sand |
| Emilia-Romagna | Area B | 36 km offshore | 34 | 35 | 2.82 | 2.82 | 1.8 | 1.8 | fine sand |
| Emilia-Romagna | Area C1 | 59 km offshore | 39 | 41 | 55.1 | 55.1 | 39.53 | 39.53 | fine sand |
| Emilia-Romagna | Area C2 | 66 km offshore | 40 | 39 | 16.21 | 16.21 | 10.56 | 10.56 | fine sand |
| Emilia-Romagna | Area C3 | 46 km offshore | 40 | 42 | 104.39 | 104.39 | 58.84 | 58.84 | fine sand |
| Emilia-Romagna | Area H | 65 km offshore | 50 | 54 | 195.22 | 195.22 | 101.55 | 101.55 | sandy silt |
| Veneto | RV_A | Laguna di Venezia | 24 | 20 | 4.85 | 4.85 | - | - | medium to fine sand |
| Veneto | RV_D | Caorle | 21 | 24 | 18 | 18 | - | - | medium to fine sand |
| Veneto | RV_G | Laguna di Venezia | 30 | 31 | 2.6 | 2 | 2 | 2 | sand from fine to very fine |
| Veneto | RV_C | Chioggia | 26 | 32 | 6.1 | 3.9 | 3.9 | 3.9 | medium to fine sand |
| Veneto | RV_H | Chioggia | 29 | 31 | 60.53 | 51.86 | 51.86 | 51.86 | medium to fine sand |
| Veneto | RV_B | Tagliamento | 11 | 16 | 48.4 | 48.4 | - | - | medium to fine sand |
| Friuli Venezia Giulia | | | | | | | | | No searches are carried out |

Several compatible sand deposit have been detected in the case study area (Fig. C.1.2 29). In December 2017 the regional decree 505 of 28 December 2017 authorized the dredging of 7600000 $m^3$ from the RV_H sand deposit[8].

Spatial reference of the Sand deposit RV_H

| Vertex | Lat WGS 84 | Long WGS 84 |
|---|---|---|
| A | 45.178302 | 12.909594 |
| B | 45.178302 | 12.935257 |
| C | 45.169151 | 12.935231 |
| D | 45.169154 | 12.909782 |

***Transmission of electricity and communications (cables)***

Inside the Case Study area there is just one telecommunication cable that connects Italy to Croatia. The fiber optic submarine telecommunications cable system Italy-Croatia became ready for service around 1994. Currently, we do not have any information regarding the system's technical

[8] https://www.regione.veneto.it/web/ambiente-e-territorio/difesa-dei-litorali

specifications. The system has a length of 230 Kilometres and is owned and/or operated by a consortium consisting of T-Hrvatski Telekom, Telecom Italia Sparkle.[9]

*Figure C.1.2 30: Italy-Croatia telecommunication cable. Source: https://www.submarinecablemap.com, revised in 12/09/2017, Telegeoghaphy websites.*

[9] http://www.fiberatlantic.com/system/jR8rl

# C.2. DECISION SUPPORT SYSTEMS ANALYSIS IN CASE STUDY AREA

The Tools4MSP Modelling Framework is a regularly updated open source software suite (Menegon et al., 2016) providing multi-objective toolsets for maritime spatial planning (Depellegrin et al., 2017; Menegon et al., 2018c).

The framework supports the development of spatially explicit results, graphics, tables and multi-dimensional grid dataset that can be utilized for more detailed spatial investigations. Currently the framework implements a Cumulative Effect assessment (CEA) and a Maritime use conflict (MUC) analysis model. Tools4MSP can be flexibly deployed to different geospatial contexts ranging from macro-regional (Gissi et al., 2017; Menegon et al., 2018a; Menegon et al. 2018b) to local/regional level (Barbanti et al., 2017). The tools CEA and MUC models implemented can support the development of maritime spatial plans within the implementation process of the MSP Directive (2014/89/CE) in various case study areas and marine waters in the Mediterranean Sea and beyond. The package is regularly upgraded within the Tools4MSP Geoplatform (**data.tools4MSP.eu**). The Tools4MSP Geoplatform (former ADRIPLAN Portal) is a community-based, open source portal based on GeoNode, a web-based Content Management System (CMS) for developing geospatial information systems (GIS) and for deploying spatial data infrastructure (SDI).

It includes over 700 geospatial datasets, organised in the following categories: coastal defence and sand extraction, energy, environmental protection, environment and ecosystem, fisheries and aquaculture, maritime transport and tourism, miscellanea. The Geoplatform capitalizes data from other projects (e.g. Shape, CocoNet) and enables access to standard services from other geoportals (e.g. EMODnet, EU Sea Atlas).. The original version was developed in the context of the ADRIPLAN Project (MARE/2012/25; 2013-2015) and has been consolidated within the Italian RITMARE Flagship Project and by ongoing projects such as SUPREME. Core functionalities of CEA/MUC have been supported by an MSP pilot study in marine waters facing the Emilia-Romagna Region (Italy), and incorporated as case studies analyses within the SUPREME (Supporting maritime spatial Planning in the Eastern Mediterranean) and SIMWESTMED (Supporting Maritime Spatial Planning in the Western Mediterranean region) projects. Currently the web-tools are providing core functionalities for ADRION-PORTODIMARE (geoPortal of Tools & Data for sustainable Management of coAstal and maRine Environment; 2018-2020) Project.

## C.2.1. Analysis of Risks and Threats from CEA results

The Tools4MSP Geoplatform implements a Cumulative Effects Assessment (CEA) for the analysis of cumulative effects generated by anthropogenic activities on marine environmental components. Its implementation is based on archetypical CEA implementations proposed on various geographical scales (Halpern et al., 2008; Andersen et al., 2013). In detail, we define CEA as a systematic procedure for identifying and evaluating the significance of effects from multiple pressures and/or activities on single or multiple receptors (Judd et al., 2015). CEA provides management options by quantifying the overall expected effect caused by multiple pressures and by identifying critical pressures or pressure combinations and vulnerable receptors. The analysis of the causes (source of pressures), pathways, interactions and consequences of these effects on receptors is an essential and integral part of the process. Moreover, we use the terms “human activity”, “uses” and “source” as synonyms and define “pressure” (Judd et al., 2015) as “an event or agent (biological, chemical, or physical) exerted by the source to elicit an effect”.

The CEA algorithm implemented in the Geoplatform is described by Menegon et al. (2018b; 2018c). The inputs of the Tools4MSP CEA tool are: (i) the area of analysis; (ii) the grid cell resolution; (iii) layers representing intensity or presence/absence of human uses (e.g., intensity of fishery and maritime transport, presence of aquacultures and oil & gas platforms); (iv) layers representing intensity or presence/absence of environmental components (e.g., seabed habitats, probability of presence of nursery habitats, probability of presence of marine mammals); (v) use-specific relative pressure weights and distances of pressure propagation; (vi) environmental component sensitivities related to specific pressures or more general ecological models that describe the response of the environmental components to a specific pressure.

The CEA model implements 15 MSFD pressures out of 18 provided by the MSFD (EC, 2008). Pressures are described according to MSFD amended version (EC, 2017, Annex 4, Table 2). The three pressures related to significant changes in salinity regime, introduction of radio-nuclides and introduction of microbial pathogens were omitted from the pressure dataset due to lack of reference and expert judgement (Menegon et al., 2018b). Finally, the geospatial distribution of single and cumulative effects and impacts are estimated combining together the pressure layers and the environmental components layers through a sensitivity score.

The geospatial dataset implemented for the study features 70 layers: 26 human uses layers (U) and 44 environmental components (E). Tabs 1 and 2 present a detailed overview of the geospatial dataset implemented. The chosen grid cell resolution was 500 meters. The units of the spatial indicators U and E are presence/ absence, weighted dummy and intensity indicators. For intensity indicators a log[x + 1] transformation and a rescaling from 0 to 1 was applied.

*Table C.2.1 1: Human uses*

| ***ACTIVITY*** | ***SPATIAL DATA*** | ***Url*** |
|---|---|---|
| ***Aquaculture*** | Aquaculture (Veneto - 2014) | http://data.tools4msp.eu/layers/geonode%3Ashape_aquaculture_veneto |
| | Aquaculture (Friuli Venezia Giulia - 2014) | http://data.tools4msp.eu/layers/geonode%3Ashape_aquaculture_fvg |
| | Aquaculture (Emilia-Romagna - 2014) | http://data.tools4msp.eu/layers/geonode%3Aaree_concessione_molluschi_rer |
| | Mussel farming vessels - 2015 | http://data.tools4msp.eu/layers/geonode%3Amyt_evf |
| ***Cables and Pipelines*** | Telecommunication Cables | http://data.tools4msp.eu/layers/geonode%3Acables_schematic_20170801 |
| | Underwater pipelines | http://data.tools4msp.eu/layers/geonode%3Acondotte_sottomarine |
| ***Coastal and Maritime Tourism*** | Marinas - Italy | http://data.tools4msp.eu/layers/geonode%3Amarina |
| | Bathing waters | http://data.tools4msp.eu/layers/geonode%3Abathing_water_pol |
| ***Coastal Defence Work*** | Opere difesa 2014 RER | http://data.tools4msp.eu/layers/geonode%3Aopere_difesa_2014_rer |
| | Opere difesa 2014 Veneto e FVG | http://data.tools4msp.eu/layers/geonode%3Aopere_di_difesa_2014 |
| ***Flying (fisheries)*** | PTM - Volanti - 2015 | http://data.tools4msp.eu/layers/geonode%3Aptm_evf |
| ***Land based activities*** | LBA - SHYFEM 2016 - N-P total / Plume / Organic matter | / |
| ***Maritime*** | Adriatic traffic density | http://data.tools4msp.eu/layers/geonode%3Atraffic_density_lines_gener_20 |

| | | |
|---|---|---|
| ***Transport*** | July 2014 - June 2015 | 14_2015_ais_3857_nocolor |
| ***Military Areas*** | Military permanent | http://data.tools4msp.eu/layers/geonode%3Amilitary_permanent |
| ***Naval base activities*** | Main Ports Stats 2015-2016 | http://data.tools4msp.eu/layers/geonode%3Aports_stats_201516 |
| | Cruise Ports (Italy, 2015) | http://data.tools4msp.eu/layers/geonode%3Acruise_ports_it_2015 |
| ***Offshore sand deposits*** | Offshore sand dredged | http://data.tools4msp.eu/layers/geonode%3Aoffshore_sand_dredged |
| ***Oil & Gas extraction*** | EMODNET Hydrocarbon Extraction - Offshore Installations | http://data.tools4msp.eu/layers/geonode%3Aemodnet_ha_he_offshore_installations_20171218 |
| ***Small scale fisheries*** | GNS - Reti a imbrocco - 2015 | http://data.tools4msp.eu/layers/geonode%3Agns_evf |
| | Small scale fisheries - Northern Adriatic (IT) | http://data.tools4msp.eu/layers/geonode%3Asmall_scale_fisheries_er_ve_fr_1 |
| | DRB - Draghe idrauliche - 2015 | http://data.tools4msp.eu/layers/geonode%3Adrb_evf_1 |
| | PS - Circuizione - 2015 | http://data.tools4msp.eu/layers/geonode%3Aps_evf |
| ***Trawling*** | TBB - Rapidi - 2015 | http://data.tools4msp.eu/layers/geonode%3Atbb_evf |
| ***Trawling*** | OTB - Strascico - 2015 | http://data.tools4msp.eu/layers/geonode%3Aotb_evf |

*Table C.2.1 2: Environmental components*

| ***ENVIRONMENTAL COMPONENT*** | ***SPATIAL DATA*** | ***Url*** |
|---|---|---|
| ***A3 - Infralittoral rock and other hard substrata*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a3 |
| ***A4.26 - Mediterranean coralligenous communities*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a4_26_or_a4_32 |
| ***A4.7 - Circalittoral rock and other hard substrata*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a4_7 |
| ***A5.23 - Infralittoral fine sands*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a5_23 |
| ***A5.25 - Circalittoral fine sands*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a5_25 |
| ***A5.26 - Circalittoral muddy sands*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a5_26 |
| ***A5.35 - Circalittoral sandy mud*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a5_35 |
| ***A5.36 - Circalittoral fine mud*** | Emodnet Seabed Habitats eunismedscale | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a5_36 |
| ***A5.531 -*** | Emodnet Seabed | http://data.tools4msp.eu/layers/geonode%3Aeunismedscale_4326_a5_531 |

| | | |
|---|---|---|
| ***Cymodocea beds*** | Habitats eunismedscale | |
| ***NH - Nursery and Spawning habitats*** | *Nephrops norvegicus* (Norway lobster) recruits<br>*Engraulis encrasicolus* (European anchovy) spawners<br>*Eledone cirrhosa* (Horned octopus) recruits<br>*Galeus melastomus* (Blackmouth catshark) spawners<br>*Pagellus erythrinus* (Common Pandora) recruits<br>*Nephrops norvegicus* (Norway lobster) spawners<br>*Eledone cirrhosa* (Horned octopus) spawners<br>*Solea solea* (Common sole) recruits<br>*Illex coindetii* (Broadtail shortfin squid) recruits<br>*Parapenaeus longirostris* (Deep-water rose shrimp) spawners<br>*Trachurus mediterraneus* (Mediterranean horse mackerel) recruits<br>*Trachurus trachurus* (Atlantic horse mackerel) recruits<br>*Galeus melastomus* (Blackmouth catshark) recruits<br>*Merluccius merluccius* (European hake) recruits<br>*Merluccius merluccius* (European hake) spawners<br>*Sardina pilchardus* (European pilchard) spawners<br>*Aristaeomorpha foliacea* (Giant red shrimp) - recruits<br>*Scomber colias* (Atlantic chub mackerel) spawners<br>*Aristaeomorpha foliacea* (Giant red shrimp) - spawners | http://data.tools4msp.eu/layers/geonode%3Anephnorr_0<br>http://data.tools4msp.eu/layers/geonode%3Aeng_en_med_eg_pers_jun_0<br>http://data.tools4msp.eu/layers/geonode%3Aeledcirr_0<br>http://data.tools4msp.eu/layers/geonode%3Agalumels_0<br>http://data.tools4msp.eu/layers/geonode%3Apageeryr_0<br>http://data.tools4msp.eu/layers/geonode%3Anephnors_0<br>http://data.tools4msp.eu/layers/geonode%3Aeledcirs_0<br>http://data.tools4msp.eu/layers/geonode%3Asolevulr_0<br>http://data.tools4msp.eu/layers/geonode%3Aillecoir_0<br>http://data.tools4msp.eu/layers/geonode%3Apapelons_0<br>http://data.tools4msp.eu/layers/geonode%3Atrac_med_med_r_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Atrac_trac_med_r_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Agalumelr_0<br>http://data.tools4msp.eu/layers/geonode%3Amerlmerr_0<br>http://data.tools4msp.eu/layers/geonode%3Amerlmers_0<br>http://data.tools4msp.eu/layers/geonode%3Asard_pil_med_eg_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Aarisfolr_0<br>http://data.tools4msp.eu/layers/geonode%3Asc_col_med_eg_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Aarisfols_0<br>http://data.tools4msp.eu/layers/geonode%3Amullbars_0<br>http://data.tools4msp.eu/layers/geonode%3Asc_col_med_r_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Asc_sco_med_r_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Amullbarr_0<br>http://data.tools4msp.eu/layers/geonode%3Aeng_en_med_r_pers_0<br>http://data.tools4msp.eu/layers/geonode%3Asard_pil_med_r_pers_jun_0<br>http://data.tools4msp.eu/layers/geonode%3Apageerys_0<br>http://data.tools4msp.eu/layers/geonode%3Asolevuls_0<br>http://data.tools4msp.eu/layers/geonode%3Apapelonr_0<br>http://data.tools4msp.eu/layers/geonode%3Aaritants_0<br>http://data.tools4msp.eu/layers/geonode%3Arajaclar_0<br>http://data.tools4msp.eu/layers/geonode%3Aillecois_0<br>http://data.tools4msp.eu/layers/geonode%3Arajaclas_0 |

| | | |
|---|---|---|
| | *Mullus barbatus* (Red mullet) spawners<br>S*comber colias* (Atlantic chub mackerel) recruits<br>*Scomber scombrus* (Atlantic mackerel) recruits<br>*Mullus barbatus* (Red mullet) recruits<br>*Engraulis encrasicolus* (European anchovy) recruits<br>*Sardina pilchardus* (European pilchard) recruits<br>*Pagellus erythrinus* (Common Pandora) spawners<br>*Solea solea* (Common sole) spawners<br>*Parapenaeus longirostris* (Deep-water rose shrimp) recruits<br>*Aristeus antennatus* (Blue and red shrimp) spawners<br>*Raja clavata* (Thornback ray) recruits<br>*Illex coindetii* (Broadtail shortfin squid) spawners<br>*Raja clavata* (Thornback ray) spawners<br>MEDISEH | |
| ***SB - seabirds*** | Potential seabirds sites grid-Adriatic | http://data.tools4msp.eu/layers/geonode%3Aseabirds_distribution_grid_adriatic |
| ***TU - Turtles*** | Sightings of loggerhead turtles in the Adriatic Sea - density map | http://data.adriplan.eu/layers/geonode%3Aloggerheadturtlesclean |
| ***MM - Marine mammals*** | Sightings of marine mammals in the Adriatic Sea - Density maps | http://data.adriplan.eu/layers/geonode%3Amarinemammals |

In Figure C.2.1 1 geospatial results from CEA modelling are presented, representing the expected value of the cumulative effect for each cell.

*Figure C.2.1 1: Spatial distribution of the CEA scores within the CS area (min = 0, max = 23).*

Figure C.2.1 2a and 2b represents the distribution of each environmental component (a) and maritime use (b) and the relative contribution to the CEA score.

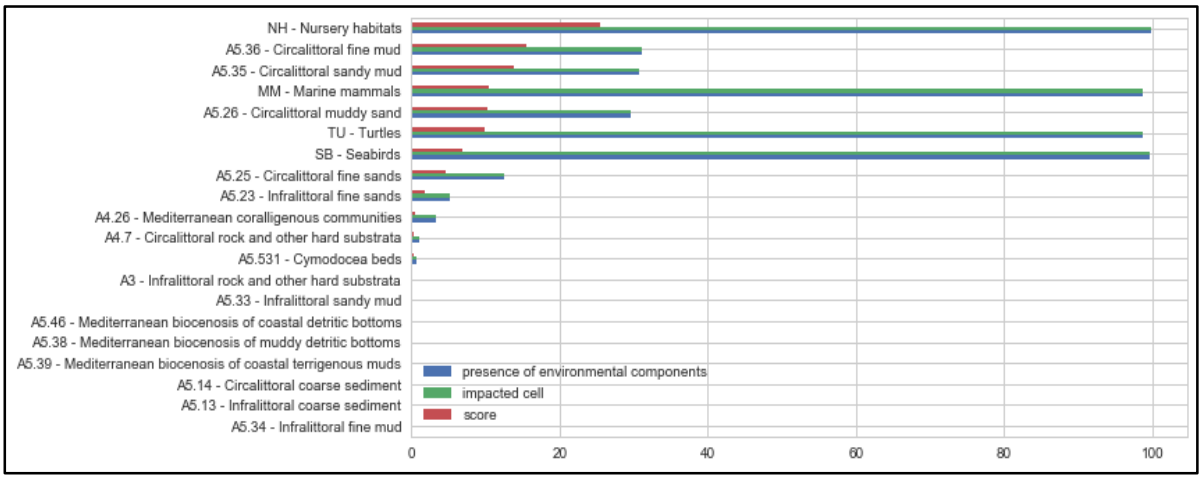



*Figure C.2.1 2a: Red: percent contribution to the total CEA score of each environmental component; Blue: cells with presence of each environmental component (in % of the total CS area cells); Green: cells featuring each environmental component impacted by human activities (in % of the total CS area cells).*

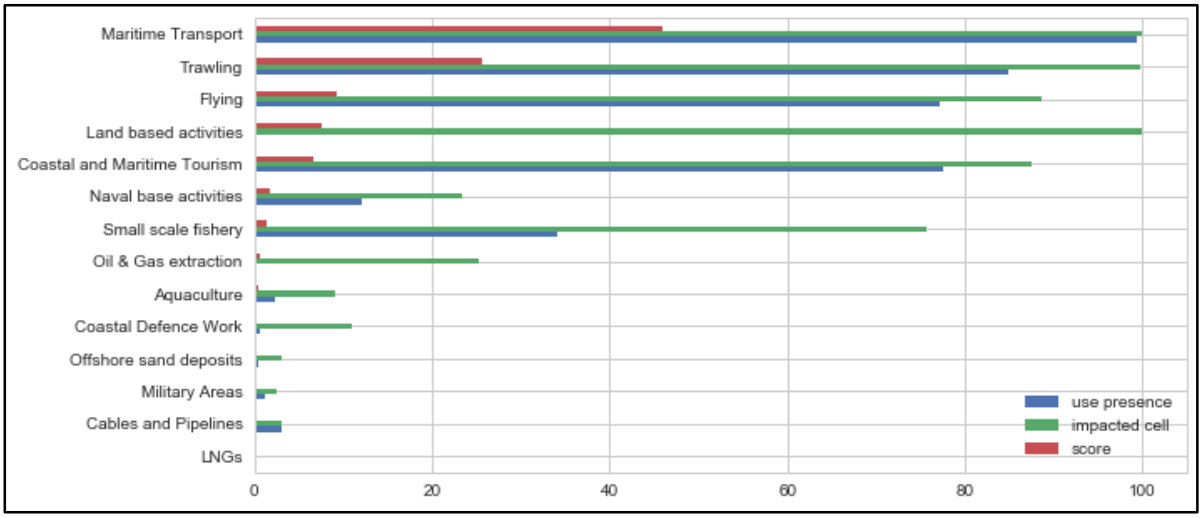



*Figure C.2.1 2b: Red: percent contribution to the total CEA score of each activity; Blue: cells on which each activity is exerted (in % of the total CS area cells); Green: cells impacted by each activity (in % of the total CS area cells).*

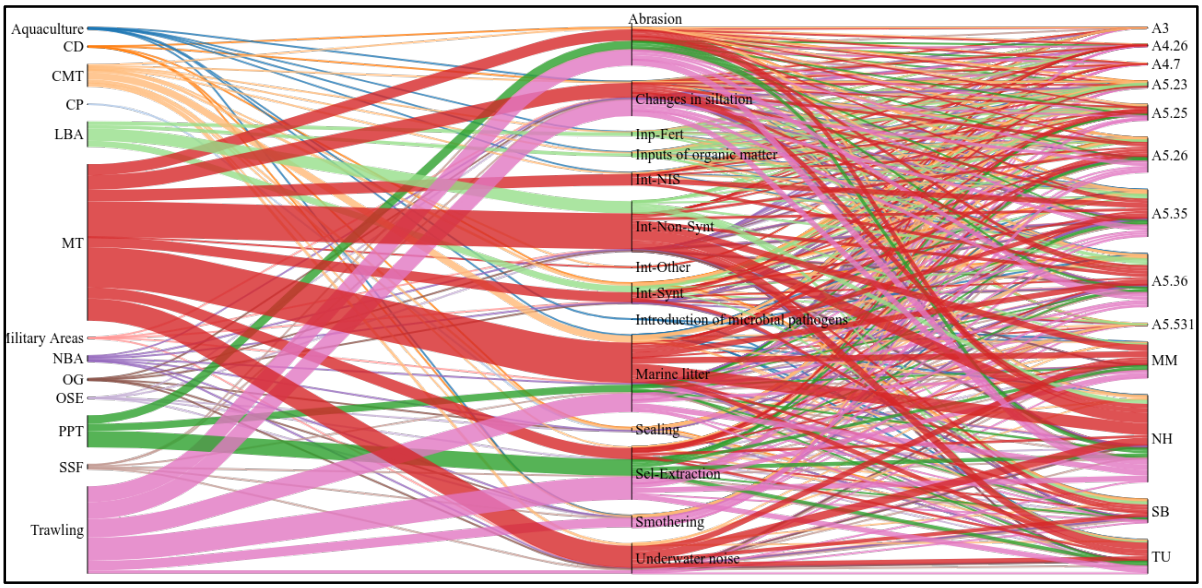



*Figure C.2.1 3: CEA impact chain visualization. Sankey diagrams that identifies the interactions and the flow of impacts generated by the Human uses (left axes) through the Pressures (mid-axes) on the Environmental Components (right axes). The width of the bands is directly proportional to CEA score and each colour identifies a specific Human use. Human uses: aquaculture, coastal defence works, coastal and maritime tourism, cables and pipelines, land based activities, maritime traffic, military areas, naval based activities, oil and gas, offshore sand extraction, Pair pelagic trawling (flying), small scale fisheries, trawling. Environmental components: NH - Nursery habitats; TU - Turtles; MM - Marine Mammals; SB – seabirds; A3 - Infralittoral rock and other hard substrata; A4.26 - Mediterranean coralligenous communities; A4.7 - Circalittoral rock and other hard substrata; A5.23 - Infralittoral fine sands; A5.25 - Circalittoral fine sands; A5.26 - Circalittoral muddy sand; A5.35 - Circalittoral sandy mud; A5.36 - Circalittoral fine mud; A5.531 - Cymodocea beds.*

The results of CEA analysis show that Adriatic waters are strongly influenced by human activities generating a complex set of pressures on habitats and ecosystems. In our analysis, distinct patterns of impact scores were detected at regional scale, with maritime transport, trawling fisheries, and riverine runoffs as the most pervasive threats across the region. CEA outputs show that highest scores are close to densely populated coastal areas (e.g. close to the cities of Venice, Trieste, Ravenna), in presence of intense naval activities (due to the shipping and cruise traffic), medium-high trawling pressure and strong riverine inputs (e.g. Po river Delta). Areas showing medium-high scores are largely distributed along the entire region. Other areas, mainly offshore (30 nm from the coast to the midline) are exposed to moderate to low pressures and, consequently, feature lower scores, except for the presence of highly valuable pelagic species (e.g. marine turtles, mammals and seabirds) and on intense trawling fishery grounds. Results evidence that the highest contribution to the cumulative effects scores is given by activities producing marine litter, selective or accidental extraction of species, seabed abrasion, changes in siltation and smothering. These pressures affect several ecologically relevant environmental components. Essential fish nursery habitats and soft-bottom benthic communities are the most affected by activities (in particular trawling fisheries) that generate mechanical damage to the sea bed, extracting species and introducing marine litter. The prominent role of trawling fisheries in the overall analysis is evident from the spatial distribution of CEA scores over a distance gradient, showing lower scores in areas where trawlers are excluded (from 0 to 3 nm from the coasts). These outputs may represent a key knowledge for a proper determination of planning needs to reach the Good Environmental Status (MSFD, 2008/56/EC).

Results indicated that circalittoral bottoms are the environmental components most exposed to anthropogenic pressures in the area. Several studies have shown a high diversity and biomass of the composition and structure of benthic assemblages over the Adriatic sandy and muddy bottoms (Santelli et al. 2017). Such high diversity is also linked to key spawning and nursery grounds for demersal and large pelagic species of commercial interest for fisheries. CEA scores on known essential fish habitats account for more than the 25% of the total (Fig. C.2.1 4), with a pattern clearly linked to trawling pressures, especially in Gulf of Venice and close the cities of Chioggia and Ravenna, and medium-high values along the whole CS coasts, even in presence of less intense trawling activities, where important essential fish habitats coexist with high traffic densities, naval activities and aquaculture.

*Figure C.2.1 4: Spatial distribution of the CEA scores on Essential Fish Habitats within the CS area (min = 0, max = 7).*

The CS area represents an important seasonal foraging ground for marine mammals and loggerhead turtles (*Caretta caretta*). The whole set of human activities generate a high potential cumulative effect on both turtles and marine mammals (10% of the total score each; Fig. C.2.1 5).

*Figure C.2.1 5: Spatial distribution of the CEA scores on megafauna within the CS area (min = 0, max = 3).*

High valuable habitats as rocky bottoms communities (e.g. infralittoral rock and coralligenous communities) are also affected by several activities exerting numerous pressures, highly contributing to the overall score (e.g. *tegnue* areas offshore Venice lagoon). However, the knowledge on their spatial distribution is still partial and needs finer mapping efforts in order to properly assess the potential effects of anthropogenic activities on their assemblages. *Cymodocea* beds also contribute to CEA score despite their limited spatial distribution.

In the CS area the complex systems of marine transportation (maritime transport density, touristic marinas tourism and commercial ports) constitute the main source of human disturbance, followed by trawling activities (Fig. C.2.1 6).

*Figure C.2.1 6: Spatial distribution of the CEA scores exerted by maritime transport within the CS area (min = 0, max = 8.5).*

Figure C.2.1 3 illustrates a Sankey diagram to represent the CEA impact chain. The chain represents the flow of impact, with the band width directly proportional to total CEA score. Results show that highest impacting uses are maritime transport and trawling.

The Sankey diagram also illustrates how a single use impacts an environmental component through its pressures: e.g. high quotas of CEA score on nursery habitats are generated by selective extraction of species and abrasion caused by trawling.

Maritime transport may exert a wide suite of pressures (marine litter, underwater noise, introduction of substances and non-indigenous species, collisions with pelagic species and, in shallower waters, changes in siltation and abrasion) on the environment in the whole CS area, and fostering the needs of a transboundary surveillance, monitoring and application of precautionary mitigation measures to reduce its potential impacts. Nautical tourism and port activities influence only coastal areas within the 10 nm offshore but may contribute to CEA with higher scores in presence of highly sensitive coastal habitats. Trawling activities are exerted in the whole CS area, with the exception of the first 3 nm from the coastline, highly contributing to the overall CEA score and generating extraction of species and a wide set of bottom disturbances (Fig. C.2.1 7).

*Figure C.2.1 7: Spatial distribution of the CEA scores exerted by trawling activities within the CS area (min = 0, max = 6.1).*

## C.2.2. Analysis of Conflicts and Synergies from MUC results

Maritime Use Conflict (MUC) analysis is based on a methodology developed within the COEXIST Project (COEXIST, 2013). In particular, the methodology presented by Gramolini et al. (2013) enables the identification of current/potential human uses and assesses their interaction in terms of conflicts. The algorithm implemented for the MUC score on a single grid is presented by Menegon et al. (2018a; 2018b). The inputs of the tool are: (i) the area of analysis; (ii) the grid cell resolution; (iii) layers of presence/absence for each human use present in the area; (iv) an expert based characterization for each human use through four attributes (vertical scale, spatial domain, temporal domain and mobility). According to the attributes of each use, the potential conflict score for each pair of uses, varying from 0 (no conflict) to 6 (very high conflict) is estimated. Finally, on each cell of the selected grid the total MUC score is calculated summarizing the potential conflict score for each pair of overlapping uses. The main output is a geospatial distribution of MUC score over the entire area of analysis. In total 28 layers of human uses were used by the MUC webtool (Tab. 1, taking in account also the protected areas and Sites of Community Importance). In Figure 4 the results from marine use conflict analysis.

*Figure C.2.1 8: Spatial distribution of the MUC scores within the CS area (min = 0, max = 66).*

Detailed analysis of the interactions between uses that generate the MUC scores are shown in figure 9.

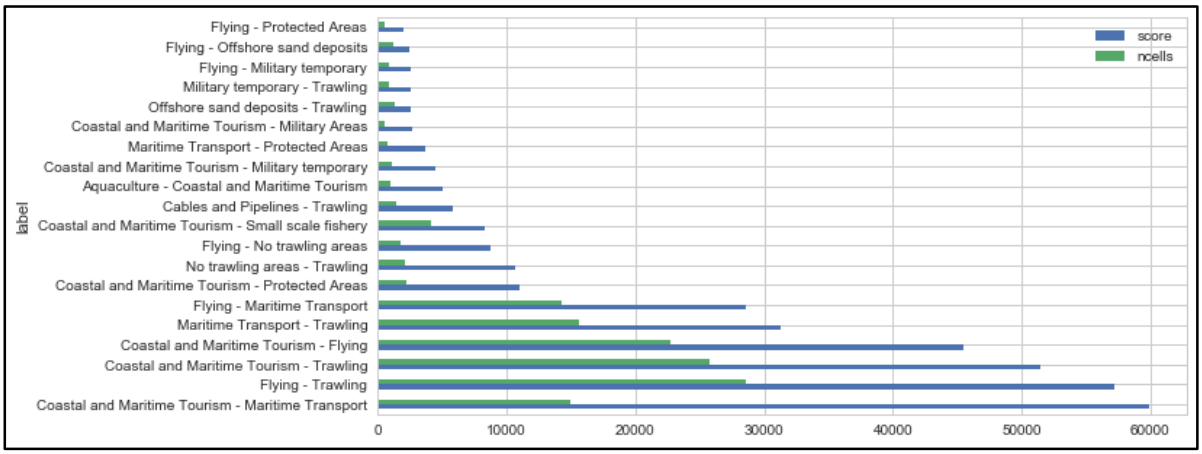



*Figure C.2.1 9: Blue: contribution to the total Muc score of each interaction; Blue: cells with presence of each interaction).*

The analysis show that the Veneto and Emilia-Romagna national waters host the highest MUC scores, due to a high concentration of uses (e.g. Maritime transport, trawling, coastal and maritime tourism, protected areas) and in presence of fixed structures (e.g. gas platforms, lng terminal, aquaculture facilities and military areas).

The main interactions potentially generating conflicts in the area are those between maritime transport, maritime tourism and trawling.

## C.2.3 Gaps

The type of analyses resulting from these data models may constitute a solid base for planning, in order to identify how pressures on the environment interact and to determine potential conflicts between anthropogenic activities. This information can be crucial to foster proper planning decisions by directing activities to maritime areas in a manner that supports rather than interferes with management and conservation actions of environmental components. However, the effectiveness of the results as always is dependent of the quality of the available data.

Therefore, it is considered necessary for the purpose of the maritime space within the case study area to improve upon the quality of the data used and the assumptions made for the assessment of both the cumulative effects and multiple use conflicts.

The difficulties encountered for the preparation of the initial assessment of local marine waters reflect the level of available knowledge where several activities, pressures and environmental components have been poorly surveyed as a whole, thus limiting the availability of accurate geo-referenced maps and detailed quantitative data. Consequently, main cumulative effects cannot be adequately assessed in the case study.

Marine mammals (*Tursiops truncatus*) and turtles (*Caretta caretta*) have been regularly observed in the area. However, a systematic monitoring and mapping activity still lacks, with the significant exception of aerial surveys performed within the NETCET project (Fortuna et al. 2105), and, in consequence, information on their spatial distribution with estimates of their abundances and densities in the Strait of Sicily are not available. Similarly, the fine scale distribution of high value benthic habitats (e.g. coralligenous formations, rocky bottom assemblages, deep corals) at a proper resolution for planning purposes is still lacking.

# C.3. ANALYSIS SUMMARY

## C.3.1 Key Issues

### *Aquaculture*

**1. Description**

A growing demand for fish products is shown worldwide (FAO, 2017 – Fisheries and Aquaculture Statistics) together with a decrease/stability of fish catches.

This requires new sustainable aquaculture products, improving productivity, quality and environmental sustainability, also by allocating the farms offshore. The development of the farms offshore allows using innovative technologies (enhanced structures with greater dimensions than the current ones) for growing mussels and the minimization of impacts on the coastal environment (environmental impact due to the plants, visual impact).

The policy framework in place [EUSAIR Action Plan, Barcelona Convention, Common Fishery Policy, MSFD (2008/56/EC) and WFD (200/60/EC)] is focused on a substantial improvement of aquaculture in several aspects. In particular, according to Pillar I of the Blue Growth of EUSAIR Action Plan, aquaculture has to be sustainably developed in the study area (current farms are shown in figure below), in order to promote economic growth in the sector (new jobs and product diversification) while minimizing the impact on marine ecosystems. Implementation of existing policies represents the focal point for future aquaculture development: the market is expected to keep increase, with a foreseen average growth in the range of 4%/year, leading to more than doubling the market between 2010 and 2030, meaning that the target of 2 million tons/year will be reached and overcome. EMFF also acts supporting innovative technologies for a sustainable aquaculture development.

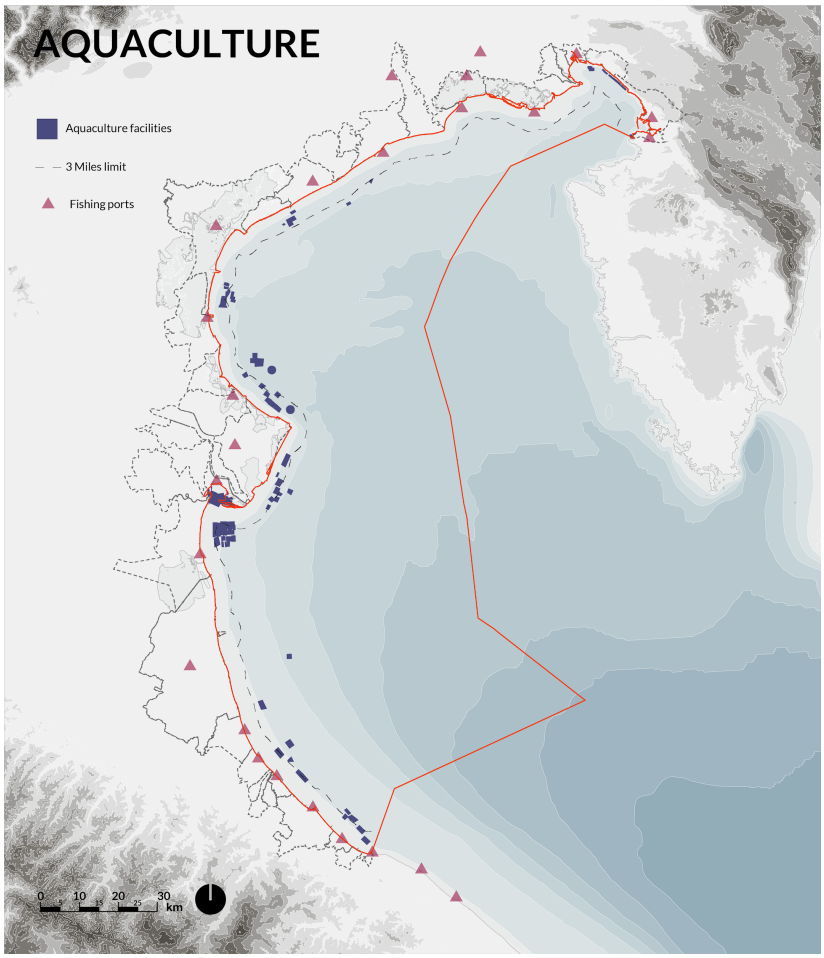



*Fig. C.3.1 1: Location of aquaculture plants in Friuli Venezia Giulia, Veneto and Emilia Romagna regions.*

The scenario in the study area is in general moving towards the need for allocation of new farms, also offshore in order to allow the use of new technologies (system, called "New Zealand" or "Japanese requires the plants to be located in areas at least 15 meters depth, see below) and allow sustainable products (Barbanti et al., 2017b).

Spatial conflicts, synergies, news impacts on the environment, as well as area suitable for the activity have to be foreseen in order to develop this scenario.

Aquaculture coexists together with other uses in the study areas, and the following main conflicts have to be taken into account when allocate new areas:

1. Maritime Transport: aquaculture farms are currently allocated in the coastal areas where traffic density is high, close to the coast and the major traffic lanes direct to Venice and Trieste ports, and lee evident to Ravenna port.
2. Fishery (Small Scale Fishery, Bottom Trawling -OTB and TBB): aquaculture farms are currently allocated in areas where small-scale fishery activities are intensively present. In case of expansion of new areas, fishery activities can enter in competition.

The following possible synergies of aquaculture with other uses can be also considered:

1. Oil and Gas extraction platform: mussels grow on the legs of the platforms. The future decommissioning platforms can be a synergy with this activity (Barbanti e Perini, 2018). In the seventies, the agreement between Agip and the fishermen to remove the mussels from the platforms, gives rise to cooperatives still very productive (they collect and consume the molluscs taken from submerged parts) and to high quality mussel market in Marina di Ravenna. The long coexistence of energy and fishing activities in the region was not affected by important oppositions. On the contrary, this involvement has led to the creation of co-operatives that are currently collecting and consuming the mussels taken from the submerged parts/legs of the platforms (*The coexistence of hydrocarbons and the territory in Italy. Experiences and proposals of interaction between upstream oil and gas and agriculture-fishing-tourism, RIE presentation, 27 May 2014 and Assomineraria Report, 2015*).
2. Tourism: aquaculture can be considered in synergic combination with tourism activities. This "multi-use combination" addresses sustainable aquaculture where farmers board people on their vessels to visit plants, learn about aquaculture techniques, with educative and recreational scopes, through daily trip along the coasts (Manente, 2015). It can also have a role in educating citizens towards sustainable practices of aquaculture (van den Burg et al., 2016). In addition, this combination can be developed also in other complementary ways. Sport fishing activity (mainly angling) can be practiced next to mussel aquaculture plants, which commonly function as attractive areas for a number of fish. Aquaculture operators can receive an income for the uses of their space but also benefit of a reduced predation pressure by predator species (e.g. seabasses, seabreams) feeding on farmed molluscs that can be caught by sport fishermen. Diving/snorkelling tourism could also be practiced next to aquaculture farms, where a rich fauna can be observed (Castellani et a., 2017).
3. Also synergies with the current presence of the ZTB in Emilia Romagna prohibiting trawling.

Concerning the allocation of new aquaculture farms, this should be performed ensuring simultaneously marine ecosystem protection in order to ensure a sustainable development of the sector (e.g. implementation of Marxan with Zones software in the RER prioritizing simultaneously aquaculture and biodiversity, Venier et al. 2017 - report Ritmare).

Aquaculture impact on the environmental components depends on the types of aquaculture activities (shellfish or finfish). In general mussel farms ("long-line" plants) is a low environmental impact activity, which can only lead to a significant organic enrichment of the hydrodynamic sediment (Barbanti et al., 2017b). In addition the problem of marine litter from aquaculture activities, like nets, ropes and other trashes.

The highest impacted areas (highest cumulative impact score) correspond to the areas where aquaculture farms are allocated, with the exception of the cooperative in the Goro area, which record a low score. This is due to the sum of pressures generated by the several activities acting in the area over sensitive habitats and environmental components. This means that on one hand aquaculture operates in highly impacted areas and on the other hand aquaculture itself can generate pressure on the environment, such as the input of organic matter, nutrients etc.

For Emilia Romagna and Veneto regions, the dependence of the entire sector on a single species makes it potentially vulnerable, both to price fluctuations and epidemics, which can increase mortality, or accumulations of toxic substances, when massive toxic algae blooms occur, inhibiting its

commercialization. In this regard, diversifying the activity by breeding also different species, such as flat and concave oysters, would give greater solidity to producers (Barbanti et al., 2017b).

In Friuli also, in the recent years, there have been emergencies due to the presence of mucilage or the proliferation of algae potentially harmful to humans and the environment (Piano di Gestione della Pesca in Friuli V.G., 2012).

**2. Spatial/temporal analysis/characteristics of the concern**

On the basis of the description above, a major criticism of the aquaculture is linked to the allocation of the farms offshore, which should be conducted while minimising the conflicts with trawling and transport activities. On the other hand, the potential synergies of aquaculture with tourism and oil and gas decommissioning platform have to be considered.

This area can be mainly identified along the Friuli Venezia Giulia coast, Veneto coast, down to the Po Delta and offshore the Ravenna port and along Emilia Romagna coast.

On the basis of the conflicts with other maritime sectors and, in general, the different pressures that impact the coastal area within 3 miles, the range between 3 and 12 miles has to be considered as a potential area of expansion at least for Emilia Romagna Region. This would increase the management costs, e.g. fuel, but would open the possibility of replacing the plastic tubular socks, now used, with biodegradable cotton nets. This system, called "New Zealand" or "Japanese", has been tested test during the "EcoSea" project (http://www.ecosea.eu/) and requires the plants to be located in areas at least 15 meters depth, but would allow both to reduce the environmental impact related to the accidental dispersion of plastic stockings and to save the costs related to their disposal, as special waste (Barbanti et al., 2017b).

### *Sustainability of fisheries*

**1. Description**

The fisheries sector is part of the Eusair Action Plan in the "Fisheries and Aquaculture" topic of Pillar I "Blue Growth". The sector has fundamental importance for the blue growth of the region, aiming to promote both sustainable growth and to achieve long-term sustainable fisheries management through the implementation of the principles of the Common Fishery Policy. The Italian north Adriatic regions host old and important fishing traditions, and its fishing ports have always been a point of reference and innovation for sea fishing in Italy.

The whole set of fishing activities (see Chapter C.1.2) in the area determine a heavy fishing pressure, which might contribute to bring fish stocks to an over-exploitation level. Furthermore, possible indirect effects of fishing activity, such as effects on substrates and other communities, must be taken into account at the ecosystem level to fully understand the effects of fishing practices on the environment. Small-scale fisheries generally have lower environmental pressure when compared to other fishing activities, such as trawlers, essentially due to lower physical impacts on the soft seabed exerted by set gears in comparison with towed ones. Moreover, this type of *metiers* shows higher selectivity for target species. The physical disturbance caused by trawling is classified as one of the most important sources of anthropogenic impact of the entire Adriatic basin. In consequence, the long-term effect of bottom trawling might have an impact on fish priority habitats, such as nursery and spawning grounds. This places the serious priority of the identification of the Essential Fish Habitats, which is fundamental for the correct planning of conservation measures.

The protection of typical soft bottom EFH would favor the achievement of the MSFD objectives of safeguarding and recovering fish stocks of particular commercial interest, with a close connection

between this descriptor (No. 3, The population of commercial fish species is healthy) with Descriptors 1 (Biodiversity is maintained), 4 (Marine trophic food webs) and 6 (Sea floor integrity), due to the complex ecosystem effects of the fishing-related use of destructive tools. Currently, portions of the area are already protected by environmental protection tools, with permanent bans or restrictions on the use of fishing techniques that cause abrasion of the sea bed. In the area, the use of towed gears is forbidden within a distance of 3 nautical miles from the coast, on seagrasses, on coralligenous and maerl beds. No trawling limits (both bottom and pelagic) may extent to 4 and/or 6 nautical miles from the coast (depending on the size and limits of boat navigation) after the annual fishing stops until the 31st October. Every type of fishing activity is also prohibited within 500 meters from offshore platforms, cables and pipelines, ports, aquaculture facilities and military polygons, while they are regulated inside MPAs and Biological Protection Zones (BPZs). However, large portions of the study area are still heavily affected by trawling.

Analysis of the cumulative effects on the bottoms of territorial and offshore waters of the CS area clearly indicates bottom trawling (both OTB and TBB) as two of the most influencing anthropic activity in the considered area, with a contribution of over the 25% of the total score, following maritime transport (45%) and followed by pelagic trawling (10%). Trawling related pressures are almost widespread in the CS area offshore the 3nm, and show hotspots of contribution to the CEA scores from the 3 nautical miles in the Venice Gulf and off the Po Delta, from the 4-6 nm along Emilia-Romagna coasts and in the offshore area South of the Po Delta (Fig. C.2.1 7).

The analysis on environmental components present, moreover, shows how the most potentially impacted in the area are the Nursery Habitats (over the 25% of the overall score) and all the Circalittoral soft bottoms.

The potentially most impacted nursery areas are located out of Venice lagoon, between Chioggia and the Po River Delta and in the central-southern portion of Emilia-Romagna, where high trawling activities coexist with intense other activities (e.g. maritime traffic) (Fig. C.2.1 4). Comparisons between figures show that the main interactions between EFH e trawl are essentially in internal and territorial waters between 3 and 12 miles.

The complex set of pressures affecting EFH is shown in a Sankey diagram (Fig. C.2.1 3). The diagram shows that the main pressures exerted by trawling fisheries on EFH are abrasion, extraction of species, changes in siltation and smothering. All pressures derived from maritime traffic (e.g. marine litter, pollution and underwater noise) also strongly affect EFH.

The analysis on the potential conflicts between uses (MUC, Fig. C.2.1 8) shows how the spatial overlap between SSF and trawling is very low, with the exception of areas between 3 and 6 nm from the coast. Otherwise, resource conflicts between trawlers and small-scale fisheries are potentially high in several coastal areas. The Adriatic Sea is probably the largest area of occurrence of shared stocks between regional and international fleets in the Mediterranean. The main issues related to shared stocks may boost the conflicts between small-scale and industrial fisheries and between local and foreign fleets, both at regional and international level, especially when transboundary common fishing grounds became overexploited and in absence of an adequate protection of recruitment and spawning areas of target species. Even if small-scale vessels and fishing gears have a limited environmental impact, they may be harmful to sensitive coastal habitats (e.g. coralligenous assemblages) and its aggregated effect on the state of the stocks can be significant. According to the Common Fisheries Policy, small-scale fisheries should therefore be valued and supported, also as a form of reconversion of sectors of industrial fishery in difficulty, developing all possible synergies, direct and indirect, with the tourism sector. At the same time, and in relation to its current size and its potential for development, it must be regulated in time and space, to guarantee reduced environmental impact and the absence of conflict with other uses of the sea and the coast.

The increase in artisanal fisheries, together with aquaculture, and a proper managing of the decommissioning of the heavy trawler fleets, can be an example of synergy with the widespread coastal tourism through the development of complementary activities, including recreational fishing, environmental services, food and gastronomy sector and ecotourism. Promoting tourism-fisheries and fisheries cultural heritage is a defined strategy within Eusair action plan, enhancing on the one hand the seasonal productions with a more sustainable exploitation of the resources, and on the other perpetuating the typical "maritime culture", with important cultural and socio-economic implications for local communities. The combination of these activities could be an important economic resource for the territories in which it is carried out and in the neighboring areas, provided that the operators are able to act in an appropriate regulatory environment that combines work activities with those related to the reception and logistic.

## 2. Spatial/temporal analysis/characteristics of the concern

Potential spatial and temporal variability are bound to the high seasonality of stocks life cycles and, in consequences, of fishery activities. The interaction between trawling and small scale fisheries spatial distribution and environmental components, especially EFH, together with the high influence of other activities, mainly maritime traffic, allow to focus on specific areas of major interest: Gulf of Trieste, out of Venice, Chioggia-Delta del Po, south Emilia-Romagna region (fig. C.3.1 2).




*Fig. C.3.1 2: Spatial characteristics of the concern.*

**Subarea A:** moderate trawling effort but in high competition with maritime traffic, and potential effects on high valuable habitats (seagrasses - Fig. C.3.1 3, coralligenous assemblages - Fig. C.3.1 4) and recruitment areas.

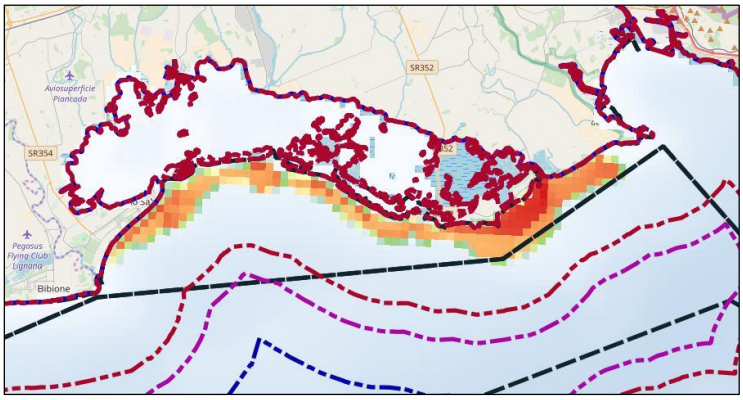



*Figure C.3.1 3: Spatial distribution of the CEA scores on Cymodocea beds within the CS area (min = 0, max = 7.1).*

**Subarea B:** high level of trawling effort, especially TBB, interacting with a complex suit of other human activities (passenger and cargo traffic, aquaculture, coastal tourism) in exerting pressures on habitats (e.g. coralligenous - Fig. C.1.1.2) and recruitment areas.

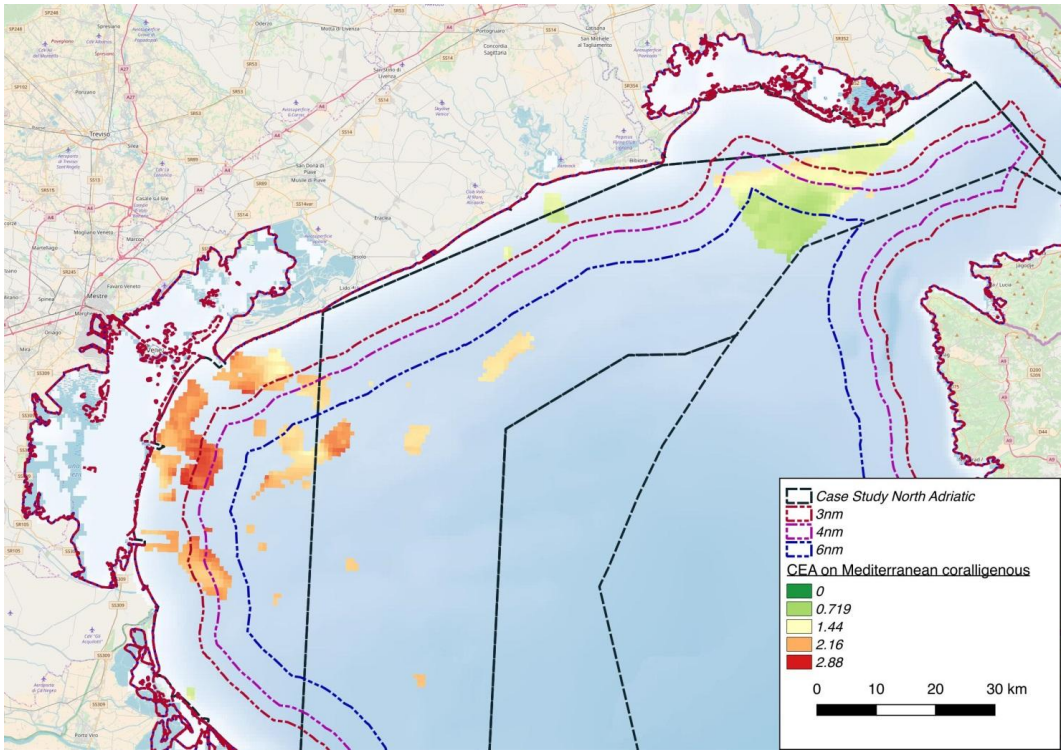



*Figure C.3.1 4: Spatial distribution of the CEA scores on coralligenous assemblages ("tegnùe") within the CS area (min = 0, max = 3).*

**Subarea C:** multiple pressures on EFH (both recruitment and spawning areas) from traffic and trawling (offshore the 4 nm).

### *Coastal and Maritime Tourism*

**1. Description**

The Northern Adriatic Sea space has been identified as an area of existing and potential tourism-driven MU development (Depellegrin et al., 2018a, Castellani et al., 2017; Depellegrin et al., 2018b; Schultz-Zehden et al., 2018). MU means the joint use of resources in close geographic proximity. This can involve either a single user or multiple users performing multiple uses (MUSES project - www.muses-project.eu/). The term covers a multitude of use combinations and represents a radical change from the concept of exclusive resource rights to the inclusive sharing of resources by one or more users (Zaucha et al., 2017).

In particular the following MU combinations have been identified in the study area (Castellani et al., 2017; Depellegrin et al., 2018a; Depellegrin et al., 2018b; Schultz-Zehden et al., 2018).

1) TOURISM & SMALL SCALE FISHERY: already existing combination of fishery and tourist known as Pescatourism activities (Piasecki et al., 2016). The term defines fishermen (usually small-scale fishery) hosting tourists on vessels to assist their fishery activity, also performing educative and recreational activities. Pescatourism generally has also educational and awareness raising purposes, with the aim of spreading the local culture of the sea, improving respect of the environment and promoting sustainability principles.

2) TOURISM & AQUACULTURE: sustainable aquaculture where farmers board people on their vessels to visit plants, learn about aquaculture techniques, with educative and recreational scopes (Manente et al., 2015). It can also have a role in educating citizens towards sustainable practices of aquaculture (van den Burg et al., 2016). In addition, this combination can be developed also in other complementary ways. Sport fishing activity (mainly angling) can be practiced next to mussel aquaculture plants, which commonly function as attractive areas for a number of fish. Aquaculture operators can receive an income for the uses of their space but also benefit of a reduced predation pressure by predator species (e.g. seabasses, seabreams) feeding on farmed molluscs that can be caught by sport fishermen. Diving/snorkelling tourism could also be practiced next to aquaculture farms, where a rich fauna can be observed.

3) TOURISM & ENVIRONMENTAL PROTECTION: this synergy depends on the various environmental protection measures in place in the marine areas of Emilia Romagna (Relitto della Piattaforma Paguro-SIC IT4070026 , ATB con reef, ZTB Fuori Ravenna), Veneto (tegnue) and Friuli Venezia Giulia (Miramare and Bibione reef) regions, regarding both natural (Natura 2000 sites and BPZs) and artificial elements (artificial reefs and a peculiar Natura 2000 site established on a sink methane extraction platform collapsed called “Relitto della Piattaforma Paguro”, SIC IT4070026 located in front of Emilia Romagna).

4) TOURISM & UCH: UCH sites are mainly represented by wrecks, including military and merchant ships, motorboats, but also platforms, airplanes, pylons, buoys and cages (www.relitti.it). Many of these are used as diving destinations with relative socio-economic value. This combination is in connection with the ENVIRONMENTAL PROTECTION one (e.g. the “Relitto della Piattaforma Paguro” is both a SIC IT4070026 and a sink methane extraction platform collapsed).

5) TOURISM & OIL&GAS DECOMMISSIONING: in the next 4-5 years 8 platforms within 12 nm are planned to be decommissioned (ENI Industrial Plan 2017-2020, "Forum on the future of Platforms"; Barbanti and Perini, 2018) – with possible reuse of platforms as, among the others, rigs to reef. Thus this combination is considered in connection with the ENVIRONMENTAL PROTECTION one.

**2. Spatial/temporal analysis/characteristics of the concern**

Here we consider areas in which synergies with tourism can be consolidated and valorized. In particular, according to the description above, three main considerations have to be taken into account:

1. An increase of tourism intensity will increase conflicts with other uses, mainly for what concerns tourism transport and touristic activities (leisure boat, scuba diving etc.) in the marine areas.
2. An increase of tourism intensity, although with a sustainable approach, will inevitably increase impacts on the coast and on the marine area in the case study domain. Also the need for more management of the tourism sector in all its aspects (activities, facilities, pressures/impacts) is required.
3. An increase of tourism intensity can on the other hand be seen in a positive way, considering the multiuse approach/synergies with other uses, described above, thus news products etc. for more socio-economic sectors and reducing impacts on the environment (sustainable development of tourism). The development of the above-mentioned multi-use has to overcome barriers with concrete actions (Depellegrin et al., 2018a; Schultz-Zehden et al. 2018), among the main barriers are the legal and administrative barriers (e.g. procedures required to get licenses for pescatourism, funding availability and the need for adaptation of aquaculture vessels, fragmentation of competences among different institutions or among different divisions/departments of the same institution, and lack of cooperation).

On the basis of the current status, future trend, policies in place, potential synergies and multiuse opportunities, an increasing trend of the criticism can be identified.

The potential development of tourism sector, also in combination with small scale fishery, aquaculture, underwater cultural heritage, environmental protection and oil & gas decommissioning platforms, will be diffused along the coastal areas of the three regions within the 3 nm, but also spread offshore for what concerns leisure boat traffic and other touristic activities. If a substantial development of these activities occurs, a further management of the tourism sector is required. An increment of tourism will also increase the impacts/pressures on coastal area.

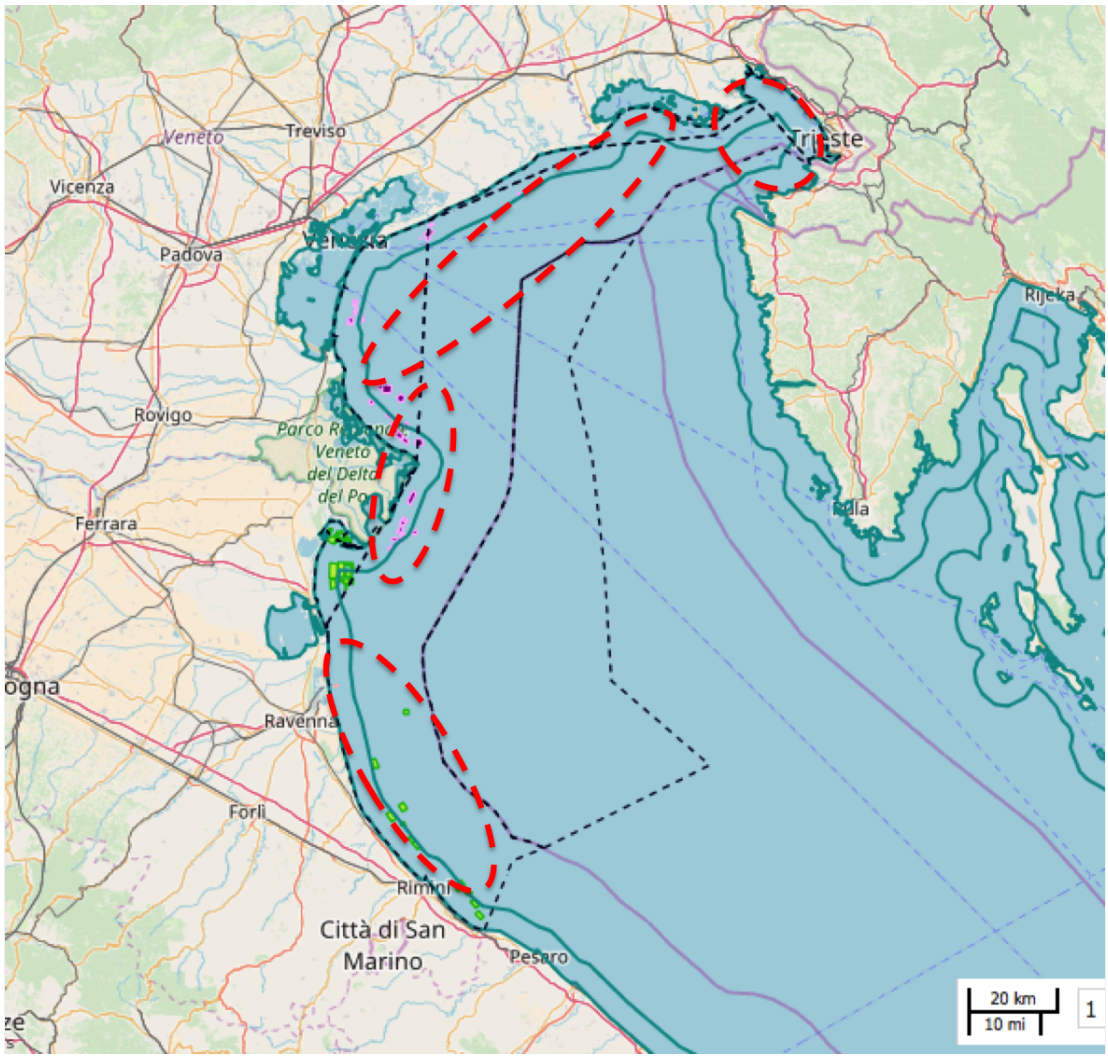



*Figure C.3.1 5: Spatial characteristics of the concern on tourism sector.*

### *Marine renewable energy generation*

**1. Description**

In the case study area, there are currently no plants for the production of energy from renewable sources from the sea (waves, currents) or at sea (solar, wind), excluding small self-consumption systems installed on O&G platforms or on platforms / observation and monitoring systems (for example, CNR "Acqua Alta" platform), or small experimental systems.

The EU 2030 climate and energy objectives include:

- The reduction of climate-changing emissions by 40% compared to year 1990;

- The 27% increase in the portion of coverage of gross final consumption through renewable sources;

- 27% increase in energy efficiency.

These objectives, and the related policy and planning tools, prompt us to carefully evaluate the energy potential at sea and to promote it wherever possible.

The exploitation of solar energy is limited to the needs of self-consumption and possible self-sufficiency of installations at sea (platforms, terminals, buoys, etc.), and as such is not of interest for this analysis.

The sea currents present in the area are insufficient for an energy exploitation, with the exception of some very localized situations (for example the inlets of the Venice Lagoon), where the tide induced currents can exceed 1 m/s and therefore justify a feasibility analysis for their energy exploitation.

There are several systems under study and development for the production of electricity from wave motion (Sannino and Pisacane, 2017), some of which have also been tested in the area through some European projects (MAREenergy, MERMAID, SDWED, THESEUS). In general, they are predominantly in a prototype or pre-industrial stage and are able to produce only small powers, which can be used for self-consumption needs. Furthermore, the study area as a whole presents a limited potential for wave energy (Figure C.3.1 6).

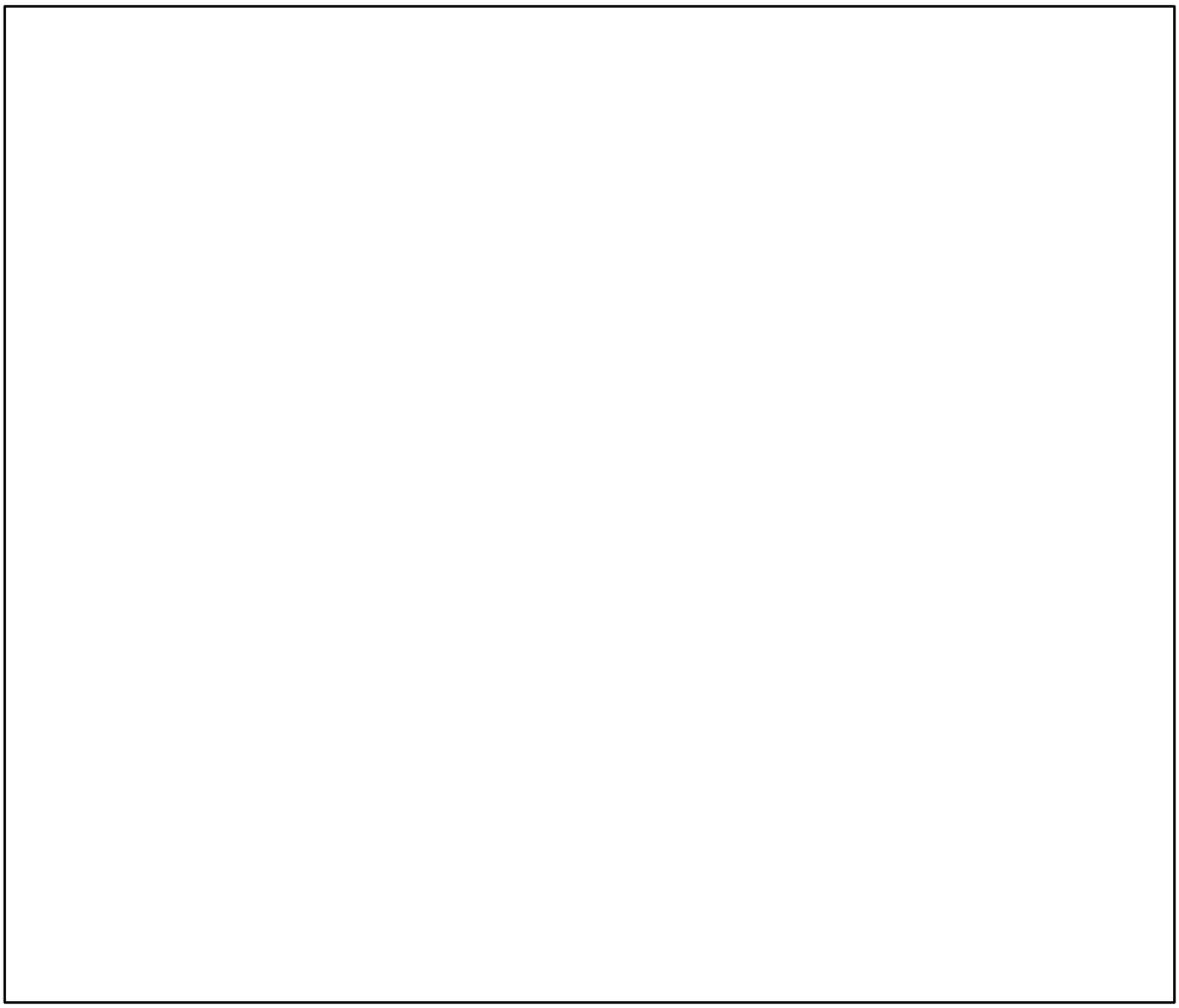


*Figure C.3.1 6: Mean annual wave climate in the Mediterranean Sea: (a) Significant wave height and mean wave direction; (b) Energy period. Data obtained from the ERA-Interim database (1979–2013) of the ECMWF and analyzed by HCMR (Soukissian et al., 2017).*

The energy potential of the area with regard to wind power has been the subject of several studies and projects developed in recent years. These include the projects 4POWER (Province of Rimini), POWERADE (Abruzzo Region), Coconet (CNR-ISMAR) and the studies carried out by RSE for MISE (RSE, 2016, 2017).

The mean windiness maps (RSE Wind Atlas; Boero et al., 2016) show in the study area average speeds at 100 and 10 m s.l.m. between 4 and 5 m/s, decreasing towards north and west (Figures C.3.1 7 and 8).

*Figure C.3.1 7: Mean annual wind climate (at 100 m above sea level) (Atlante Eolico RSE).*

*Figure C.3.1 8: Mean annual wind climate (at 10 m above sea level) in the Mediterranean Sea according to the ETA model. Arrows indicate the mean annual wind direction (Boero et al., 2016; Soukissian et al., 2017).*

On the basis of these studies it is possible to conclude that there is, in particular in the southern part of the study area, a potential that can be exploited economically, also relying on existing incentives, and therefore a preliminary analysis of the areas most suited for this use is justified, considering the factors of direct interest (wind depth, depth, distance from the possible connection to the network) and other factors of similar importance such as environmental and landscape aspects (e.g. presence of habitats and species of interest, visibility from the shore) and potential conflicts / synergies with other uses present in the area.

### *Military areas spatial conflicts*

**1. Description**

The North Adriatic case study area hosts activities dedicated to military uses. Moreover, there are areas reported as dangerous for activities at sea due to the possible presence of dumped unexploded munitions. In the areas in front of the coast of Riccione and Chioggia there are exercise areas that are not currently used and, therefore, without specific orders that permanently or temporarily prohibit other uses of the sea in this area.

The main military activities are concentrated in the site for ground-sea shooting exercise "ECHO 346 Foce Reno" in Emilia-Romagna, between the Reno river mouth and Porto Garibaldi, active since 1975. Sea areas falling within the shooting range are forbidden to anchorage, navigation, fishing and any other public use of the sea, according to the procedures established by specific Ordinances. In particular, areas A1 and A2 are permanently interdicted to anchorage and fishing, while areas A1, B1, A2 and B2 are temporarily forbidden to navigation and fishing during shooting exercises. In the A2 - s1 area navigation is always permitted, but anchorage and fishing are permanently forbidden (Fig. C.3.1 9).

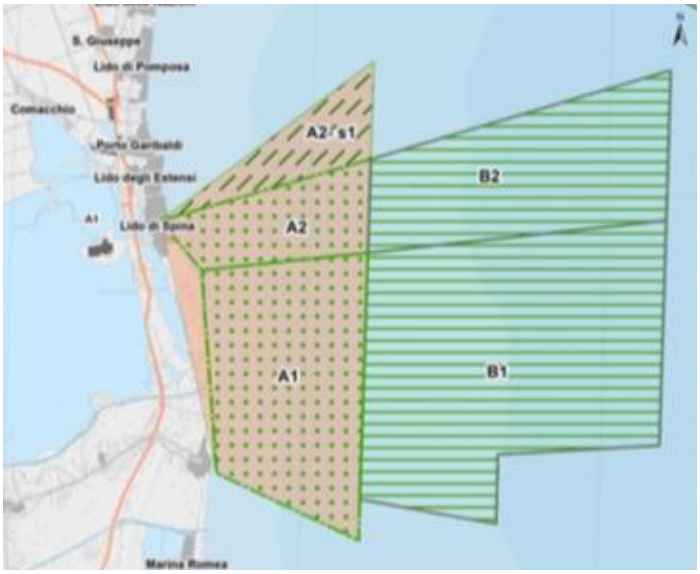



*Figure C.3.1 9: ECHO 346 zonation (Barbanti et al, 2018).*

Over the years, the limitations to other uses have been slightly reduced, allowing to navigate in the A2 - s1 sector even during the exercises and reducing the days and hours of interdiction to foster compatibilities with the fisheries needs. Currently, in B1 and B2 areas both pelagic and bottom fishing activities are allowed, with the exception of practice days. The existing bans, however, due to the site extension (about 11 nautical miles from the coast), cause a drastic increasing in navigation times for vessels and boats in order to bypass and avoid the prohibited sea areas, with higher fuel consumption, making the professional fishing activity almost uneconomical. Conflicts are also generated with activities related to navigation, leisure boating, bathing and coastal tourism, not being allowed to use the beaches close to the area (Fig. C.3.1 10).

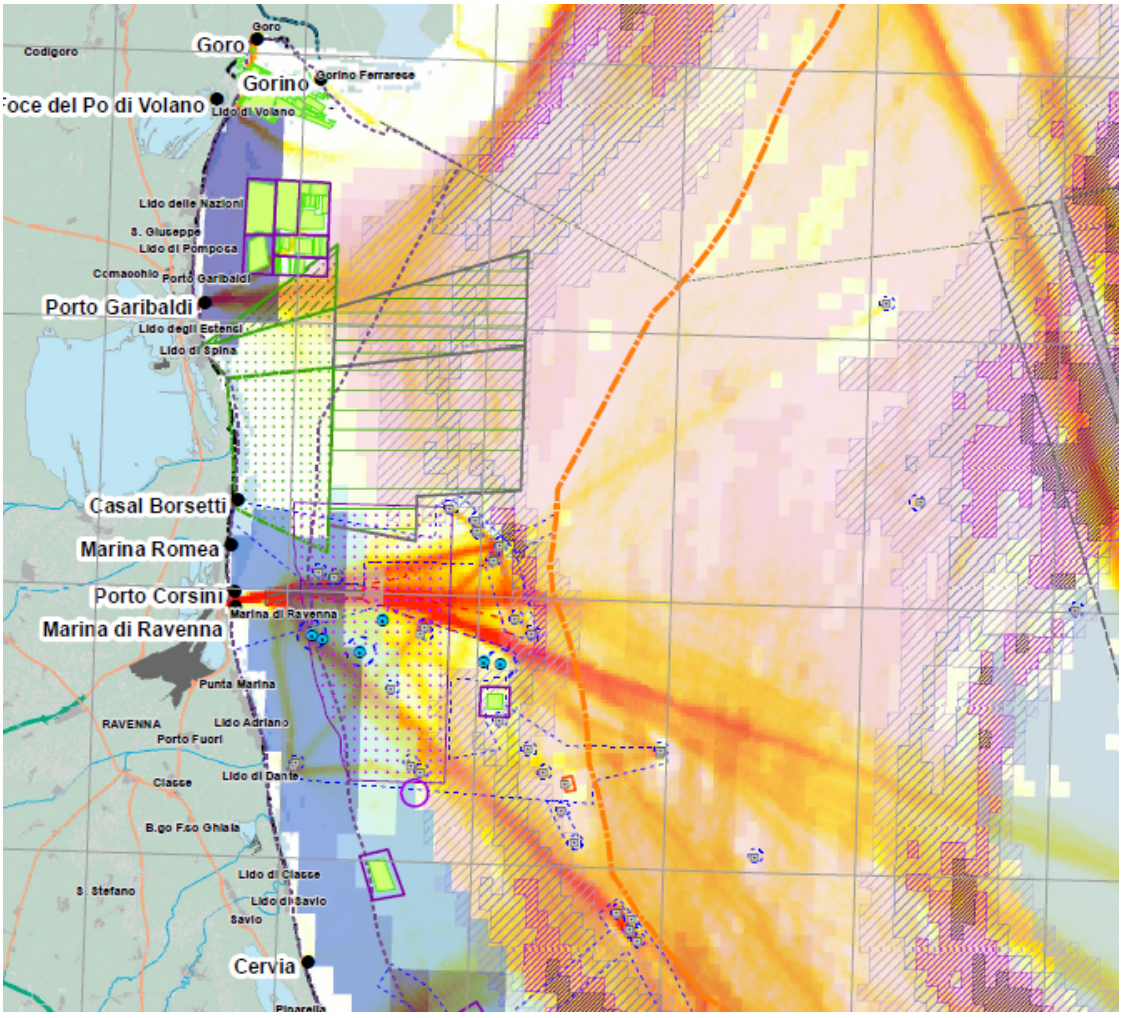



*Figure C.3.1 10: Present military areas and other uses present in the area relevant in terms of conflicts and potential benefits in case of reduction of the military area (from Barbanti et al., 2018).*

The MUC (see chapter C.2.2) analyses highlight the spatial conflict between the military activities and the other uses. The most affected activities are coastal fishing and tourism, both for the permanent and temporary bans. Furthermore, no aquaculture facilities are allowed in the area, even if the area are highly vocated to marine farming (e.g. mussel farming).

From the environmental point of view, indirect benefits can be generated on local habitats and species due to the strong limitations of impacting uses generated by bans. More complex is the potential effect on seabirds, which on one hand could be favored by the protection of their essential habitats (e.g. nesting sites) but, on the other hand, could suffer the strong noise impact derived from shooting activities. Possible impacts can also be linked to potential releases into the environment of energy and substances during shooting exercises, with potential repercussions on the quality and healthiness of commercial fishes and bathing waters.

### *Hydrocarbon extraction: decommissioning and re-use*

**1. Description**

The marine area facing the Emilia-Romagna coast has housed since the '60s many facilities (platforms, wellheads, terminals, pipelines) for the extraction and transportation of gaseous hydrocarbons that supply about 50% of methane gas nationwide (Assomineraria, 2015). Even though production in the last few years has halved, on the basis of the existing reserves and from what emerges from the Business Plan presented by ENI for the period 2017-2020, we can reasonably foresee the continuation of the extraction activities "in order to maximize the recovery proven reserves ".

The development and maintenance of this activity, with which the territory has been living for some decades (RIE, 2014), required a precise regulation of the coexistence between research and exploitation activities and other uses of the sea and the coast (e.g. security areas around platforms and terminals and along submarine pipelines, areas forbidden to trawlers).

It is interesting to note that in the Emilia-Romagna area the highest concentration of Italian and Mediterranean platforms coexisted since the '70s with a very developed maritime and coastal tourist sector, without any direct, positive or negative relation, which can be obtained from the analysis of the temporal evolution of the two sectors (RIE, 2014).

An indirect effect on coastal tourism of mining activities is given by the induced coastal subsidence, which can favour flooding and erosion processes of the coastal strip. The interventions implemented over the years have considerably reduced the phenomenon, which today persists with relatively high values in the area immediately south of Ravenna (Fig. C.3.1 11).



*Figure C.3.1 11: Subsidence trends in the coastal area of the Emilia-Romagna Region. Data from Interferometric Synthetic Aperture Radar (InSAR) 2006-2011.*

The activities of gas extraction and the associated infrastructures are subject to specific environmental monitoring programs (waters, seabed, biota), so as to be able to identify and eventually correct alterations induced on marine ecosystems.

The marketing and consumption of mussels taken from the platforms, even for the needs of cleaning them, are allowed and implemented for years by fishing operators, in agreement with ENI, owner of the plants. Finally, it should be mentioned the use of some platforms in use and no longer productive for environmental monitoring activities of various kinds.

To the themes of coexistence between active plants and other uses of the sea and the coast, we add the specific theme of managing the end-of-life of the O&G facilities and their possible reuse after their

mining closure. Today this topic potentially regards nine platforms within the study area (Fig. C.3.1 12) within the next 4-5 years.

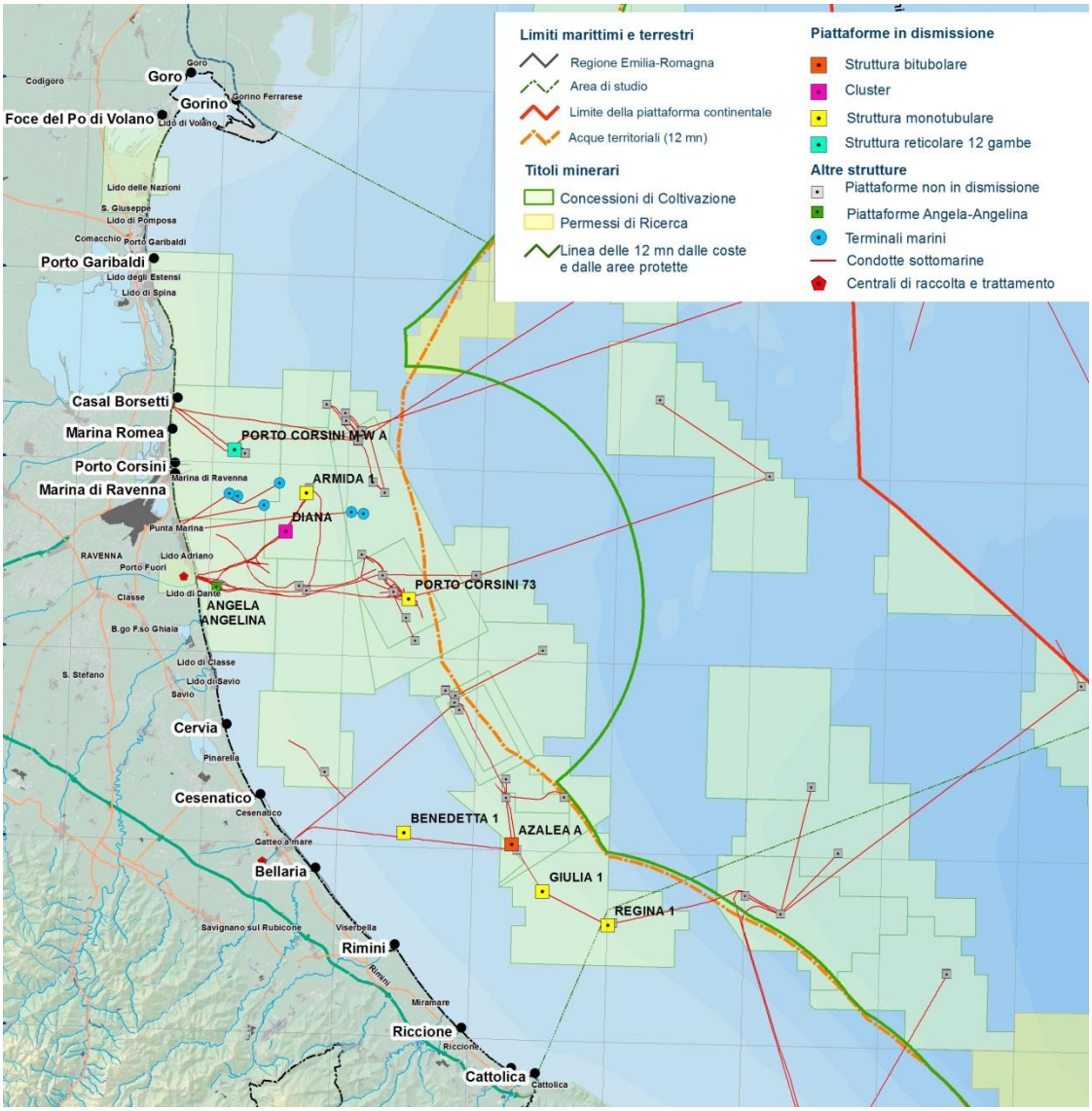



*Figure C.3.1 12: Platforms and concessions in front of the Emilia Romagna coast, with indication of the platforms to be decommissioned divided by type (source: MISE UNMIG, Forum "Future of Off-shore Platforms"; extracted from Barbanti et al., 2018). To these must be added the ADA3 monotubular platform, located in the area in front of the Adige river mouth.*

These are structures of different type (monotubular type, bitubular / cluster, reticular) located within the 12 miles from the baseline. Other structures to be decommissioned will follow progressively over time, including the Angela Angelina platform (8-leg reticular structure, built in 1997, 2 km from the coast near the Fiumi Uniti mouth (Ravenna), where a discussion has recently opened between ENI and Local Administrations, to facilitate the preventive closure of the plant and its dismantling or possible reuse.

The search for optimal solutions to manage the problem of disposal from an environmental and socio-economic point of view is the subject of an intense discussion and of regulatory changes (see the Forum "Future of Off-shore Platforms" promoted and coordinated by MISE). It involves, sometimes in a relevant manner, the management of the maritime space, both for the areas directly occupied by the structures and for the interaction with other activities that may potentially be synergistic or conflicting with the structures to be decommissioned. For this reason, the topic is dealt with here, with preliminary analysis and proposals that can then be developed in more depth, also in light of the current legislative evolution, and included in the future plan of the maritime space.

The current legislation (Article 63 of Presidential Decree 886/1979) provides that, except for the exception authorized by the competent MISE office, having heard the Ministries of Infrastructure and Transport (former Merchant Marine) and Defense, the part of the coating pipe or other installation emerging from the seabed must be totally removed following the mining closure. On this subject, new national Guidelines are being prepared and soon to be issued pursuant to Article 25 c.6 of the Legislative Decree. 104/2017, implementing Directive 2014/52/EU, "for the decommissioning of platforms for the cultivation of hydrocarbons at sea and related infrastructures, in order to ensure the quality and completeness of the assessment of the related environmental impacts".

Decks, jackets, pipelines can be re-used for their original design (possibly elsewhere) or these structures and wells can be repurposed for alternative uses, including:

• retrofitting infrastructure (pipelines) to accommodate carbon storage (CCS),

• transformer locations for wind farms,

• offshore wind power to gas,

• LNG docking stations,

• support recreational activities such as scuba diving stations, recreational fishing, environmental education, marinas, gastronomic experience);

• support monitoring, observing and research activities;

• function as structural and or logistical support for aquaculture installations;

• support renewable energy devices: wave energy devices, wind energy, solar panels;

• convert into artificial reefs, as a so called ‘rigs to reefs’ concept (BOEM, 2012; EBN, 2016; Barbanti et al. 2017), promoting environmental conservation and biodiversity and allowing new tourism and recreational uses.

### *Coastal defense*

**1. Description**

The defense from coastal risks and erosion is part of the Eusair Action Plan in the "Marine Environment" topic of Pillar III "Environmental Quality", and is a key issue for the Italian regions of the Northern Adriatic. Large coastal portions are very vulnerable to sea level rise and storm surges due to the intense coastal dynamics and morphological features, which, especially in Emilia-Romagna and Veneto, is characterized by depressed areas, lagoons and brackish valleys. Often, the only natural defense from the marine floods is represented by the dune lines, which are extremely discontinuous due to anthropic levelling and erosion. Coastal erosion is mainly a consequence of the sedimentological balance deficit caused by reduced sedimentary contribution from rivers, as a consequence of anthropic alterations of their watercourses, and by the interruption of the sediment

coastal flows, due to the presence of coastal engineering works, and is widespread in large coastal sections of the study area (Fig. C.3.1 13).




*Figure C.3.1 13: Coastal Erosion trends (Rizzetto et al., D3.2.2. Co-Evolve project, 2017). Legend: red = erosion confirmed; green: aggradation; blue: stable; yellow: artificial coastline.*

The coastal area is also afflicted by the lowering of the seabed (with some exceptions, such as the "Banco della Mula di Muggia", in Friuli), which affect the stability of the defense works, especially during storm events. Other factors, such as sea level rise, coastal engineering and subsidence can have repercussions on the evolution and stability of neighboring coasts. Subsidence is a slow lowering movement of the earth's surface at a speed ranging from a few tenths of millimeter to tens of millimeters per year. The main causes are natural processes (tectonic and geodynamic processes, e.g. the subduction of the Adriatic plate below the European one, the consolidation of the land due to lithostatic loads, deglaciation and karst) and/or the increased anthropogenic pressure (generally related to the extraction of fluids and solids from the subsoil). Italian regions of Northern Adriatic are among the most affected by subsidence phenomena in Italy, especially Veneto (Fig. C.3.1 14) and Emilia-Romagna (Fig. C.3.1 11) (respectively 305 and 174 municipalities, ISPRA 2015 data) while the phenomenon is smaller in Friuli Venezia Giulia (24 municipalities), although it is concentrated in coastal areas bordering Veneto. The coastal areas most subject to subsidence in the study area are close to Venice lagoon, the Po river delta and the city of Ravenna.



*Figure C.3.1 14: Veneto areas affected by subsidence phenomena (2002-2010) (Ruol & Pinato 2016).*

The defense of coastal areas from erosion and sea ingression is both an ecological-environmental and economic priority. Specific objectives aim to reduce the vulnerability of the territory, improving the performance of the existing defensive systems, promote multifunctional architectural/naturalistic interventions, reduce the exposure to the risk of the settlement system, modifying the urban planning regulations, protect the high environmental and naturalistic value of areas subject to flooding (e.g., Regional Park of the Po Delta), safeguard the economic activities of the coast, with particular attention to coastal tourism and prevent the possible effects linked to climate change.

The overall picture shows long stretches of coastline and wide coastal areas under erosion and risk of flooding, in particular in Emilia-Romagna and Veneto Region (Fig. C.3.1 15 and 16).




*Figure C.3.1 15: Risk of flooding on Emilia-Romagna coasts (yellow = low, orange = medium, red = high, purple = very high; Barbanti et al., 2017).*

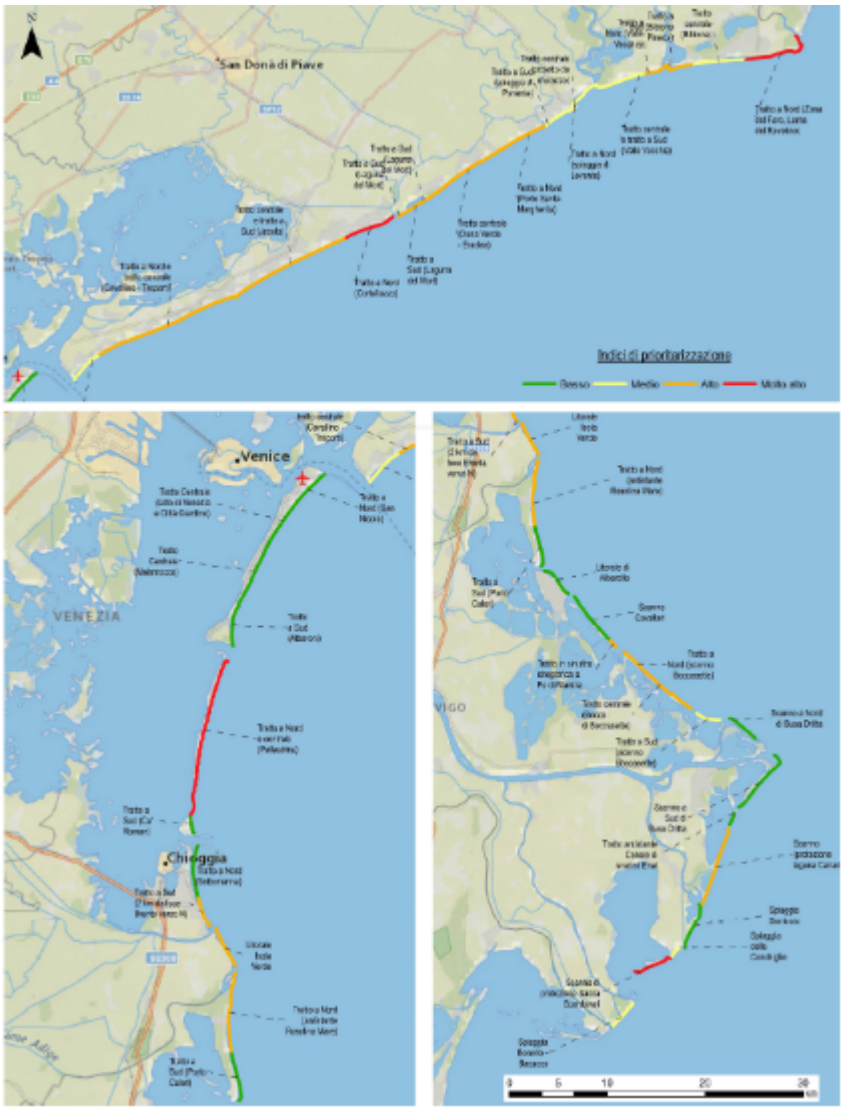



*Figure C.3.1 16: Priority of interventions on Veneto coasts (Ruol & Pinato 2016).*

This situation will most probably get worse in the next decades, due to relative sea level rise and storm surges. To counteract this phenomena, a wide and continuous set of measures and interventions will be required, with a strategic view and a long-term perspective. Such view is presently reflected in the Flood Risk Management Plans prepared according to Directive 2007/60/EU (Piani di Gestione delle acque e del rischio alluvioni del distretto idrografico delle Alpi Orientali, del distretto padano, del distretto dell'Appennino Settentrionale e del distretto dell'Appennino Centrale) and Plans prepared at regional level (Ruol & Pinato, 2016; Idroser, 1996; Piano ICZM RER, 2005).

Currently, the set of preventive actions considers:

- structural coastal works sized to withstand over time the action of the sea and currents (brushes, emerged and submerged barriers, etc.).

- "soft defense" works: interventions realized through the reshaping of sedimentary deposits or the addition of new sediments, coming or not from the same coastal area (beach nourishments, creation or reconstruction of coastal dunes).

- non-structural interventions: set of regulatory and legislative provisions, to regulate the use and management of the shoreline (rules for the movement of sediments in the coastal area, regulatory plans defining coastal urbanization and beach concessions).

In general, the management plans indicate the "soft defense" as the best practice to prevent coastal erosion and risk of flooding, and provide recommendations for the management of coastal engineering, in order to avoid possible macroscopic negative effects on the sediment dynamics caused by the presence of incorrectly planned hard structures along the coast. The reduction in the use of hard works is made possible by the increasing use of artificial sand nourishment as a integrate system to protect the coasts.

In the recent past, the sediments used for nourishment works were mainly from coastal accumulations and dredging activities of the ports and river mouths, according to their environmental quality. They are currently used in significant amounts for the so-called "ordinary maintenance" of beaches and coastal areas. Relict sand deposits are considered the best strategic resource for the structural restorations of regional coasts, the so-called "extraordinary maintenance" (ICZM Guidelines, 2005; Barbanti et al., 2017). Sands accumulated in these deposits, called "relict sands" (Fig. C.3.1 17), derive from ancient beaches (8-11,000 years ago) formed during the marine transgression phase following the last ice age, then submerged after the seal level rise. These deposits are an important strategic resource for beach nourishment since their composition is similar to that of current beaches.

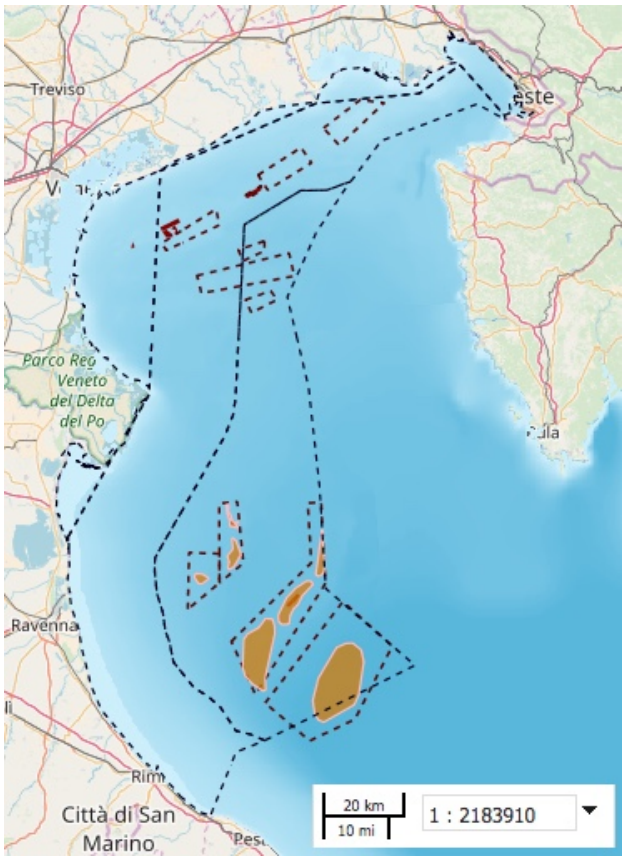



*Figure C.3.1 17: Relict sands deposits of Veneto (brown) and Emilia-Romagna (orange) regions and potential requests of concessions for extraction (hatched areas).*

The potential impacts of coastal defense activities are mostly temporary and limited to the intervention areas. Soft interventions may generate a direct impact on the coastal area in the operational phases (e.g. searching, transporting and allocating sands), but also for possible, although temporary, alteration of coastal benthic communities (e.g. clams) if breeding and recruitment periods are not taken into account. However, compared to hard coastal defense techniques, nourishment is the technique with less long-term impacts. Dredging activities of relict sand do not involve significant impacts on the coastal sedimentary dynamics. However, during the complex set of dredging activities other alterations may occur, both physical (morphological and bathymetric alterations of the seabed, plumes of suspended sediments) and biological (extraction and burial of benthic organisms). The biological effects, until they disappear, may have significant repercussions on economic activities of great importance for the area such as fisheries, which is also affected by pelagic and bottom trawling bans in the area during mining activities. Possible conflicts that could limit sand exploitation and dredging operations may arise from the presence Oil & Gas concessions, extraction platforms and related pipeline close to the deposits. Moreover, potential temporary conflicts may arise during sand extraction with maritime transport.

Soft interventions may generate synergies and with key economic sectors such as coastal tourism. The adaptation of seaside structures and the regeneration of coastal dune allow synergies with the environmental and landscape protection and an increased/maintained usability of these environments for tourist frequentation, helping to maintain the width of beaches. If well planned, soft interventions can also favor the maintenance of coastal habitats (emerged and submerged).

2. Spatial/temporal analysis/characteristics of the concern

*Figure C.3.1 18: Spatial characteristics of the concern*

The theme of coastal defense and adaptation to climate change through the use of soft interventions highlights the need to consider the sands as a strategic resource for the entire Adriatic basin. Climate change and, in particular, sea level rise risk having a decisive influence on coastal defense trends, causing increased vulnerability to sea flooding, especially during intense storms. For the twenty-first century, the projections of the Intergovernmental Panel on Climate Change indicate a rise in the "median global sea level" of over 30 cm (IPCC, 2015). Galassi and Spada (2014), combining the best estimates of pressure, temperature, salinity and dynamic effects, have calculated for the Mediterranean Sea a possible increase between +5 cm and +26 cm by the 2040-2050, depending on the climatic assumptions used. Some more recent studies have highlighted the contributions to recent sea-level rise from ice sheet melting that were not included in the models reviewed in the AR5 estimates (European Environment Agency, 2017, and references therein). These different assessments have resulted in higher estimates for sea-level rise during the 21st century, i.e. 0.4–0.6 m for the low forcing scenario (RCP2.6) and 0.7–1.2 m for the high forcing scenario (RCP8.5) (Horton et al., 2014; Kopp et al., 2014; Johansson et al., 2014). Even if regional and local sea levels can differ from the global mean owing to large-scale factors, such as changes in ocean density and circulation, relative sea-level changes along most of the European coastline are projected to be reasonably similar to the global average (European Environment Agency, 2017). The immediate consequences are direct and indirect damage to populations, coastal settlements, monumental heritage and agriculture due to frequent flooding. In particular, various problems are being created in the lagoon's systems, with erosion of the seabed, obstruction of tidal channels and serious damages to the lagoon ecology.

## C.3.2 Land-sea Interactions

Land and sea are intrinsically connected via multiple, complex social-ecological interactions (Álvarez-Romero et al., 2011; Makino et al., 2013; Stoms et al., 2005). These interactions are important components of local ecology and represent major factors influencing people's livelihoods and wellbeing. Connections between land and marine ecosystems occurs through transport vectors, and the direction of influence is mainly, although not exclusively, from land to sea (Stoms et al., 2005). Indeed, land-based activities can alter the flow of material, energy or organism and affect the marine biota through impacts on ecological processes. Currently the concept of land-sea interactions is not yet well defined and its declination and analysis should take into account different levels of interactions such as economic, environmental, of governance, or of planning in the strict sense.

In the North Adriatic case study, a test application of the methodology proposed by UNEP-PAP/RAC was developed. From the analysis of the critical issues in the case study area, several interactions crossing the land-sea interface emerged. Starting from the recommendations developed within the activity C.1.3.7 "Land-Sea interaction and relationships with Integrated Coastal Zone Management (ICZM)", specifically starting from part B of the workflow proposed by the related report, the description and analysis of such interactions have been made as much as possible considering all the MSP spheres that these interactions affect. These are socio-economic, environmental and related with governance aspects. The LSI were described in relation with those maritime uses that emerged to be the one interacting through the land-sea boundary, both between each other and with the environment, in the case study area. As a general comment, the level of detail of the information required by the methodology was too high with respect to the case study context. In any case a preliminary application of the methodology and analysis of LSI was here developed.

### *PART B – LSI IN-DEPTH ANALYSIS*

#### *Aquaculture*

Step 9 - Pathways of interactions

The marine coastal strip in the case study area, where aquaculture sites are located, is directly affected by the contributions of both organic matter and polluting substances transported by the rivers and through the coastal basin. Such inputs, distributing within the coastal strip, negatively affect the aquaculture sites. They derived by land-based human activities, and for this reason the LS interaction that origins should be ascribed to LSI between uses. In this case, in fact, the rivers correspond to the environmental vector of the interaction. The material that flows within the marine environment through such vectors leads to periodic eutrophication phenomena that affect the coastal marine area. The northern area of Emilia-Romagna, in particular, is more subject to the development of anoxia/hypoxia episodes and algal blooms in the summer/autumn period compared to the remaining coastal area (RER-ARPA ER, 2017).

On the contrary, the environmental pollution from aquaculture activity depends on the types of species bred and the amount of organic enrichment, contaminants and litter that derived from it. Such impact can lead to eutrophication and contamination of the environment, negatively interact with tourism activity. Moreover, the distance from the coast of the aquaculture sites is correlated with the visual impact that their presence can lead on the coastal environment thus potentially affecting the coastal tourism. Aquaculture in the North Adriatic area is mainly characterized by mussel farms, ("long-line" plants) that have a low environmental impact activity, which can only lead to moderate organic enrichment in the surrounding environment (Barbanti et al., 2017b) and to marine litter introduction (nets, ropes, other trashes).

The socioeconomic system is affected by several known issues related with aquaculture. Eutrophication phenomena and monocultures in Veneto and Emilia Romagna cause a potential higher vulnerability of the entire sector due to the risk of epidemics. Epidemic phenomena can increase mortality or accumulations of toxic substances when massive toxic algae blooms occur, inhibiting its commercialization or causing price fluctuations. Also for this reason, the distance from the coast of the aquaculture sites is correlated to its economic sustainability. Development of new technologies in aquaculture, will allow offshore plats to be economically sustainable and with a minor visual impact.

Contemporarily, aquaculture activities can have synergy in combination with tourism activities. This "multi-use combination" addresses sustainable aquaculture where farmers board people on their vessels to visit plants, learn about aquaculture techniques, with educative and recreational scopes, through daily trip along the coasts (Manente, 2015).

In the case study area, the regions are responsible in licencing, renewals, extensions and authorization requirements.

Step 10 - Spatialize interactions

A first LSI with a spatial content is the river input of organic matter and pollutants. The spatial characterization of this process can be considered as correspondent mainly to the river mouths. However, the spatialization of the river inputs should be extended to the whole drainage river basin of the Emilia Romagna, Veneto and Friuli Regions. LSI due to aquaculture farms can be spatialized in the coastal area within 3 to 12 miles and in the ports where the activity takes place.

Step 11 - Quantify interactions

With the actual knowledge and data, it is not possible to quantify the intensity of the interaction in relation with the socio-economic dimension. Meanwhile, regarding the input of material in the environment due to aquaculture activity and affecting indirectly the tourism sector, the intensity of interaction can be considered low.

Step 12 - Analyse temporal dimension

Temporal dimension relevant on the short term (e.g. on a cyclic base: daily, seasonal; on a non-cyclic base: inter-annual variability).

### *Fisheries*

Step 9 - Pathways of interactions

LSI affecting fishery activities are related with the changes of environmental quality of coastal waters due to river inputs. Such inputs can affect the fishery-based economic activities in the cities where major fishing ports insist and where fishery products are mainly consumed and used for restaurant purposes. Fishery can for this reason interacts with tourism sector. Moreover, the fishery activity can affect the coastal tourism due to the impact of fishery activity on marine habitats and species when fishery techniques are destructive and the activity is excessive overexploiting the natural resources. Moreover, fishery is source of litter that is discharged in the marine environment.

Step 10 - Spatialize interactions

LSI can be spatialized around rivers delta and in the major fishing ports (Porto Tolle, Chioggia, Caorle).

Step 11 - Quantify interactions

With the actual knowledge and data, it is not possible to quantify the intensity of the interactions reported above.

Step 12 - Analyse temporal dimension

Potential spatial and temporal variability are bound to the high seasonality of stocks life cycles and, in consequences, of fishery activities.

### *Tourism*

Step 9 - Pathways of interactions

Tourism activity are strongly related to LSI concerning the quality state of the coastal and marine environments being at the same time affected by and cause of pollution. Rivers input of nutrients and contaminants in the bathing waters negatively interact with tourism activity, as well as tourism is source of pollution affecting the coastal waters. Fishing tourism is one of the activities with the higher development potential in an LSI perspective, to reduce negative interactions and underpin synergies.

Development of itineraries involving sustainable and compatible activities at sea (e.g. diving) and on land (e.g. visit to museums, environmental research and marine species recovery centres, etc.), and touristic itineraries crossing the land-sea border could be supported, including some of the most important Italian wetlands (e.g. Venice and Caorle lagoons, Po Delta) and touching world famous art cities like Venice and smaller villages with historical maritime tradition (e.g. Caorle, Chioggia, Cesenatico, Cervia)

Governance in tourism sector is a major issue. The sector is characterized by a complex, interlinked and fragmented reality. In 2017 a Strategic Plan for Tourism in Italy has been developed to address a more consistent and coordinated approach, improving policies in terms of both the demand and supply. It aims to provide a simple and clear framework to improve the decisions made in the sector and promote integration.

Region also can adopt Regional Strategic Plan for tourism development, where general directives to the tourism operators are indicated.

Step 10 - Spatialize interactions

Tourism is widely distributed along the coastline of the case study area. Among the major tourism areas where LSI insist there are the Po Delta, Venice and Caorle lagoons, Chioggia, Cesenatico and Cervia.

Step 11 - Quantify interactions

Veneto, Friuli and Emilia Romagna regions have the major tourism fluxes, in terms of nights spent and presences, more than the other Adriatic regions summed together (sources *EUROSTAT 2017, see Country fiche: Coastal Tourism*).

Actually, there are not site-specific estimates of the socio-economic and environmental impact of the tourism sector. The country-wide analysis on WTTC 2018 data highlights that the economic impact of tourism on national markets is growing. Tourism generated 1.490.500 jobs directly in 2017 (6.5% of total employment). By 2028 is foreseen that tourism will account 1.783.000 jobs generated, an increase of 1.7% pa for the next 10 years (WTTC Economic Impact Italy report 2018).

Also, due to lack of data, it is not possible to assess the impact of pollution and other LSI on and from tourism.

Step 12 - Analyse temporal dimension

Temporal dimension is relevant on the short term (e.g. on a cyclic base: daily, seasonal; on a non-cyclic base: inter-annual variability), due to the seasonality of the tourism activities.

### *Oil & Gas*

Step 9 - Pathways of interactions

Mining activities and the main extraction platforms in the case study area are located in front of Emilia Romagna Region. The coastal area in front of the marine zone where gas platforms are installed and work is strongly affected by subsidence processes due to the same extraction activity. Such phenomenon favours the flooding and erosion processes of the coastal strip and indirectly interacts negatively with tourism activities. The phenomenon nowadays is mainly located south of the city of Ravenna.

Platforms in the case study area can interact with tourism as source of fishery products. In fact, the mussels that growth on them finding a hard substrate favourable for their growth and settlement, are collected by fish farmers. Such collection activity is allowed in agreement with the owner of the plants.

Besides this, chemical pollutants and marine litter introduced at sea through gas and oil platforms and related activities (maritime traffic, accidental dispersions, underwater pipelines, etc.) constitute the several interactions of this activity with environmental components and other uses even reaching the coastal areas.

Licenses of exploration and exploitation of hydrocarbons in the offshore are granted by the Ministry of Economic Development (MISE) in the areas of the continental shelf governed by Italian laws and ministerial decrees.

Step 10 - Spatialize interactions

In relation with the subsidence process all the coast along Emilia Romagna Region with particular regard at the south of the Ravenna city is involved in LSI. In relation with the economic interactions all the case study area is affected by this activity.

Step 11 - Quantify interactions

Some consideration can be made about the economic interaction of the Adriatic LNG on its hinterland. After a long political debate, ended in 2008 between Adriatic Lng, Edison, Consvipo and the Municipalities, an agreement for territorial compensation for the Polesine areas was signed. An investment commitment of 12.1 million euros for the development of the territory was established and was divided into several macro areas: 2.5 million to the interested municipalities, and the remaining 9,1 million used for investments in the delta territory, fishing sector, Park Authorities and in welfare (Luigi Pellizzoni, Conflitti ambientali, 2011).

Ravenna hosts the Central-Northern productive district E&P (DICS). The DICS made investments for 566 million euros in the two-years period 2015-2016, and the 92% of the total investments was made for the economic activities in the territory.

In the last three years, the Municipality of Ravenna has obtained an income of 17 million euros between Royalties and Taxation related to Eni's activities (RAPPORTO AMBIENTALE 2017 ATTIVITÀ OIL & GAS, Assomineraria).

Step 12 - Analyse temporal dimension

The temporal dimension does not present fluctuations since the extraction activities are constant as well as the production rate that feeds the economy of the case study area.

### *Military areas*

Step 9 - Pathways of interactions

Sea areas falling into the Military area "ECHO 346 Foce Reno" in Emilia-Romagna, are forbidden to several uses. The ban of public use has refrained also urbanization, allowing an indirect protection of natural resources and limiting also other pressures. Nevertheless, shooting exercises can have potential negative repercussion on the status of the bathing waters and also of commercial fishes. Moreover, the inland part of the military area insists in several natural reserve properties (Reserves of Sacca di Bellocchio I, Sacca di Bellocchio II, Sacca di Bellocchio III, Sacca di Goro, Foce del Reno) of State domain, managed by the Ufficio Territoriale Carabinieri per la Biodiversità di Punta Marina (RA). The area is also part of the Regional Park of River Po Delta; Special Protection Area Birds Directive 79/409/CEE; Site of Community interest from Habitat Directive 92/43/CEE and also a Ramsar area.

The ban limits the coastal and maritime tourism since the use of the coastal area surrounding the military one is not allowed. Moreover, no aquaculture facilities are allowed in the area, even if the area is highly vocated to marine farming (e.g. mussel farming).

Step 10 - Spatialize interactions

The interested area extends in Emilia-Romagna from the inland reserves to the marine area ECHO 346.

Step 11 - Quantify interactions

Lack of data does not permit a quantification of the interactions.

Step 12 - Analyse temporal dimension

Part of the military area have a short and scheduled temporal extension (B1, B2), meanwhile the inland natural reserves and the areas A1 and A2 of the military area are permanent.

## *PART C – INFORM THE PLAN ABOUT LSI ANALYSIS OUTCOMES*

Step 13. Identify LSI hot-spot areas

Main hotspot areas of LSI have been identified. The boundaries of the highlighted areas are approximate and absolutely not exhaustive in defining the LSI boundaries.

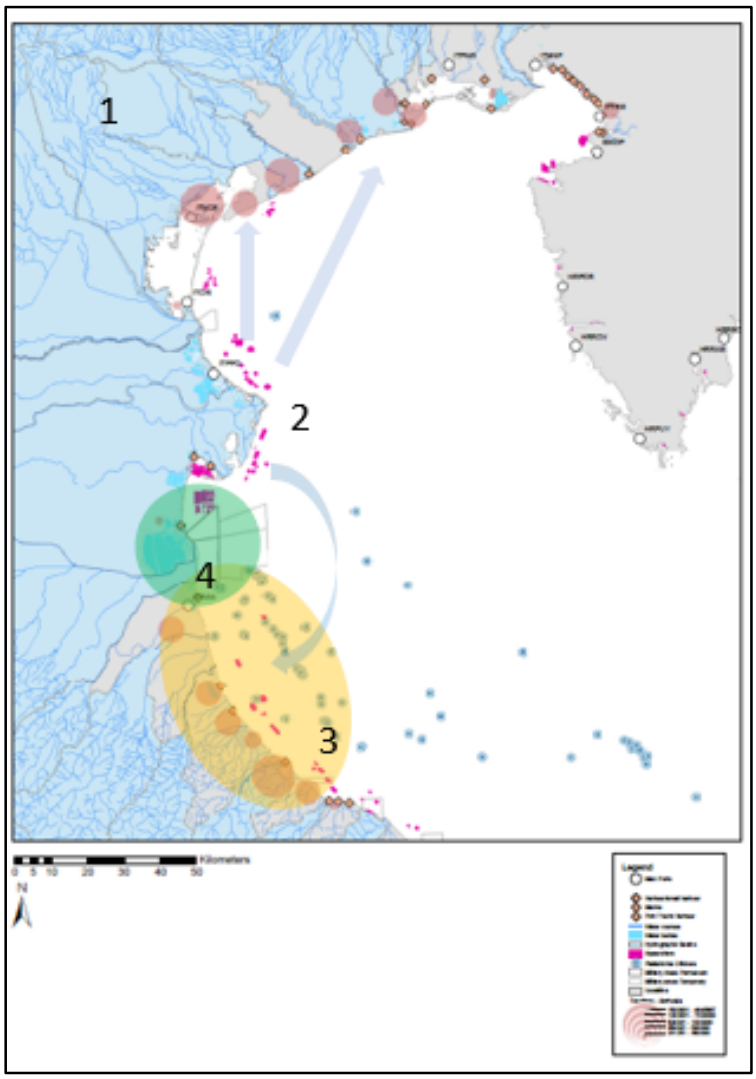



*Figure C.3.2 1: Potential LSI hotspot areas. 1: this area refers to the whole land-sea interface and is related with the LSI derived from rivers and ports; 2: LSI that elapses between aquaculture and tourism activities; 3: LSI interaction that determines subsidence due to the presence of extraction platforms; 4: LSI from military areas.*

Step 14. Identify key messages from LSI analysis

The LSI analysis was carried out in all the North Adriatic CS, starting from the output of the analysis of the critical issues identified in the area. The foundation of such approach resides on the need of focalize the analysis toward what was already identified to be of priority concern in the case study and to support the planning process in trying to find solutions and favour the building of a future effective MSP. The LSI analysis started from the recommendations developed within the activity C.1.3.7 "Land-Sea interaction and relationships with Integrated Coastal Zone Management (ICZM)", specifically from part B of the workflow proposed by the related report.

We found some limitations in applying this methodology to the case study. For instance, the carrying out of the analysis, following the requirements of the proposal, was little oriented due to the generality

of the requirements per se. However, likely the level of vagueness of certain guidelines is not strictly responsibility of the proposal per se, but it is due to the actual status of the art on the LSI topic.

The level of detail of the information required was found to be too high with respect to the scale on which the analysis has to be developed and for all the possible sectors, which implies high effort in doing the analysis without selection of information based on the case study needs.

For what concerns the localization of LSI, it was difficult to select localize the observed interactions (in or outside the planning area) since there is no defined boundary landwards that establishes what is the area to be considered for the LSI analysis. Indeed, depending on the sector/use of attention the correct and ideal boundary to consider can change even widely (i.e. agricultural use can affect a wide area starting from land territory; ports are more locally focused but the need of developing land infrastructures has to be considered even if it is not part of the MSP plan). Especially there is a matter of competencies and integration of different levels and typologies of "planning" (sectorial, land use).

Supposedly, natural processes affecting the coast are present in the CS area; however, at this point of the planning process there is no exhaustive information to assess their effects on maritime activities, scale and spatial allocation. A specific assessment to fill this knowledge gap should have been developed, targeting relevant interactions of natural processes in the coastal area. Moreover, the North Adriatic case study focused mainly on specific sectors and related activities (i.e. tourism, fishery, aquaculture, transport), for which interactions with natural processes can be relevant.

Besides all this, along with the LSI analysis, confusion was often found in distinguishing the interactions between uses that cross the land-sea boundary from what has been already defined conflicts and synergies between uses. It should be better to define the level of distinction and of coincidence (if any) of these analyses to avoid confusion and overlap of non-well addressed information.

In the context of the land-sea division, there are a number of mechanisms and approaches which may facilitate integration (including ICZM, MSP and SEA). Adherence to other European environmental directives will also demand cross-coast planning, as well as improved guidance and capacity building to encourage greater awareness and understanding of the needs of both marine and terrestrial components. This will require good relationships between the people involved in developing the different plans. It may also require the use of strong and appropriate planning 'guidance' and associated support so that maritime based and terrestrial planning communities can adjust their professional practice to the needs of each other.

However, this exercise, carried out in the context of the North Adriatic case study and in the framework of SUPREME project, helped to make a first LSI analysis to localize the main areas and activities involved in the land-sea interactions and dynamics identified along with the previous analytical phase. Several limitations and constraints in the proposed approach and in general in the application of the LSI analysis emerged. Such results are also fundamental to guide future ameliorations of the analytical method and to help more in-depth studies on LSI definition and determination.

### *GENERAL CONCLUSIONS*

Overall, the synthesis of the main key messages emerged from the LSI analysis exercise is the following:

1. A better understanding and definition of what LSI are, even considering all the different spheres that they affect (environmental, socio-economic, administrative), it is necessary in

order to overcome the generality and vagueness that limited the effectiveness of the LSI analysis and to orient the gathering of the best information needed.

2. The geographical scale at which the analysis is carried out is fundamental and can strongly influence the LSI analysis in terms of choice of the relevant information, depth of the analysis, type and entity of the interactions identified, and all in relation with all the spheres, socio-economic, administrative and environmental. The methodology of LSI analysis to be effective, should take into account such aspects in order to be contextualized in different analytical conditions.
3. It is necessary having indications on how to identify possible boundaries of LSI since interactions can be very different in intensity and influence in the analysed area, both on land and sea space, and also depending on the sectors involved.
4. More information on the effects of natural processes affecting the maritime activities along the coastline is needed to better identify compensations measures or even anticipate negative interactions.
5. More clarity in distinguishing LSI from conflicts and synergies among uses and uses and environment is needed to better focalize the analysis on the land-sea interface, avoiding confusion and having well established the information needed for the analysis and it final aim.
6. Collaboration, co-production of knowledge and sharing of needs and priorities between maritime based and terrestrial planning communities are fundamental to pave the way toward the best practice of planning.

# D. VISIONING, SCENARIO AND OBJECTIVES OF MSP

## D.1. DEFINING STRATEGIC FRAMEWORK

The identification of the multilevel and multisectoral objectives, which reflect the needs and demands of the area and the expected trends, is imperative where the plan is on track of development and/or implementation, and it needs to be done at an early stage of the MSP process. The defined objectives drive the entire process orienting the plan proposal and underpinning its effectiveness.

The analysis of the existing national, international and European strategic documents highlights preferred future development trajectories as well as the objectives predisposed for the planning area. The vertical and multi-scale approach adopted in the analysis of the sectoral objectives and trends led to the identification of the priorities that are present in the case study area.

The EU Strategy for the Adriatic and Ionian Region (EUSAIR), adopted by the European Commission and endorsed by the European Council in 2014, is the starting point in the identification and definition of the case study objectives, which derived from the high-level goals of the strategy. In fact, the marine and maritime aspects are predominant in the EUSAIR Action Plan (SWD (2014) 190 final), and MSP is explicitly cited as cross-cutting tool to implement it, both at national and cross-border level.

## D.2. VISIONING

The area on which this MSP exercise is carried out is heavily anthropized and strongly interested by development trends related with several maritime sectors. The Northern Adriatic and its coast include coastal and marine habitats of highly ecological relevance and value, and host marine species of priority concern. These environmental characteristics orient nature conservation and protection priorities in the area, while promoting its attractiveness that largely supports the present need and opportunity for growth and development. Indeed, many maritime uses that insist in the region represent fundamental socio-economic assets for the area and need to be properly managed. For these reasons planning the future development of each maritime uses and activities should be done ensuring the compatibility of all the decisions taken, and the plans should incorporate all the three pillars of sustainability: economy, society, environment. The vision thus foresees that socio-economic and conservation objectives in the area will be reached sustainably, avoiding incompatibilities and nature deterioration, favouring synergy between environmental and socio-economic objectives, and answering to the needs and demands of the coastal and marine area involved.

## D.3. DEFINING PLANNING OBJECTIVES OF MSP IN THE CASE STUDY

National and case study objectives that have impact on maritime spatial planning of the marine area in the North Adriatic case study area were determined in accordance with the analysis carried out within the task C1.2.1. and the analytical segment of the task C1.3.8. related with case studies activities.

Starting from the International/EU objectives we scaled down the analysis of the objectives at the national level. This approach allowed the identification of the objectives that summarise the overall strategic guidelines of multiple relevant strategic documents. Also the objectives directly related to

official documents at local level (local strategies and plans) and spatial management were analyzed. After passing through this desk-analysis, the local requests were included in the pilot. The sectoral objectives characterizing the case study area, on the base of its specific needs and expectation for its future economy, were identified. The identification of the local objectives reported for the North Adriatic area was mainly framed by the stakeholders' engagement activity that was carried out in Venice (see chapter G below). Thus, the "Specific objectives" reported in the table refer to objectives directly related to spatial management, some of them having a spatial content and relevance that were considered and incorporated during the planning phase.

Main sectors were defined and recognized as pivotal for the case study area for their relevance in mobilizing interests and in eventually leading existing or potential conflicts in the area, which need to be managed and anticipated.

The results obtained from this analysis are the foundation for the analysis phases of the MSP exercise.

*Tab. D.3 1. Matrix of relevant planning objectives within the North Adriatic Case Study*

| Main sectors | Planning Objectives | Trends |
|---|---|---|
| **Fishery** | **International/EU Objectives** | Increasing demand of fish products but fishery is decreasing drastically, with a foreseen further reduction in fishing capacity in terms of number of boats, of tonnage and engine power. [10]<br><br>Trawling fleet and fishing effort under constant reduction<br><br>SSF under consolidation and expansion, also in connection with tourism<br><br>High potentials for recreation fisheries, in connection with actions and initiatives to diversify the touristic offer |
| | **Eusair**<br>(i)To promote research, innovation and business opportunities in blue economy sectors, by facilitating the brain circulation between research and business communities and increasing their networking and clustering capacity.<br>(ii)To adapt to sustainable seafood production and consumption, by developing common standards and approaches for strengthening these two sectors and providing a level playing field in the macro-region.<br>(iii)To improve sea basin governance, by enhancing administrative and institutional capacities in the area of maritime governance and services.<br>**BARCELONA CONVENTION**<br>-To prevent, reduce and control marine litter generation and its impact on the coastal and marine environment<br>-Sea-floor integrity is maintained, especially in priority benthic habitats<br>-Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock<br>-Alterations to components of marine food webs caused by resource extraction or human induced environmental changes do not have long-term adverse effects on food web dynamics and related viability<br>-The sustainable use of natural resources is ensured, particularly with regard to water use<br>**CFP**<br>- fishing activities are sustainable in ecological, economic and social terms and provide a source of healthy food for EU citizens.<br>- foster a dynamic fishing industry and ensure a fair standard of living for fishing communities | |

[10] Programma nazionale triennale della pesca e dell'acquacoltura 2017-2019 (G.U. n. 63 – 16/03/2017)
Programma Operativo FEAMP, MIPAAF https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/8752
D. Dirett. N. 6 del 20 settembre 2011: Adozione piani di gestione
Piano di gestione (ex art.24 del Reg. (CE) n.1198/2006 e art.19 del Reg. (CE) n.1967/2006) GSA 17 Mar Adriatico Centro-Settentrionale – Altri sistemi

| | | |
|---|---|---|
| | and in the meantime achieve sustainable catch levels in the long term for all stocks by 2020;<br>- minimize or avoid unwanted catches and harmful practices;<br>**Marine Strategy Framework Directive - MSFD (2008/56/EC)**<br>Descriptor 3 Requires that all populations of commercially exploited fishes and molluscs should remain within biologically safe limits<br>Descriptor 6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected. | |
| | **National Objectives** | |
| | **General objectives**<br>- [11]reach sustainable fishing levels, exploiting stocks below the maximum sustainable yield (MSY) by 2020<br>- Significant reduction in fishing capacity, reducing/eliminating the most destructive fishing practices<br>- Promote the role of small scale fisheries in the area, considering its important and peculiar socio- economic (and cultural) value for coastal communities, in synergy with ecotourism development.<br>**Specific Objectives**<br>- [2]zoning of fisheries to reduce overfishing of pelagic and demersal species, with particular attention to fishery in nursery areas and coordinated management of stocks. Eventually denying fishing activity in certain areas and establishing Biological Protection Zones with specific general (e.g. no trawling, larger mesh for set nets), metier based and seasonal (e.g. temporary fishing bans) measures.<br>- Monitoring of fishing effort and assisting the adoption of alternative (sustainable) fishing methods and metiers.<br>- Foster synergies between sustainable fishery cultural heritage and eco-tourism. | |
| | **Local/Case study Objectives** | |
| | Regional (Emilia-Romagna, Veneto and Friuli V.G.) strategic objectives are developed within national policies and the application of the European Maritime and Fisheries Fund (EMFF) for the EU's maritime and fisheries policies for 2014-2020.<br>Local regulatory frameworks describe the status of fish resources and habitats, the existing fishing activities and identify the local objectives of biological and socio-economic sustainability and specific management measures for each *metier*.<br>Within EMFF, Regional authorities promote the implementation of investments aimed at reducing impacts and providing for the innovation of both structures and production processes. Regions promote participatory local development strategies implemented by the fishermen's Coastal action group (FLAGs). Local participatory development strategies implemented by FLAGs must:<br>- maximize the participation of the fisheries and aquaculture sectors in the sustainable development of fisheries areas;<br>- ensure that local communities make full use of and benefit from the opportunities offered by maritime and coastal development;<br>- range from needs and potentials of fisheries to broader strategies aimed at diversifying fishing areas.<br>Specific objectives within EMFF 2014-2020 regard:<br>- sustainable development of fisheries<br>- the development and modernization of ports, landing sites, auction halls and fishing | |

[11] European Maritime and Fisheries Fund - Operational Program for Italy (FEAMP), 2004-2015/ 2014-2020.

| | | |
|---|---|---|
| | shelters<br>- investment for fisheries products processing facilities and marketing<br>- increasing employment and territorial cohesion | |

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| **Aquaculture** | **International/EU Objectives**<br><br>**Eusair**<br>(i)To promote research, innovation and business opportunities in blue economy sectors, by facilitating the brain circulation between research and business communities and increasing their networking and clustering capacity.<br>(ii)To adapt to sustainable seafood production and consumption, by developing common standards and approaches for strengthening these two sectors and providing a level playing field in the macro-region.<br>(iii)To improve sea basin governance, by enhancing administrative and institutional capacities in the area of maritime governance and services.<br><br>**BARCELONA CONVENTION**<br>-Human-induced eutrophication is prevented, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms, and oxygen deficiency in bottom waters<br>-To prevent, reduce and control marine litter generation and its impact on the coastal and marine environment<br>-Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem<br><br>**CFP**<br>- aquaculture activities are sustainable in ecological, economic and social terms and provide a source of healthy food for EU citizens.<br><br>**Marine Strategy Framework Directive – MSFD (2008/56/EC)**<br>- Descriptor 6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.<br>- Descriptor 9: Contaminants in Seafood: "Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards"<br>**Water Framework Directive – WFD (2000/60/EC)**<br>- preventing the deterioration of the ecological and chemical status of all surface water bodies and achieving a satisfactory quality<br><br>**National Objectives**<br><br>**General objectives**<br>- Improve productivity, quality and environmental sustainability of aquaculture through proper space planning for the development of new sites co-location with other activities and facilitation of permitting procedures<br>- Introduction of new species with high commercial values<br>- Strengthen technological development, innovation and knowledge transfer<br>- Enhancement of the competitiveness and viability of aquaculture enterprises | Data available for the whole Italian production, from 2002 to 2015, revealed a general decrease, from more than 180.000 tons in 2003 to about 140.000 tons in 2015, and in terms of economic value.<br>The growing demand for fish products together with a decrease/stability of catches requires new aquaculture producers. The policy framework in place is focused on a substantial improvement of aquaculture in several aspects. Implementation of existing policies could represent the focal point for future aquaculture development,[12] the market is expected to keep increase, with a foreseen average growth in the range of 4%/year, leading to more than doubling the market between 2010 and 2030, meaning that the target of 2 million tons/year will be reached and overcome<br><br>Potentials and expectations of further expansion of shellfish farming |

[12] Italian Strategic Plan for Aquaculture 2014-2020

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| | - Protection and restoration of aquatic biodiversity and the enhancement of ecosystems related to aquaculture and the promotion of resource-efficient aquaculture<br><br>**Specific Objectives**<br>- Identification of new sites for the implementation of shellfish aquaculture<br>- Explore the potential to further implement marine fish farming in the area<br>- Reduction of marine litter production related to mussel farming | |
| | **Local Case study Objectives** | |
| | Regional (Emilia-Romagna, Veneto and Friuli V.G.) strategic objectives are developed within national policies and the application of the European Maritime and Fisheries Fund (EMFF) for the EU's maritime and fisheries policies for 2014-2020.<br>Within EMFF, Regional authorities' specific objectives regard:<br>- sustainable development of aquaculture and modernization of aquaculture units<br>- investment for aquaculture products processing facilities and marketing<br>- increasing employment. | |

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| **Maritime Transport (Shipping)** | **International/EU Objectives** | -a higher traffic density in the next years, due to the increasing importance of the Short-Sea Shipping and of the Mediterranean economic exchanges Considering the GDP projections reported in the PSNPL and considering that some Italian ports could benefit from the growing economies of the Euro-Mediterranean area, it is reasonable to forecast a trend scenario of annual growth for container traffic between 2% and 3.5%, namely 7.2 and 8 million TEU. Therefore, until 2020, gateway traffic flows in Italian ports are expected to grow on average between +0.8 and +1.6 million TEU, compared to 2014<br><br>- a strengthening of the phenomenon of mega-ships, which is currently influencing these trends and |
| | **Eusair**<br>(i)To strengthen maritime safety and security and develop a competitive regional intermodal port system.<br>(ii)To develop reliable transport networks and intermodal connections with the hinterland, both for freight and passengers.<br>(iii)To achieve a well-interconnected and well-functioning internal energy market supporting the three energy policy objectives of the EU – competitiveness, security of supply and sustainability<br><br>**BARCELONA CONVENTION**<br>-Contaminants cause no significant impact on coastal and marine ecosystems and human health<br>-To prevent, reduce and control marine litter generation and its impact on the coastal and marine environment<br>-Noise from human activities causes no significant impact on marine and coastal ecosystems<br>-Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem<br>-The natural dynamics of coastal areas are maintained, and coastal ecosystems and landscapes are preserved<br>-The sustainable development of coastal zones is facilitated by ensuring that the environment and landscapes are taken into account in harmony with economic, social and cultural development<br><br>**International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM),** Adoption: 13 February 2004; Entry into force: 8 September 2017<br>- to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments<br>- all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific Ballast Water Management Plan<br>All ships will also have to carry Ballast Water Record Book and an international ballast | |

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| | water management certificate.<br><br>**White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system" COM(2011) 144 final**<br><br>- Growing transport and supporting mobility while reaching the emission reduction targets<br>- Improving energy efficiency performance, developing and deploying sustainable fuels and propulsion systems<br>- Optimizing the performance of multimodal logistic chains (Deliver a fully functional and EU-wide core network of transport corridors, ensuring facilities for efficient transfer between transport modes (TEN-T core network) by 2030, with a high-quality high-capacity network by 2050 and a corresponding set of information services)<br>- Using transport and infrastructures more efficiently through use of improved traffic management and information systems<br><br>**Maritime Policy (IMP)**<br><br>- technological growth, research and innovation in the marine and maritime sector (C 1.3.6)<br><br>[13] **Maritime Transport Policy** (2009-2018) and the following implementation report, published in September 2016 identify general objectives related to five thematic areas:<br>(i) Maritime Safety and Security;<br>(ii) Digitalisation and Administrative Simplification;<br>(iii) Environmental Sustainability and Decarbonisation;<br>(iv) Raising the Profile and Qualifications of Seafarers and Maritime Professions;<br>(v) EU Shipping: A stronger global player | might continue to do so in the future<br><br>- the traffic volume of non-containerized goods, including oil and other dangerous goods and liquefied natural gas (LNG), is also expected to increase significantly at the EU level but in Italy there is a decrease in LNG production, which is set to fall over the years, as the data for 2020 and 2030 also show a negative trend<br>-We can find estimate of increase in Ro-Ro traffic. The PSNPL states that Ro-Ro traffic should reach a value between 85.7 and 90.8 million tons in 2020 and provides a target value of about 110 million tons by 2030 |
| | **National Objectives** | Expected increase of west-east and short-range ferries |
| | **General objectives**<br><br>- Improve the competitiveness of the port and logistic system, facilitate the growth of passengers and freight traffic and the promotion of intermodal transport, also in relation to the rationalisation, reorganization and consolidation of existing Port Authorities.<br>- Simplifications and speeding up of administrative/bureaucratic procedures in order to reduce transit time and costs and optimize approval procedures and realization of works<br>- Improve the efficiency of technical and nautical services (pilotage, etc)<br>- Improvement of maritime and land accessibility through infrastructural interventions and through an upgrading of rail services.<br>- Improve the quality and competitiveness of logistic services to guarantee a functional integration of the port systems with the dry port and with the logistics platform<br>- Improving the infrastructural performance for any kind of traffic, from containers, to liquid and solid bulk, steel products, Ro-Ro/Ro-Pax, general and project cargo. Recovery and modernization of existing infrastructures (docks, terminals, seabed, etc)<br>- Enhance the innovation through the diffusion of ITS for the management of port operations<br>- Reduce the impact of ports on the environment at global and local scales promoting the use of technologies aimed at energy efficiency and environmental sustainability<br>- Centralized and multiannual planning of financial resources to be allocated to infrastructure, giving priority to maintenance and enhancement of the existing assets and avoiding overcapacity (already existing in many port areas especially in container terminals).<br><br>**Specific Objectives**<br><br>- Improve accessibility of ports and marinas<br>- Development of internal water navigation for Emilia Romagna and Veneto Region | Maintenance / possible further expansion of present cruise traffic |

[13] https://ec.europa.eu/transport/modes/maritime_en

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| | - Improving security of traffic management | |
| | **Local/Case study Objectives** | |
| | **General objectives**<br>- Growth opportunities for LNG linked to the investments for the regasification and creation of a network for distribution and storage<br>- Improving waterway system (Sistema Padano-Veneto)<br>**Specific Objectives**<br>- The Regulatory Plan of the Trieste Port Authority foresee the creation of a logistic Platform by 2019 and the development of other port infrastructures (extension of the container terminal of PIER VII and a new Ro-Ro terminal)<br>- New LNG platform close to Krk | |

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| **Coastal Defence and Flood protection and Restructuring of seabed morphology** | **High-Level Objectives**<br>**EUSAIR**<br>-To contribute to the goal of the EU Biodiversity Strategy to halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restore them in so far as feasible, by addressing threats to marine and terrestrial biodiversity.<br>-Improving the quality and innovation of tourism offer and enhancing the sustainable and responsible tourism capacities of the tourism actors across the macro-region.<br>**BARCELONA CONVENTION**<br>-Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic, and climatic conditions<br>-The natural dynamics of coastal areas are maintained, and coastal ecosystems and landscapes are preserved<br>-New and emerging land-based pollution related problems are identified and tackled, as appropriate<br>**Directive 2007/60/EC on the assessment and management of flood risks**<br>- Reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity.<br>**2013 EU Strategy on adaptation to climate change**<br>Infrastructures need to be designed to withstand potential flooding, also taking into account the potential impact of climate change on the frequency and intensity of floods. In the design of flood defense infrastructure, changing flood intensities and patterns need to be considered.<br>**Marine Strategy Framework Directive – MSFD (2008/56/EC)**<br>- Descriptor 6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected. | Surveys estimate 3,7 billion $m^3$ of available sand deposits of which 930 million are useful for extraction.<br>From estimates carried out at national level, it emerges that the overall requirement of nourishment sand is of around 10 M $m^3$ / year, half of which attributable to permanent losses that need to be offset with external contributions.<br>For obvious reasons of localization of sand deposits and for their intrinsically non-renewable nature, it emerges an unavoidable need of their strategic management.[14]<br>It will be necessary a national strategy that defines the standards for environmental protection, through appropriate dredging regulations that take into account the environmental impact, the cost of |

[14] TNEC Guidelines pag.297

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| | **National Objectives**<br><br>**General objectives**<br><br>**Piano Nazionale di Adattamento ai Cambiamenti Climatici (PNACC) – 2017**<br>Reduce and/or prevent the exposure of human assets and infrastructure to risks related to flooding and erosion by protecting coastlines.<br><br>It is necessary to develop econometric models to evaluate the risk of coastal erosion that will enable coastal administrations to reach an assessment of the economic value of the beach to develop cost/benefit analysis in case of coastal-defences interventions.[16]<br><br>**Local/Case study Objectives**<br><br>Specific objectives are focused on regional criticalities, according to local Flood management plans (PGRA) and coastal spatial plans. Specific objectives and actions aim to:<br>- reduce the vulnerability of the territory, improving the performance of the existing defensive systems<br>- promote multifunctional architectural / naturalistic interventions<br>- reduce the exposure to the risk of the settlement system, modifying the urban planning regulations<br>- protect the high environmental and naturalistic value of areas subject to flooding (e.g., Regional Park of the Po Delta)<br>- safeguard the economic activities of the coast, with particular attention to coastal tourism<br>- prevent the possible effects linked to climate change.<br><br>Sources:<br>Piani di Gestione delle acque e del rischio alluvioni del distretto idrografico delle Alpi Orientali, del distretto padano, del distretto dell'Appennino Settentrionale e del distretto dell'Appennino Centrale.<br>Piano per la gestione integrata delle zone costiere – Regione Emilia-Romagna<br>Gestione Integrata della Zona Costiera - Studio e monitoraggio per la definizione degli interventi di difesa dei litorali dall'erosione nella regione Veneto | dredging activity, as well as the needs of the shipping sector.[15]<br><br>Increase of coastal defence measures (ordinary and extra-ordinary maintenance)<br><br>Potential increase of sand extraction for coastal adaptation to climate change (extra-ordinary maintenance) |

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| **Oil & Gas production/ Energy** | **High-Level Objectives**<br><br>**EUSAIR**<br><br>(i)To strengthen maritime safety and security and develop a competitive regional intermodal port system.<br><br>(ii)To develop reliable transport networks and intermodal connections with the hinterland, both for freight and passengers.<br><br>(iii)To achieve a well-interconnected and well-functioning internal energy market supporting the three energy policy objectives of the EU – competitiveness, security of supply and sustainability<br><br>**BARCELONA CONVENTION**<br><br>- Contaminants cause no significant impact on coastal and marine ecosystems and human health<br><br>- Noise from human activities causes no significant impact on marine and coastal | For the year 2016, compared with the previous, hydrocarbon production decreased by -12.5%.<br><br>Exploitation is expected to continue in the coming years, although at a reduced rate and moving offshore.<br><br>Recently, many Adriatic countries, |

[15] WWF Italia, 2015. Progetto medtrends: tendenze della blue growth e dei potenziali impatti ambientali e conflitti nei mari italiani – rapporto finale

[16] TNEC guidelines pag.145

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| | ecosystems<br><br>- To eliminate to the extent possible, prevent, reduce and control selected/regulated pollutant inputs, oil discharges and spills<br><br>- Alterations to components of marine food webs caused by resource extraction or human induced environmental changes do not have long-term adverse effects on food web dynamics and related viability<br><br>- Sea-floor integrity is maintained, especially in priority benthic habitats<br><br>**The Renewable Energy Directive 2009/28/EC**<br><br>- Establish mandatory national targets consistent with a 20 % share of energy from renewable sources and a 10 % share of energy from renewable sources in transport in Community energy consumption by 2020<br><br>**A Roadmap for Moving to a Low Carbon Economy (COM 2011, 112 final)**<br><br>- EU should prepare for reductions in its domestic emissions by 80% by 2050 compared to 1990.<br><br>**Directive 2012/33 / EU of 21 November 2012** on the sulphur content of marine fuels based on standards developed in the International Maritime Organization (IMO) obliges to progressively reduce the maximum sulphur content of fuels for use maritime transport (from the current 3.5% to 0.5% by January 2020).<br><br>**Marine Strategy Framework Directive – MSFD (2008/56/EC)**<br><br>- Descriptor 6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.<br><br>- Descriptor 11 Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.<br><br>**National Objectives**<br><br>**General objectives**<br><br>- Improve national infrastructure flexibility with regard to supply sources, enhancing transport corridors and connecting infrastructures;<br>- Manage fluctuations in gas flows and gas tips and diversify sources of supply;<br>- Match European directive 1513/2015 purposes of promoting the transition to low carbon greenhouse gas emissions;<br>- Promote the use of biomethane in transport and energy applications;<br>- Increase security of supply and diversification of sources and allow a reduction in gas prices[17]<br>- Maintain the contribution of the areas to the national energy policy, allowing the exploitation over time of the methane fields already authorized in a safe way for the environment<br>- Promote the development of marine renewable energy sources<br>- Supporting sustainable development and proper transboundary cooperation with adequate planning and effectual governance system<br>- A portion of the revenues for the extraction of hydrocarbons will be redistributed on the affected territories in term of employment and infrastructure development.<br>**Specific objectives**<br>- Promote the reuse, in synergy with other uses, of methane platforms to be decommissioned.<br>- Prevent potential effects on protected and high valuable species with specific measure to avoid direct pressures from seismic surveys and all other sources of noise pollution<br>- identify suitable areas and solutions to promote the generation of energy from renewable sources at sea<br>- PCI 6.5.1 recognize for Croazia the rigasificator near Veglia Island (LNG Regasification vessel in Krk, HR)[18] | including Italy, are promoting the development of new oil & gas resources, focusing on new themes in the field of research and development, even in the deep offshore context.<br><br>There is a potential for marine renewable energy exploitation, which requires an analysis of the areas most suited for this use, considering the factors of direct interest (wind, depth, depth, distance from the possible connection to the network) and other factors (e.g. environmental and landscape aspects, potential conflicts / synergies with other uses in the area).<br><br>In the future trends of LNG use in transport and energy, particular attention should be given to the development of biomethane [1]<br><br>Progressive decommissioning of O&G platforms and potential reuses (e.g. MRE, LNG, aquaculture, tourism, research and education) |

[17] National Energy Strategy 2017

[18] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-energy/6.5.1-0037-hr-s-m-14

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| | **Local/Case study Objectives** | |
| | Objectives referred to the case study area are in line with EU and National objectives and developed within local Regional Energy Plans (PER):<br><br>General areas of intervention:<br>Energy saving and efficient use of energy in different sectors<br>Production of electricity and heat from renewable sources<br>Energy rationalization in the transport sector<br><br>Emilia Romagna 2030 Energy strategy have the following objectives:<br>- the reduction of climate-changing emissions by 20% to 2020 and by 40% to 2030 compared to 1990 levels;<br>- the 20% increase for 2020 and 27% for 2030 of the amount of coverage of consumption through the use of renewable sources;<br>- the increase in energy efficiency to 20% in 2020 and 27% in 2030.<br>Promote the reuse, in synergy with other uses, of methane platforms to be decommissioned.[sm]<br><br>Friuli Venezia Giulia Region focuses on gas as a transitional energy carrier, for a more sustainable energy model (lower environmental impact and lower energy costs), but it intends to reiterate its willingness not to authorize Zaule's onshore regasification (PCI 6.19) on its territory, considering this oversized project for the Region itself, as well as in contrast to the model of development of the Port of Trieste. | |

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| **Coastal tourism** | **High-Level Objectives** | Seaside tourist flow is steadily increasing over the last 20 years in the area. The tourism sector is characterised by highly positive dynamics at international level. In line with the international scenario, the tourism sector in Italy continued to register positive results, and 2015 was the sixth consecutive year of growth of international arrivals, up 4.4% on 2014. This significant growth also continued into the early months of 2016 (+5% on average) and it is estimated |
| | **Eusair**<br><br>(i) Diversification of the macro-region's tourism products and services along with tackling seasonality of inland, coastal and maritime tourism demand.<br><br>(ii) Improving the quality and innovation of tourism offer and enhancing the sustainable and responsible tourism capacities of the tourism actors across the macro-region.<br><br>Wide area branding (Northern Adriatic, EUSAIR brand)<br><br>**BARCELONA CONVENTION**<br><br>- Human-induced eutrophication is prevented, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms, and oxygen deficiency in bottom waters<br><br>- Contaminants cause no significant impact on coastal and marine ecosystems and human health<br><br>- New and emerging land-based pollution related problems are identified and tackled, as appropriate<br><br>- To prevent, reduce and control marine litter generation and its impact on the coastal and marine environment<br><br>- Alterations to components of marine food webs caused by resource extraction or human induced environmental changes do not have long-term adverse effects on food web dynamics and related viability<br><br>- The natural dynamics of coastal areas are maintained, and coastal ecosystems and landscapes are preserved | |

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| | - The sustainable development of coastal zones is facilitated by ensuring that the environment and landscapes are taken into account in harmony with economic, social and cultural development<br>- The sustainable use of natural resources is ensured, particularly with regard to water use<br>- To ensure sustainable use of natural resources, in particular water, in order to prevent their pollution and degradation<br><br>**Marine Strategy Framework Directive - MSFD (2008/56/EC)**<br>- Descriptor 10 Properties and quantities of marine litter do not cause harm to the coastal and marine environment.<br><br>**"Europe, the world's No. 1 tourist destination – a new political framework for tourism in Europe" (COM(2010) 352 final)**<br>- To stimulate competitiveness in the European tourism sector<br>- To promote the development of sustainable, responsible, and high-quality tourism<br>- To consolidate Europe's image as a collection of sustainable, high-quality destinations<br>- To maximise the potential of EU financial policies for developing tourism.<br>**„A European Strategy for more Growth and Jobs in Coastal and Maritime Tourism" (COM(2014) 86 final)**[19]<br>Improving knowledge; Addressing demand volatility; Overcoming sector fragmentation<br>1. Improve knowledge and data availability, in particular coastal and maritime.<br>2. Develop a coastal and maritime focus, where appropriate, in EU tourism initiatives, including in promotional and communication campaigns.<br>3. Promote a pan-European dialogue between cruise operators, ports and coastal tourism stakeholders.<br>4. Support the development of trans-national and interregional partnerships, networks, clusters and smart specialisation strategies.<br>5. Assess the need for EU action on qualification requirements for professional yacht skippers and recreational boating.<br>6. Assess the need for EU action on provisions for nautical tourism safety equipment.<br>7. Stimulate innovative management schemes through the ICT and the Tourism business portal.<br><br>Addressing environmental pressures;<br><br>8. Promote ecotourism, using the European Eco-Management and Audit Scheme and EU Ecolabel indicators and encourage linking to other sustainability actions.<br>9. Promote implementation of the Protocol to the Barcelona Convention on Integrated Coastal Management and the relevant Council Recommendation, and promote Maritime Spatial Planning and Green Infrastructure, to ensure the sustainable development of EU coastal areas.<br>10. Promote strategies on waste prevention, management and marine litter to support sustainable coastal and maritime tourism.<br><br>Promoting an innovative, sustainable and high-quality offer; Insularity and remoteness – seeing opportunities in geographical constraints<br>11. Encourage the diversification and integration of coastal and inland attractors, including through transnational thematic itineraries like cultural, religious or ancient trade routes.<br>12. Contract a study on how to improve island connectivity and design innovative tourism strategies for (remote) islands.<br>13. Contract a study to identify innovative practices for marina development.<br>14. Develop an online guide with an overview of the main funding opportunities available for the sector (particularly SMEs). | that this trend will remain globally positive – around 4% on average – up to 2030 (PST 2017-2022).<br>Sustainable tourism in systematic reinforcement, reducing the impacts of tourism related structures on the environment (e.g. land use, waste production, marine litter, energy and water consumption).<br>-According to the national strategic plan "Turismo Italia 2020: Leadership, Lavoro, Sud", the sector should lead to the creation of 500.000 new jobs with an increase of €30 billion in GDP by 2020 and it is expected to grow by 2.3% per year, up to €83.4 billion - 4.7% of GDP - in 2024 (source: Spatial demand and future trends C.1.3.1 del MIT)<br>- hit and run tourism and sharing economy is increasing (PST 2017-2022)<br>Recovery of the nautical sector<br><br>The Strategic Tourism Plan for Friuli Venezia Giulia assign to Maritime activities a high development potential and classify the maritime sector as |

[19] https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/body/com_2014_86_en.pdf

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| | **National Objectives** | a priority |
| | **General objectives**<br>- Innovating, specialising and integrating the country's amenities<br>- Boost the tourism system's competitiveness<br>- Development of an effective and innovative marketing<br>- Achieve efficient and participatory governance in the process of drafting and establishing the plan and tourism policies<br>- Foster the development of sustainable coastal and maritime tourism<br>- Improve quality for sustainable tourism offer<br>- Diversification of the cruise and nautical sectors and enhancement of the yachting sector<br>- Sustainable and thematic tourist routes, in synergy with productive activities, fostering Adriatic-Ionian cultural heritage | |
| | **Local/Case study Objectives** | |
| | **General objectives**<br>- Governance models for sustainable use of Unesco sites, which are subject to greater "tourist pressure;<br>- Safeguard the tourist use of the coasts (seaside tourism) through the defence against flooding and coastal erosion contrast<br>- Improve nautical infrastructure (ports of nautical tourism, shipyards, ports open to public transport) and tourism services sustainability<br>- Foster synergies between tourism, environmental protection and cultural heritage of historical maritime activities (e.g. artisanal fisheries and aquaculture)<br>- Extent of coastal tourism offshore with the potential planning of artificial reefs (involving protection and scuba diving activities) and fostering the development of Underwater Cultural Heritage tourism<br>- Diversification of the touristic offer<br>- Distribution of the touristic offer on wider areas (enlarge Destinations)<br>- Deseasonalization<br><br>**Specific Objectives**<br>- the "Rimini Sea Park", an intervention involving redevelopment of 15 km of coastline, as a new international attraction. [20]<br>- Strategy of online and offline communication and branding of alternative and slow tourism for the Friuli Venezia Giulia maritime regions[21]<br>- Strengthen the sea-mountains connection in Friuli<br>- enhance the city branding of Venice to attract talent, investors and students.[22] | |

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| **Environmental Conservation** | **High-Level Objectives** | Reaching the 10% of the Aichi target 11 in the Adriatic<br><br>Starting from the report ETC/ICM Technical Report 4/2017 Spatial Analysis of MPA Networks in Europe's Seas II, Volume A, 2017: |
| | **EUSAIR**<br>(i)To ensure a good environmental and ecological status of the marine and coastal environment by 2020 in line with the relevant EU acquis and the ecosystem approach of the Barcelona Convention.<br>(ii)To contribute to the goal of the EU Biodiversity Strategy to halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restore them in so far as feasible, by addressing threats to marine and terrestrial biodiversity.<br>(iii)To improve waste management by reducing waste flows to the sea and, to reduce nutrient flows and other pollutants to the rivers and the sea. | |

[20] Rimini Sustainable Urban Mobility Plan (SUMP)

[21] Piano strategico del turismo in FVG (http://www.regione.fvg.it/rafvg/cms/RAFVG/economia-imprese/turismo/FOGLIA111/)

[22] Destination Management Plan 2016-2018 of Venice

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| | **BARCELONA CONVENTION**<br>Overall, all the strategic objectives of Barcelona Convention tackle the Environmental Conservation theme<br><br>**NATURA 2000 (Birds & Habitat directives)**<br>- Avoid activities that could seriously disturb the species or damage the habitats for which the site is designated<br>- take positive measures, if necessary, to maintain and restore these habitats and species to improve conservation.<br><br>**Marine Strategy Framework Directive – MSFD (2008/56/EC), Structure, functions and processes of marine ecosystems – Annex III, Table 1**<br>achieving the Good Environmental Status (GES) of the EU's marine waters by 2020 and protect the resource base upon which marine-related economic and social activities depend. | In Adriatic Sea:<br>4% of increase percentage coverage of Natura 2000 sites since 2012 but mainly in the nearshore zone within 0-1 nm<br>3.8% of increase percentage coverage of MPAs (Natura 2000 sites, National Designated sites (NDS) and Regional Sea Convention sites (RSC)) since 2012 mainly in the near shore zone 0-1 nm<br>5.8% total surface area coverage of MPAs in Adriatic Sea<br>Then, 4.2% missing from the 10%[23]<br><br>In the Northern Adriatic no exhaustive habitat trends studies exist. It's possible to recognize the current status of some environmental features. (see Country Fiche)<br>*P. oceanica* of the Gulf of Trieste and other seagrasses can be classified as "disturbed" and generally in regression. |
| | **National Objectives**<br><br>**General objectives**<br>By 2020, ensure the conservation of biodiversity, or the variety of living organisms, their genetic diversity and the ecological complexes of which they are part, and ensure the protection and restoration of ecosystem services in order to guarantee their key role for life on Earth and human well-being. [24]<br>By 2020, substantially reduce the nationwide impact of climate change on biodiversity, by defining the proper measures to adapt to climate changes and mitigate their effects and increasing the resilience of natural and semi-natural ecosystems and habitats.<br>By 2020, integrate biodiversity conservation into economic and sectoral policies, also as potential for new employment opportunities and social development, while improving the understanding of the benefits from ecosystem services derived from biodiversity and the awareness of the costs of losing them, [2]Safeguard and improve the conservation status of species and habitats in terrestrial and aquatic ecosystems<br>Halt the spreading of invasive alien species[25]<br>Increase terrestrial and maritime protected areas and ensure their effective management<br>Protect and restore genetic resources and natural ecosystems linked to farming, forestry and aquaculture<br>Mainstream natural capital accounting in planning, programming and national accounting.<br>Provide biological diverse and dynamic seas and prevent impacts on maritime and coastal environment<br>Halt soil consumption and combat desertification<br>Minimize pollutant loads in soils, water bodies and aquifers, considering the good ecological status of natural systems Implement integrated water resource management at all levels<br>Maximize water efficiency and adjust withdrawals to water scarcity<br>Minimize emissions and reduce air pollutants concentration<br>Ensure sustainable forest management and combat forest abandonment and degradation<br>Prevent anthropogenic and environmental risk and strengthen urban and territorial | |

[23] ETC/ICM Technical Report 4/2017 Spatial Analysis of MPA Networks in Europe's Seas II, Volume A, 2017

[24] Italian National Biodiversity Strategy 2010-2020

[25] National Sustainable Development Strategy 2017-2030

resilience

Guarantee high environmental performances of buildings, infrastructures and open spaces

Boost urban regeneration, ensure sustainable urban accessibility and mobility

Ensure ecosystems restoration and defragmentation, strengthen ecological urban-rural connections

Ensure the development of potential and the sustainable management of territories, landscapes and cultural heritage

Conservation of the capacity of renewal of commercial stocks

**Specific Objectives**

- Return of fishing activity by values compatible with levels of security of stocks, identified by Biological Limit Reference Points, and exploitation oriented towards the medium-long term sustainability, identified by Biological Target Reference Points.[26]
- implementation of the marine protected areas networks (e.g. Natura 2000 "Habitat Directive" sites and marine protected areas established according to the laws n. 979/1982 and n. 394/1991 with Decree of the Minister of the Environment)
- establishment of new Sites of Community Interest (SCIs) for instance starting from land-sites taking in account adequate conservation measures for target habitats and species.

## Local/Case study Objectives

**General objectives**

- implement the network of MPAs in the CS area (Marine Protected Areas, Natura 2000 sites and Biological Protection Zones) according to national and international conservation priorities (e.g. for the militainment of biodiversity (MSFD descriptor 1), for the conservation of fish stocks full reproductive capacity (MSFD descriptor 3) and seafloor integrity (MSFD descriptor 6)
- Evaluating the role of potential OECMs in the area as site favouring environmental conservation

**Specific Objectives**

- complete the designation of local SCIs in Special Areas of Conservation (SACs) with adequate management [1. Relitto della piattaforma Paguro, 2.Tegnùe di Chioggia, 3.Laguna del Mort e Pinete di Eraclea, 4.Tegnùe di Porto Falconera, 5.Trezze San Pietro e Bardelli, 6.Relitti di Posidonia presso Grado, 7.Area marina di Miramare]

- evaluate the potential implementation of the Habitat Directive with the proposal of a new Site of Community Importance (pSCI), according to the protection needs foreseen for habitat and species (Annexes II and IV) that insist in the area:

**Posidonia beds** (and other marine seagrasses, e.g. *Cymodocea* spp.) in Northern Adriatic Sea (IT-AS- 8A02-0001), located mainly in limited areas in front of the Grado lagoon and in the Gulf of Trieste.

**Coralligenous assemblages** (Local name: *Tegnùe* or *trezze*) in Northern Adriatic Sea (IT-AS- 8A02-0001), mainly concentrated between the Po Delta and the Gulf of Trieste and **maerl beds**, whose presence is limited in the area offshore the Grado lagoon.

*Phalacrocorax aristotelis desmarestii* (European shag – Mediterranean), Natura 2000 species code A392, this species is present in North Adriatic Coast (IT-AS- 8A04-0306) and Venetian Coast (IT-AMS- 8A04-0306). It is mentioned in the following directives/agreements:
- EU Birds Directive Annex I
- Bern Convention Revised Annex I
- SPA/BD Protocol of Barcelona convention Annex II

***Caretta caretta*** (Loggerhead sea turtle), Natura 2000 species code 1224. It is mentioned in the following directives/agreements:

[26] "The state of fishing and aquaculture in Italian seas" Ministry of Agricultural, Food and Forestry Policies, MIPAAF

| | | |
|---|---|---|
| | - EU Habitat Directive Annex II and Annex IV [27]<br>- Bern Convention Revised Annex I<br>- Bonn Convention annex I<br>- CITES Annex I<br>- SPA/BD Protocol Annex II<br><br>***Tursiops truncatus*** (Common bottlenose dolphin), Natura 2000 species code 1349. It is mentioned in the following directives/agreements:<br>- EU Habitat Directive Annex IV [28]<br>- Bern Convention Revised Annex I<br>- Bonn Convention annex I<br>- CITES Annex I<br>- SPA/BD Protocol Annex II<br>- ACCOBAMS | |

# E. RESULTS OF THE CASE STUDY IMPLEMENTATION – RECOMMENDATIONS

## E.1 TOWARDS A PROPOSAL OF PLAN FOR THE NORTHERN ADRIATIC

### E.1.1 Introduction – the planning rationale

The main aim of the planning exercise is to simulate an MSP process, to understand its potentiality, issues and limits. In line with the provisions of the European Framework Directive on MSP 2014/89/EU, the general objectives of this proposal for a maritime spatial plan in the NA are the following:

1) To support the Blue Growth through the identification of actions and measures to support the economic activities of priority indicated by the Member States;
2) To verify that measures supporting Blue Growth do not affect negatively the marine environment.

In order to answer to the general planning objectives, the planning proposal was built to manage, anticipate, and avoid potential conflicts emerging between human uses, and to control, reduce, avoid potential conflicts between human uses and the marine environment. Moreover, the proposal answers to the need of addressing the demands of the local communities and economic actors, that have been involved in the planning process through the stakeholder engagement process delivered within the SUPREME activities. The planning proposal is composed of a series of measures that answer specifically to most of the critical issues identified in the previous phase (section C.3.1) which reflects on conflicts, synergies, and potential overlapping of existing uses, and future trends of development, and potential conflicts with priorities for environmental conservation (habitats and species). The planning strategy is built on the integration of a series of measures of multiple types, as following:

[27] https://eunis.eea.europa.eu/species/641 (include a list where this species is protected)

[28] http://eunis.eea.europa.eu/species/1567

- ➢ spatial measures, related to the zoning of some areas according to potential vocations and uses; in some cases the zoning can be permanent or temporary, in order to promote a dynamic ocean management according to the different conservation priorities and seasonality;
- ➢ management measures, related to the implementation of activities of management, communication, or lifelong learning for specific sectors/actors;
- ➢ monitoring measures, related to the need of improving knowledge on specific areas or functionalities of the marine environment in relation to specific planning and management concerns. The planning measures have been proposed also in relation to the the considerations and analysis of the land-sea interactions (section C.3.2). The activities to compose the planning measures of the case study were built on the best available knowledge and on what the partner group made available during the project. Particular attention was given to the data source and on their mode of use.

The measures were structured on the base of the following process:

- ➢ Phase 1 - Definition of the planning objectives for the case study (international, regional, national, subnational)
- ➢ Phase 2 - Oriented analysis for the identification of the critical aspects related with the synergies and conflicts between uses, and uses and environment → identification of the critical issues that have to been considered within the plan, in relation with the potential trends of development of the uses and of the potential effects on the environment.
- ➢ Phase 3 - Elaboration of potential measures and actions that respond to the critical issues in a way to support the development of the economy of the sea, anticipating potential conflicts among uses and valorizing synergies between uses and uses and environment.

The planning proposal here below represents an initial planning strategy that should be subjected to the discussion with the competent authorities, the multiple stakeholders and decision makers involved and sharing an interest in the case study area.
In the next section, the planning measures are reported and discussed.

## E.1.2. Plan proposal

The plan proposal for the Northern Adriatic is composed by a series of planning measures (fig. E 1.2 1), organized in order to respond to the critical issues as follows:

- Managing conflicts and synergies from maritime transport;
- Finding space for aquaculture;
- Supporting demersal fisheries;
- Supporting synergies between tourism and other uses in the NA;
- Identifying priority areas for conservation considering conflicts and synergies between maritime uses and the marine environment;
- Other potential spatial measures:
-
    - o Identifying areas for renewable energy production: the case of offshore wind in Emilia Romagna Region
    - o Reducing conflicts between military areas and fishery in Emilia Romagna Region
    - o Managing in a MSP framework and perspective the oil and gas platform decommissioning issue in Emilia Romagna Region.

The measures and actions answering are reported in relation to the following classification proposed by Douvere (2008):

- Input measures: measures that influence the inputs to human activities in a marine area;
- Output measures: measures that limit the outputs of human activities in a marine area;
- Process measures: measures that specify the nature of the process of human activities in a marine area;
- Spatial and temporal distribution: measures that specify where and when human activities can occur in a marine area.

For each critical issues, the planning measures answers incorporating both the contribution for managing synergies and conflicts between uses, and for managing synergies and conflicts between uses and the environment.

The following sections and subsections report the description of the planning measures, including their spatial representation.

*Figure E.1.2 1: Planning measures in order to respond to the critical issues.*

### *E.1.2.1 Managing conflicts and synergies from maritime transport*

The intensive and growing maritime transport activity in the case study area can lead to several risks as well as environmental impacts. The risks of accidents is high due to the speed of boats and yachts because of the limited available marine space. Boat collision in the Adriatic Sea is most notable along the north and western parts, and with the increasing traffic, collisions are expected to grow especially

in the area of the Gulf of Trieste. Moreover, collision with fast moving vessels, is of concern for dolphins and sea turtles. Shipping emissions of pollutants are increasing as well as the risk of introducing harmful aquatic organisms and pathogens through ships ballast waters and sediments. The quantity of oil and gas products carried by ships is growing especially in the Gulf of Trieste. This likely means that concentrations of hydrocarbons in the environment will increase. This will be more pronounced and evident in the northern part of the Gulf of Trieste near the ports of Koper and Trieste. Underwater noise is another important and recognized pressure that origin from the maritime transport activity, highly impacting cetaceans in the area and with strong transboundary connotation. Finally, the traffic volume of LNG is expected to increase significantly in the case study area participating to the increased traffic between bunkering facilities and areas.



*Figure E.1.2 2: Identification of actual bunkering/anchoring areas*

***The case of the Gulf of Trieste***

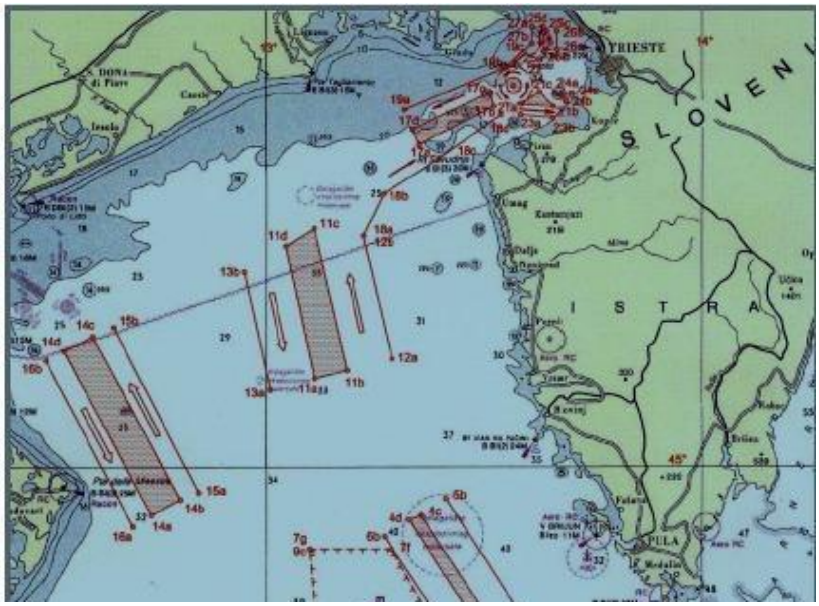



*Figure E.1.2 3: Existing traffic separation schemes in the Northern Adriatic (Source: IMO, 2003).*

The area of the Gulf of Trieste is mostly characterised by muddy and sandy bottoms, with occasional hard rock bottoms and seagrass meadows of *Posidonia oceanica* and *Cymodocea nodosa* (Lipej et al., 2000). The average depth is 20 m, while the maximum depth is 38 m. The area is inhabited by high biomass benthic communities and characterised by high variations of salinity (32–39 PSU) and water temperature (6–26°C), high riverine output, strong stratification, occasional oxygen depletion and occasional mucous aggregate phenomena (Lipej et al., 2000). Due to its natural characteristics and the degree of anthropogenic pressure, the area can be considered very sensitive. The Gulf of Trieste, in particular, is subject to substantial chemical, industrial and sewage pollution and is considered one of the most heavily polluted areas in the Mediterranean (Horvat et al., 1999).

The port of Trieste is located within a Site of National Interest (SIN). These sites are defined by the Italian State as very large contaminated areas, in need of soil, surface water and groundwater remediation. The SIN of Trieste was declared by Decree of the Italian Ministry of the Environment in 2003 and covers a marine coastal area of about 12,000,000 m2 in the eastern part of the Gulf of Trieste (Cibic, 2017). It is divided into 5 macro sites (fig. E. 1.2.1 3) on the basis of the main activities located there and their consequent anthropogenic pressures: (1) a port area, (2) a shipbuilding area, (3) an iron foundry area with a steel plant, (4) a petroleum area where petroleum products are handled, stored and processed, and (5) a residential area/centre bay, the largest among the 5 areas. Of course the contaminated nature of the site affects the surrounding area and activities such as fishing, aquaculture, swimming and urban development are restricted within the SIN (Cibic, 2017).

Moreover, spatial overlapping between shipping density and fishing activities can be noted particularly in proximity of the traffic separation schemes (fig. E.1.2 5). The competition of fishing

grounds with the established (and more convenient) traffic lanes, and the trends of intensification of transport in the area main lead to spatial conflicts between the two activities.

The density of traffic in the area, the spatial restriction to ensure the safety of the activities, the anchoring sites and the traffic separation schemes strongly influence and limit other uses (fig. E.1.2 6).

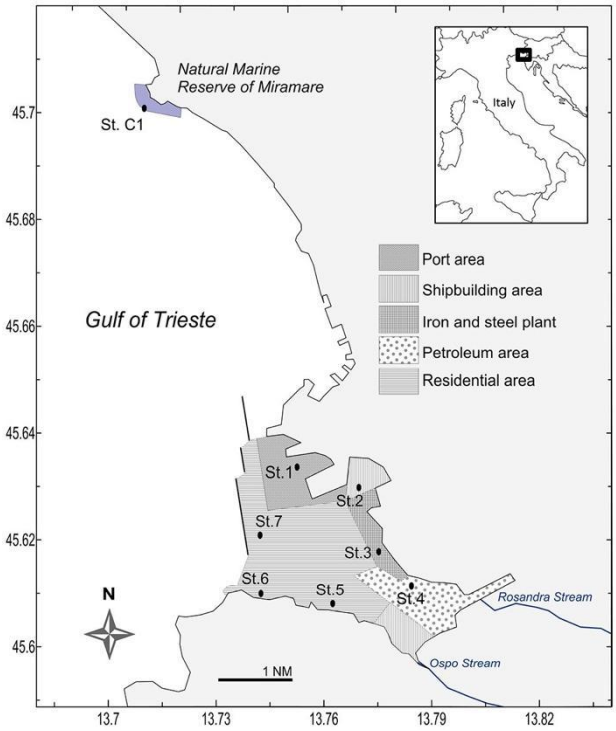



*Figure E.1.2 4: Location of the seven sampling stations within the five macro sites of the Site of National Interest (SIN) of Trieste, and the reference station C1 (Source: Cibic, 2017).*

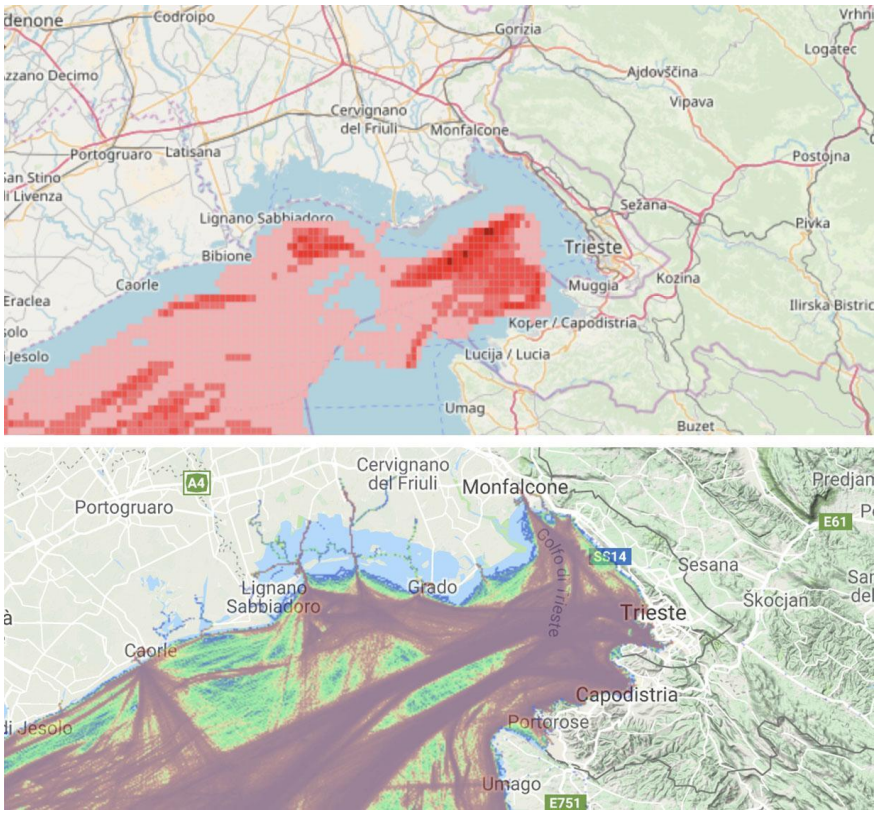



*Figure E.1.2. 5: Spatial distribution of trawling activities (top) and shipping density (down) in the Gulf of Trieste (Source: Adriplan Portal, Marine Traffic, 2018).*

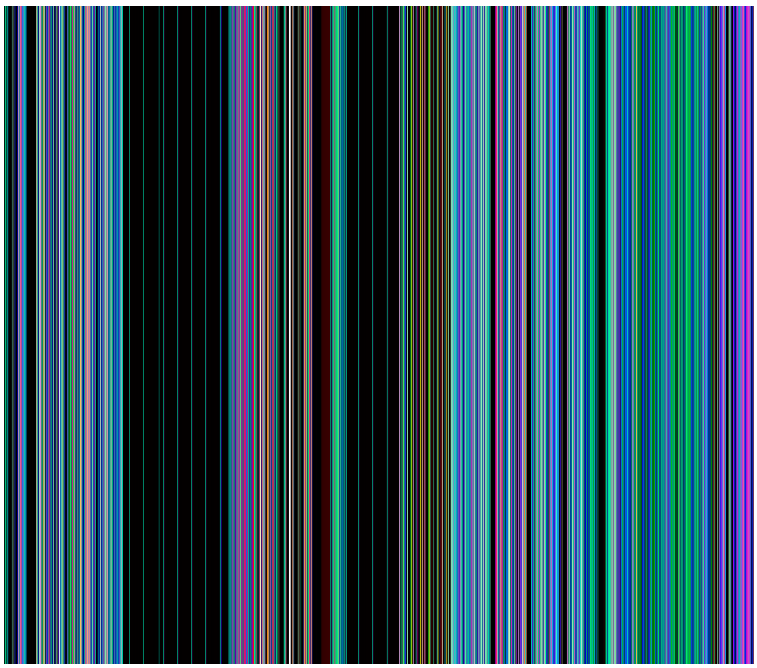


*Figure E.1.2 6: Nautical chart showing the restrictions to navigation in the area, bunkering sites and interdicted zones.*

*Portfolio of measures*

| | |
|---|---|
| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area*<br><br>- Limitation of vessels quantity<br>- Limitation of vessel speed in particularly sensitive areas<br>- Limitation of dangerous goods handling | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area*<br><br>- Limitation and monitoring of discharged ballast water<br>- Reduction of the trawling fishing effort<br>- Increased monitoring of the activity in sensitive areas |
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br><br>- Investments for LNG transformation<br>- Integration of transboundary VTS data<br>- International agreements on dangerous goods (Bonifacio model) | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br><br>- Establish a continuous traffic separation scheme<br>- Establish a major buffer for Miramare MPA<br>- Enlargement of current bunkering/anchoring areas |

### *E.1.2.2 Finding space for aquaculture*

The measures proposed for the aquaculture sector, intend not to identify specific polygons where to allocate new aquaculture (mussels) farms, but rather to provide, at a more general level, an assessment for the suitable areas (high, medium and low suitability) for the activity, by means of a multi-criteria approach.

In order to identify the suitable areas, the following criteria have been considered:

1. Definition of the main indicators for optimal mussel growth in the area: Temperature, Depth, Currents, Chlorophyll-a, Significant wave height, Dissolved Oxygen, Total Nitrates, Total Phosphates, Salinity, Salinity plume) in line with Valentini et al., 2016, Davaasuren et al., 2010, Andersen et al., 2013, etc.
2. Definition of the range of suitable values for the growth of mussel species present in the study area (*Crassostrea gigas, Mytilus galloprovincialis, Ostrea edulis*) on the basis of an in-depth analysis in the literature (Davaasuren et al., 2010, Valentini et al., 2016, Andersen et al., 2013, etc.) and discussion with experts. Among these parameters, the chlorophyll-a is considered the most significant parameter, as it is the one with greater variability in the study area (see figure below). Therefore, we consider the chlorophyll-a a good proxy for the expected mussels growth rate in the study area, in line with the results of Brigolin et al., 2017; Barbanti et al., 2017; Barbanti and Perini, 2018.

3. Evaluation of socio-economic aspects. The expected management cost can be considered one of the main parameters characterizing the socio-economic analysis. The distance from ports (all the ports useful for aquaculture activities have been considered) can be then used as a proxy for that, meaning the closer the cheaper.
4. Evaluation of conflicts with two main maritime uses: maritime traffic and fishery (trawling OTB, TBB and small scale fishery).
5. Exclusion of "constraints": areas of prohibition or conflict with "fixed" use (e.g. LNG, military areas, submarine pipelines, sand deposits) in line with Brigolin et al., 2017.

Concerning the expected mussel growth rate, Chlorophyll-a has been considering a proxy of "high mussels growth rate" whenever equal or greater than 3 $mg/m^3$ and "medium mussels growth rate" when included between 1 and 3 $mg/m^3$. Lower values are not considered to identify suitable areas for the activity (Andersen et al., 2013; Stelzenmüller et al. 2013; Valentini et al., 2016; etc.).

*Figure E.1.2 7: Chlorophyll-a climatology trend observations in the study area.*

Concerning the socio-economic aspects, management costs are considered high whenever the distance from ports is equal or greater than 6 nm. This threshold represents a good proxy of sustainable costs, including the current location of almost all the farms in the study area. In Emilia Romagna and Veneto regions, the farms are located between 3 and 4 nm from the coastline (distance from ports is higher though), with a maximum of 8 nm, while in Friuli Venezia Giulia regions, farms are located very close to the coast, less than 1 nm.

*Figure E.1.2 8: Ports location in red. The blue area, close to the coast, represent the area within 6 nm from ports, while in light grey the area further than 6 nm. In dark grey, the location of all the current aquaculture farms in the study area. In Friuli Venezia Giulia, they are, not well visible, very close and along the coastline.*

Concerning the conflicts with maritime uses, the following ranges of values have been considered to classify the conflict in "high" or "low".

| Maritime use in conflict with aquaculture | High level of conflict | Low level of conflict |
|---|---|---|
| Small scale fishery | >= 10 000 (number of operations recorded in 2017) | < 10 000 (number of operations recorded in 2017) |
| Trawling OTB | >= 10% of the total OTB effort (normalized values of the total swept km in 2017) | <10% of the total OTB effort (normalized values of the total swept km in 2017) |
| Trawling TBB | >= 10% of the total TBB effort (normalized values of the total swept km in 2017) | <10% of the total TBB effort (normalized values of the total swept km in 2017) |
| Traffic | >= 300 (number of passages in a cell recorded during 2014-2015) | < 300 (sum of passages in a cell recorded during 2014-2015) |

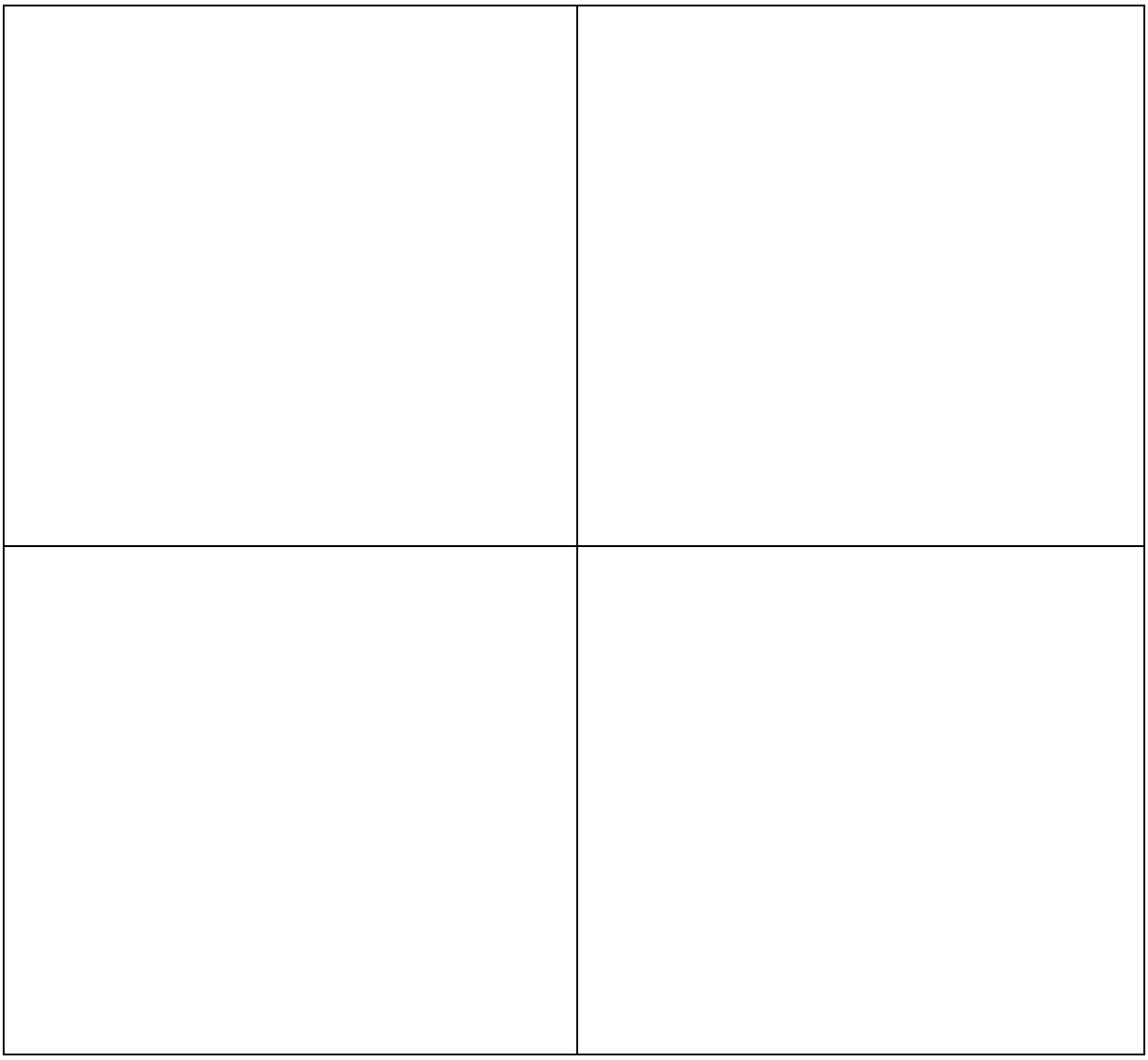


*Figure E.1.2 9: Maritime uses in conflicts with aquaculture: a) upper-left small scale fishery; b) upper-right trawling OTB; c) bottom-left trawling TBB; d) bottom-right maritime traffic (in blue value 1-150, in yellow 150-300 and red >300)*

Concerning the small-scale fishery (fig. E.1.2 9a), 10 000 operations is the threshold above which the fishing efforts is high and concentrated very close to the coast, excluding the current aquaculture farms. Thus we consider values greater than 10 000 as indicators of high conflict, while values lower than 10000 as indicators of low conflicts.

Concerning both OTB and TBB fishery activities (fig. E.1.2 9b and c), we consider values greater than 10% of the total value (values are normalized) as indicators of significant trawling activities, thus of high conflict in the area, while values lower than 10% indicate low conflict.

Concerning traffic intensity (fig. E.1.2 9d above), the values above 300 are considered representative of higher traffic intensity and high conflict in the study area.

Overlapping the different classes for all the above-mentioned criteria, we obtained the following suitability surfaces (see also the table below):

- High suitability (dark green) when the expected mussels growth rate is high, the expected management costs and the conflicts with other uses are both low;
- Medium suitability (light green) when the conflicts with other uses are low and the expected management costs and the expected mussels growth rate are both medium/high;
- Low suitability (brown) when the conflicts with other uses are high and expected management costs and the expected mussels growth rate are both medium/high.

| | **Expected mussels growth rate** | **Expected management costs** | **Conflicts with other uses** |
|---|---|---|---|
| HIGH SUITABILITY | HIGH | LOW | LOW |
| MEDIUM SUITABILITY | HIGH | HIGH | LOW |
| | LOW | LOW | |
| | LOW | HIGH | |
| LOW SUITABILITY | HIGH | LOW | HIGH |
| | LOW | LOW | |
| | HIGH | HIGH | |
| | LOW | HIGH | |

The three spatial distribution of high-medium-low suitability are represented in the figure below.

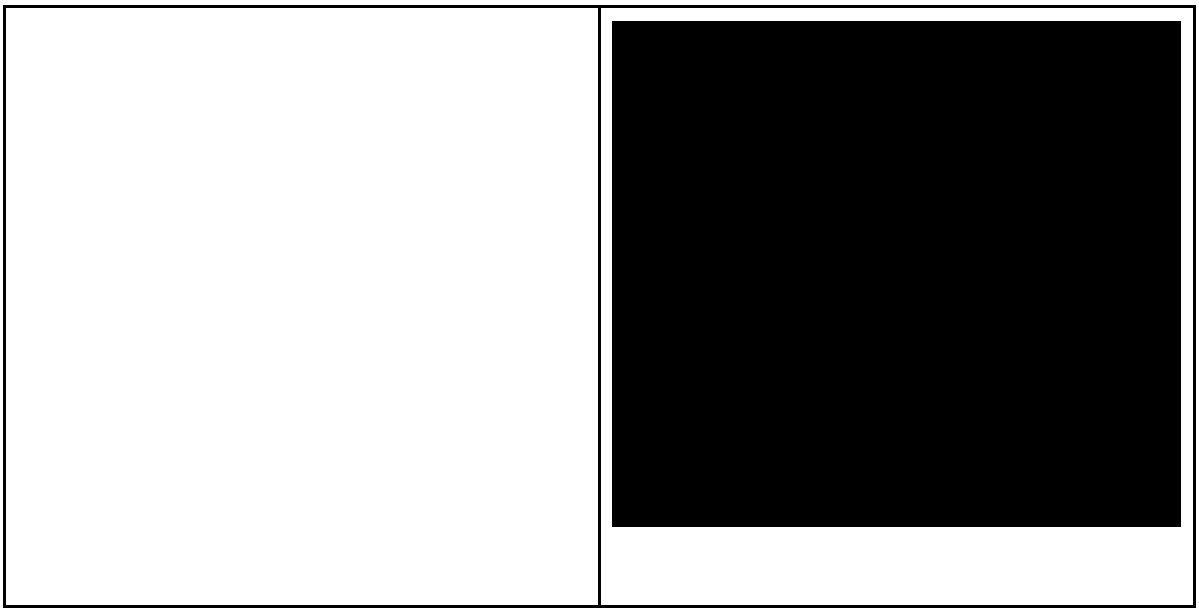


*Figure E.1.2 10: The map on the left shows the suitable areas obtained after crossing the classes of the criteria described. In dark green high suitability, light green medium suitability and brown low suitability. The map on the right shows the suitable areas in case of trawling ban up to 6nm.*

High suitable areas (dark green) are identified close to the coast where chlorophyll-a values are higher and the management costs cheaper (less distance from ports). In the coastal areas the trawling

activities (OTB, TBB) are also lower since not allowed within 3nm. This is particularly evident in the Emilia Romagna region.

Low suitable areas (brown) are characterized by high conflicts (trawling, small scale fishery and traffic). The pattern of low suitable areas is clearly in line with Fig. *E. 1.2.2 5* of high conflicts distribution. Coastal areas where suitability is low are mainly characterized by the traffic corridors in entrance to the ports and the small-scale fishery activity, mainly along the Venetian coast

Medium suitable areas (light green) are located in all the other situations where conflicts are low.

On the basis of this assessment, the following scenarios, in line with the other criticalities, can be considered:

- Moving the ban of trawling offshore up to 6 nm (figure 6 on the right), in line with the requirements of a sustainable fishery development, automatically expanding the high and medium suitable areas offshore. If the trawling activity remains like it is, the space for aquaculture activity is indeed affected by significant limitations.
- Site-specific assessment of interference of aquaculture with traffic, where traffic routes are less intense (green areas), while the main traffic routes are not going to be affected by planning scenarios: an evaluation if lower intensity traffic can be redirected to free some areas for aquaculture activity can be performed.

The following areas of constraints, including mooring areas, military areas (permanent and temporary), safety areas around oil and gas platforms, LNG, traffic lanes, fishing prohibited areas have to be overlapped to the high-medium-low suitability distribution and considered for a final identification of suitable area. A specific note for the areas indicating the pipelines to platforms (light orange in the map below): farms can be possibly installed here, according to competent authorities.

*Figure E.1.2 11: The constraints, which include mooring areas, military areas (permanent and temporary), safety areas around oil and gas platforms, LNG, traffic lanes, fishing prohibited areas.*

Concerning Emilia Romagna region, the areas/polygons pointed out in Fig. E.1.2 11 result from a detailed analysis of the state of the art and measures proposed for the aquaculture sector as described in detail in Barbanti et al., 2017a; Barbanti et al., 2017b; Barbanti and Perini, 2018. The areas proposed, among various considerations, take also into account:

1) Proximity to ZTB "Fuori Ravenna" where trawling is prohibited, benefitting on both reduced fishery activity and higher water quality.

2) Oil and gas decommissioning: mussels grow on the legs of the platforms. The future decommissioning platforms can be a synergy with this activity (Barbanti and Perini, 2018). See also synergy of aquaculture and oil & gas decommissioning platforms described in section C.3.1.

3) Promotion of the development of the aquaculture farms in the offshore area: the distance further to 6 nm from ports, would increase the management costs, e.g. fuel, but would open the possibility of replacing the plastic tubular socks, now used, with biodegradable cotton nets. This system, called "New Zealand" or "Japanese", has been tested test during the "EcoSea" project (http://www.ecosea.eu/) and requires the plants to be located in areas at least 15 meters depth, but would allow both to reduce the environmental impact related to the accidental dispersion of plastic stockings and to save the costs related to their disposal, as special waste (Barbanti et al., 2017b).

Concerning Veneto and Friuli Venezia Giulia regions, the "high suitable" areas, are also characterized by:

- Higher current values (greater than 0.2 m/s);
- The proximity to ZTB or protected areas, in order to benefit on both reduced fishery activity and higher water quality;
- Multi-use tourism-aquaculture approach: aquaculture can be considered in synergic combination with tourism activities (multi-use combination described in section C.3.1).

Portfolio of measures

| | |
|---|---|
| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area* | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area*<br>- Measures to reduce (methodologies and/or technologies) and to prevent the loss of marine litter generated by aquaculture activity, including nets, ropes and other trashes.<br>- Reduce the potential of by-catch |
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br>- Environmental monitoring in correspondence of aquaculture activities<br>- Better practices of waste management related to operational activities<br>- Development of cost efficient and sustainable measures and methodologies for retrieving the marine litter generated by aquaculture | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br>- Promotion of synergies with other sectors (tourism, oil and gas platforms, protected areas)<br>- Identification of suitable areas where to allocate new aquaculture farms<br>- Identification of "constraints area", where not to place new farms |

### *E.1.2.3 Supporting sustainable fisheries*

Given the great overfishing of the demersal resources in the Northern Adriatic Sea (GSA 17), along with the fishing pressure in marine habitats, evidence strongly supports the need to evaluate appropriate management approaches. Several fishing activities operate simultaneously in the area, and the need to minimize conflicts among them is also a social concern. Demersal fish species are highly vulnerable to certain fishing activities (e.g., bottom otter trawling and rapido trawling), and all the assessed stocks are being fished above the fishing mortality levels leading to maximum sustainable yield (MSY; FMSY). In the northern Adriatic Sea, where most of the harvested stocks are overexploited due to non-selective exploitation patterns and opportunistic fishery behaviors, the protection of the main nurseries (i.e. areas where juveniles congregate at the end of their planktonic dispersal phase) and spawning areas (i.e. areas where adults concentrate during the spawning period) of commercial species is increasingly viewed as a major step toward the achievement of more sustainable exploitation patterns (Colloca et al., 2013). Indeed, a reduction in fishing mortality on immature fish represents a fundamental prerequisite for sustainable fisheries, which follow the "spawn at least once" rule. As a matter of fact, in the northern Adriatic catches are composed by mainly young individuals; in fact, the most representative age classes are age 0, 1, and 2 (Grati et al., 2018). Most fishing activities targeting demersal species is carried out by bottom otter trawlers and rapido trawlers, and the use of set gears (e.g., gillnets, trammel nets) is typically performed inside the coastal areas (i.e., towed gears have been permanently banned within 3 nm of the coast) and/or offshore areas unsuitable for trawling as the "Sole Sanctuary" (Bastardie et al., 2017). In such area the macrozoobenthic assemblage is characterized by the presence of holoturians, which exhibit evisceration if subjected to physical or chemical stress, causing problems to fisheries because this event makes the fish less suitable for marketing ("yellow fish" problem). This behavior, together with the high presence of the bryozoan *Amatia semiconvoluta*, which obstructs the nets and compromises their efficiency, discourages trawl fishing in this area (Santelli et al., 2017). Thus, gillnetters represent the only gear fishing in these grounds and catch many sole, skates, and other large fish.

Considering the above information, the following management measures are proposed:

*Fig. E. 1.2. 12: proposed management measures*

- Exclude trawlers having LOA<15m from the 4 nm strip from the coast in the regions Veneto and Emilia Romagna all year round (protection of nursery grounds for several demersal species).
- Exclude trawlers having LOA>15m from the 6 nm strip from the coast in the regions Veneto and Emilia Romagna all year round (protection of nursery grounds for several demersal species).
- Exclude trawlers inside the "Sole sanctuary" all year round (protection of spawners of common sole and prevent a possible future exploitation of holoturians).

- Exclude gillnetters inside the "Sole sanctuary" from December to February (protection of adults of common sole during the spawning period).
- Minimum mesh size for gillnets = 72 mm (stretched mesh size) when used inside the 3 nm strip from the coast (protection of nursery grounds for several demersal species).

Portfolio of measures

| | |
|---|---|
| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area*<br><br>• Limitation on fishing activity and capacity to local fleets (e.g. taking in account FLAGs), in order to reduce total efforts and foster local markets.<br>• Extent seasonal limitation for specific métiers and target species. | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area*<br><br>• Measures to reduce the production of marine litter from fishing vessels.<br>• Review the limitations on allowable catches.<br>• Reduce the potential of by-catch fostering selective gears and techniques. |
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br><br>• Specify of fishing gear types and mesh size for SSF<br>• Specify best practices to reduce trawling pressures on vulnerable species (e.g. turtles, mammals).<br>• Specify potential compensation measures to drive the shift from towed gears to fixed.<br>• Specify commercial rules to sustain local markets. | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br><br>• Establishment of new Biological Protection Zones for specific EFH.<br>• Extent the no trawl areas to 4 and/or 6 nm according to local criticalities.<br>• Establish new MPAs and/or Habitat Directive – Natura 2000 sites with proper management of trawling and SSF to foster protection of sensitive habitats and vulnerable species. |

### *E.1.2.4. Identifying priority areas for conservation considering conflicts and synergies between maritime uses and the marine environment*

**Scope**

The general objective of the plan is to support conservation of the NA, articulated in a specific objective into a spatial percentage of new areas for conservation and protection of biodiversity, in line with the Aichi targets (CBD, 2010), and with the European Biodiversity Strategy at 2020 COM(2011) 244 (EC, 2011). The planning objectives are achieved through the identification of 1) spatial measures for conservation as new marine protected areas (MPAs), or other effective area-based management tools (OECMs) and of 2) management measures for specific maritime activities and sectors.

In order to identify potential areas to support conservation of the target species, the plan takes into consideration the following **conservation targets**:

- seabed habitats: mobile bottoms, seagrass meadows, hard bottom associations and unique rocky outcrops called "trezze" and "tegnue".
- threatened species and essential habitats: 2.1 bottlenose dolphin (*Tursiops truncatus*) 2.2 loggerhead turtle (*Caretta caretta*) feeding ground, 2.3 spawning and nursery areas for a number of species of commercial interest for fisheries.

The CBD establishes a series of criteria to define a well-connected network of MPAs, which are the following (Diz et al. 2018; Rees et al. 2018):

- ✓ Ecological and biological significance of the area forming the network;
- ✓ Representativity, that is "captured in a network when it consists of areas representing the different biogeographical subdivisions of the global oceans and regional seas that reasonably reflect the full range of ecosystems, including the biotic and habitat diversity of those marine ecosystems" (CBD, 2007);
- ✓ Connectivity;
- ✓ Replicated ecological features;
- ✓ Adequate and viable sites.

In order to orient the identification of potential priority areas for conservation, the plan takes into consideration the following design criteria:

1. Optimization, i.e. to maximize the benefits of conservation on multiple targets by identifying areas for protection that answer to multiple objectives;
2. Targeted protection, i.e. potential areas of protection must target high-value conservation features that are mentioned as priority habitats and species in the legislative sources (e.g. *Cymodocea nodosa*, according to the Annex II, Habitat Directive)
3. Connectivity, i.e. the identification of potential stepping stones to support ecological connectivity and the incorporating and building of redundancy within the networks to increase the resilience of marine ecosystem to environmental disturbances
4. Equality, to ensure the distribution of the commitment to conservation among Italian Regional Administrations and related marine areas of responsibility.

The identification of potential areas for conservation is structured on a series of activities, in order to identify multiple types of areas that can contribute to conservation. Firstly, priority areas for conservation are identified by applying systematic conservation planning (Possingham et al. 2000, Pressey et al. 1993) through Marxan under different scenarios. We specifically address potential threats to megafauna from maritime transport and fishery, in order to explore targeted measures,

including management and spatio/temporal measures. Secondly, we analyzed the potential for conservation of other area-based conservation measures (OECMs), by applying the criteria proposed by IUCN, 2018 and McKinnon et al. 2015, through the protocol elaborated by Shabtay et al. 2019 in the NA. Thirdly, we confronted the mosaic of the priority areas and potential OECMs with the other measures of the present plan in order to design a coherent framework of measures that respond to the CBD criteria for MPAs networks. Finally, we propose potential ways for management and implementation of the network, including potential tools for the designation of the priority areas of conservation (e.g. Marine Protected Areas, Fishery Restricted Areas, Zone for Biological protection).

## 1. Identification of priority areas for conservation through marine spatial prioritization

Marine spatial prioritization through Marxan is applied to identify priority areas for conservation under multiple conservation scenarios. Marxan meets predefined conservation targets and minimizes costs to resource users (Possingham et al. 2001; Wilson et al. 2007; Ban et al. 2009). We tested several scenarios (table E.1.2. 1) in order to identify the priority areas for conservation that respond to multiple scenarios of planning. In all the scenarios we applied the conservation targets deriving from the CBD (CBD, 2010) to the same conservation features. This multi-analytical approach delivered results of the four scenarios which were analysed to support and orient the identification of priority areas of environmental preservation and conservation, which is rooted in the best available knowledge of the area.

*Table E.1.2. 1 Scenarios*

| **Scenario no.** | **Costs** |
|---|---|
| S1 | Equal to area of the planning units |
| S2 | CEA scores |
| S3 | CEA scores deriving only from fixed uses (removing the contribution of mobile uses as fishery, aquaculture, and coastal and maritime tourism) |
| S4 | Density of uses |

### *Focus on megafauna, maritime transport and fishery*

It is recognized the presence of different species of cetaceans in North Adriatic. Some of them are common and recognized as integral part of the marine fauna belonged to this area, others are only occasionally registered being not sedentary in this marine zone (Bearzi et al. 2004). Nonetheless, it was observed the strong and general decrease in abundance of cetaceans in this marine area. For instance, the common dolphin (*Delphinus delphis*) is almost disappeared and the only cetacean regularly reported in North Adriatic is the bottlenose dolphin (*Tursiops truncatus*), which has to survive to several human pressures such as pollutant contamination, prey depletion due to fishery activity and climate changes (Bearzi et al. 2004). More than this, fishery activity is recognized as one of the main impacting maritime activity on marine mammals in North Adriatic, provoking direct mortality of these megafauna due to pelagic trawling technique causing high rate of by-catch. Such events can be even determined by small scale fishery at a lower extent. By catch and overfishing involve even animals other than cetaceans, such as piked dogfish (*Squalus acanthias*), thintail threshers (*Alopias vulpinus*), angel sharks or monkfish (*Squatina squatina*), and smooth-hounds (*Mustelus mustelus*) (Fortuna et al. 2009). Underwater noise is recognized as an important form of pollution with relevant transboundary nature and of international concern (Codarin & Picciulin, 2015). It derives mainly from vessels and cruise tourism, impacting both coastal and open water areas, and highly affecting cetaceans' behavior. Military exercises as well as the use of sonar are also sources of

underwater noise pollution affecting marine mammals. Maritime traffic, other than noise, can provokes collision events between large vessels, such as cruisers, ferries and container ships, and cetaceans are regularly registered in the Adriatic, especially during summer season (Carić & Mackelworth, 2014). The loggerhead turtle (*Carretta carretta)* is also a common species in the North Adriatic. In fact, this marine area is one of the most important feeding grounds in the Mediterranean for this species. Loggerhead turtles are highly impacted by by-catch events that seriously affect turtles' populations (Casale et al. 2004). Frequent phenomena of turtle contaminations by pollutants and marine plastic ingestion are recorded in North Adriatic (Franzellitti et al. 2004, Lazar et al. 2011, Lazar & Gračan 2011), which also strongly affect these animals. Even collision with boat is recognized as impacting sea turtles (Casale et al. 2010).

The North Adriatic is an area highly impacted by human uses and anthropogenic pressures (Gissi et al. 2017), where both fishery and maritime traffic are extremely intense. Thus, there is the urgent need of mitigation measures to improve environmental quality and prevent further decline of cetacean and turtles' populations in North Adriatic.

*Table E.1.2. 2. Summary of pressures affecting the bottlenose dolphin (Tursiops truncatus) and human uses from which they origin. Proposed mitigation measures starting from Douvere, 2008.*

| **Species** | **Use** | **Pressures** | **Measures** |
|---|---|---|---|
| *Tursiops truncatus* | Fishery (*defined*) | By-catch,<br>Depletion of preys/trophic sources,<br>Habitat degradation | Spatial and temporal/seasonal, input, output, and process |
| | Maritime transport and tourism (*precautionary*) | Underwater noise,<br>Collision,<br>Pollution,<br>Habitat degradation | Spatial and temporal/seasonal, input, output, and process |
| | Land-based activity (*defined*) | Pollution,<br>Marine litter,<br>Habitat degradation | Input, output, and process |
| | Military activity (*precautionary*) | Underwater noise | Spatial and temporal/seasonal |
| *Caretta caretta* | Fishery (*defined*) | By-catch,<br>Habitat degradation | Spatial and temporal/seasonal, input, output, and process |
| | Maritime transport and tourism (*defined*) | Collision,<br>Pollution,<br>Habitat degradation | Spatial and temporal/seasonal, input, output, and process |
| | Land-based activity (*defined*) | Pollution,<br>Marine litter,<br>Habitat degradation | Input, output, and process |

In North Adriatic in the period 2012-2015, 87 cetaceans were found stranded along the coast and the majority were bottlenose dolphins, and in the case study pilot the area more interested by such events was in Emilia Romagna between Comacchio and Cesenatico, close to the river Po mouth. In 2012, also non-common species in the North Adriatic were found stranded: stripped dolphin (*Stenella coeruleoalba*) and Risso's dolphin. In general, natural disease/pathological conditions are recognized as the main causes of mortality. Several pathogens likely derived from land and enter the marine environment through rivers and land-based activities inputs, as well as through ballast waters. High is the rate of human related mortality, which was recognized as the cause of strandings in the 40% of the animals mainly due to fishery activity. Such mortality events are mainly detected in summer (June,

July) and autumn (September and October, likely due to the increased monitoring and reporting efforts related to touristic activity and the beginning of the fishing activity in autumn).

Since bottlenose dolphins are widespread in North Adriatic, as well as fishery and transport are present and intense in all the area, we consider the critical issue derived from the conflicts between such uses and *Tursiops truncatus* present at the entire case study area scale. This species does not show particular seasonal fluctuations in terms of populations distribution. It is in fact present all year long in all the Adriatic basin. However, higher population density has been identified from October to March and from April to September. The future trend of bottlenose dolphin population in terms of conservation status and vitality is unknown due to lack of detailed data on its distribution and abundance on wide temporal scales. However, simulation model results indicate the potential for steady-state distribution and abundance values in the near future. Such predictions, however, do not consider the future trends related to the impacts of human activities on bottlenose dolphin populations, for this reason the Precautionary Approach has to be strictly applied.

The loggerhead turtles (*Carretta carretta)* populate the North Adriatic mainly during spring and summer, thus moving southward when temperatures drop down. This species probably uses the west coast of the North Adriatic as migratory corridor and in general it is difficult to define specific areas where this animal is mainly concentrated. However, it has been identified one highly frequented site in the case study area, which is Goro. In the framework of the NETCET project, in the period 2012-2015, numerous dead sea turtles were found and analyzed to detect the reason of the mortality events. Only in 2013, 442 sea turtles were found dead in Italy coasts, and numerous were found in the case study area. The main reasons of this mortality were identified to be: pollution (chemicals and macroplastics), infections, anthropic activities (fishing and maritime transport).

Both cetaceans and sea turtles in North Adriatic do not show a defined and limited spatial distribution in the case study area being both migratory groups of animals. For this reason, their monitoring and protection activities must cover the entire case study area and must be constant. However, some important areas for this megafauna can be recognized and also a seasonality can relate to them.

***Existing spatial management measures for megafauna***

There is only one MPA in the case study area.

Name of MPA: Miramare
Management measures: Activities are regulated differently according to 2 zones (A, integral reserve; B, general reserve). Commercial fishery and the general prohibitions (as at art. 19.3, Law 394/91) apply to both zones. Navigation, anchoring, bathing, scuba diving, leisure fishing (from shore only) are prohibited or regulated according to different zones. This MPA is also listed as Natura 2000 SCI (IT3340007).
Legal reference: Ministerial Decree 12/11/1986

Moreover, different Natura 2000 sites in the case study area, designated by Italy, actually list cetaceans and sea turtles as species present within the site.

*Tursiops truncatus*:
- Four IT SACs: “Laguna di Marano e Grado”; “Foce dell'Isonzo - Isola della Cona”; “Valle Cavanata e Banco Mula di Muggia”; “Carso Triestino e Goriziano”.
- Four IT SCIs: “Tegnue di Chioggia”; “Tegnùe di Porto Falconera”; “Trezze San Pietro e Bardelli”; “Area marina di Miramare”.

*Caretta caretta:*
-Five IT SACs: "Laguna di Marano e Grado"; "Foce dell'Isonzo - Isola della Cona"; "Valle Cavanata e Banco Mula di Muggia"; "Cavana di Monfalcone"; "Carso Triestino e Goriziano".
- Six IT SCIs: "Tegnue di Chioggia"; "Tegnùe di Porto Falconera"; "Trezze San Pietro e Bardelli"; "Area marina di Miramare"; "Vene di Bellocchio, Sacca di Bellocchio, Foce del Fiume Reno, Pineta di Bellocchio"; "Sacca di Goro, Po di Goro, Valle Dindona, Foce del Po di Volano".

### *Jurisdictional framework for cetaceans' protection*

The main responsible for the protection of cetaceans in Italy is the Ministry of the Environment, Territories and Sea, which can have the technical support of ISPRA, ARPAs, research institutes, universities, museums, manager of MPAs.

*Table E.1.2. 3. Jurisdictional framework for the protection of cetaceans in Italy (Source: Conservazione dei cetacei in Italia. Inquadramento strategico. Notarbartolo di Sciara, 2010)*

| | |
|---|---|
| Habitat Directive 92/43 CEE | *Tursiops truncatus* is one of the species listed in Annex II. In Italy, for the moment, there is not ZPS established for the protection of such species. |
| Marine Strategy Framework Directive 2008/56/CE | Some of the indicators identified from the Directive are relevant for the conservation and protection of cetaceans: 1,4, 7, 8, 10, 11. |
| ACCOBAMS (2001) | Juridical instrument at regional level specifically focused on the protection of cetaceans. The sub-regional unit of coordination in Mediterranean is RAC/SPA (UNEP-MAP) in Tunis. All the deliberations proposed by this agreement are not legally binding but voluntary, and for this reason often not efficient. |
| Barcelona Convention, SP/DB Protocol (1978) | In the first part of the protocol the institution of SPAMI (Specially Protected Areas of Mediterranean Importance) are foreseen, even in ABNJ. In the second part there is the list of species to be protected among which there are listed 18 species of cetaceans. |
| Convention on Migratory Species or Bonn Convention (CMS, in Italy 1983) | The objective is to protect the migratory species. Species of protection concern as well as that need international cooperation for their conservation are listed in Appendix I and II. In Italy, such Convention is accomplished through ACCOBAMS. |
| Convention of Berna (1979) | The objective is to protect the European wild fauna and flora. Such Convention is accomplished through the Habitat and Birds Directives. |
| Washington Directive (CITES) (ratified in 1975 in Italy) | This directive rule activities of extraction and international market of species or part of them beyond the 12 nm, in ABNJ, even if such activities are scientific objectives. The species of cetaceans ruled by this directive are 10, one of them is *Tursiops truncatus*. |
| UNCLOS (1982, ratified in Italy in 1994) | Art. 65: the member states, if they want, have the right of a) prohibit, limit and rule the exploitation of marine mammals; b) member states should cooperate for their conservation; c) in particular for cetaceans, member states should cooperate at the international level to protect, conserve, monitor and study these marine mammals. |
| Convention on Biological Diversity (CBD, 1992) | This convention establishes the criteria for the institution of MPA even in ABNJ even to protect pelagic and migratory species cetaceans included. |
| International Convention for the Regulation of Whaling (ICRW, ratified in Italy in 1998) | Thanks to this convention, Italy enters within the International Whaling Commission (IWC). |

### *Main concerns related with megafauna in NA*

Cetaceans and sea turtles are pelagic marine animals, migratory for nature. They used to move and spanning high distances following their own ecological boundaries. For this reason, political boundaries have no jurisdiction on them and the preservation and conservation of such animals need a common effort and cooperation at the international and transboundary level. Most of the maritime uses

affecting these animals produce impacts such as pollution (contaminants, marine litter and pathogens) and underwater noise that are difficult to spatially confine and manage. Thus, such impacts are transboundary for nature and distribution extent. The Habitat Directive prescribes to member states to monitor by-catch events as well as the adoption of mitigation measures that are not adequately followed. Especially, an increase in maritime traffic is expected in the next years, suggesting an increase in the conflict between this activity and cetaceans and turtles' conservation in the future. On the contrary, fishing effort and trawling fleet seem to be in decline. For this reason, fishery could not be the main threat for cetaceans and turtles anymore in the next years.

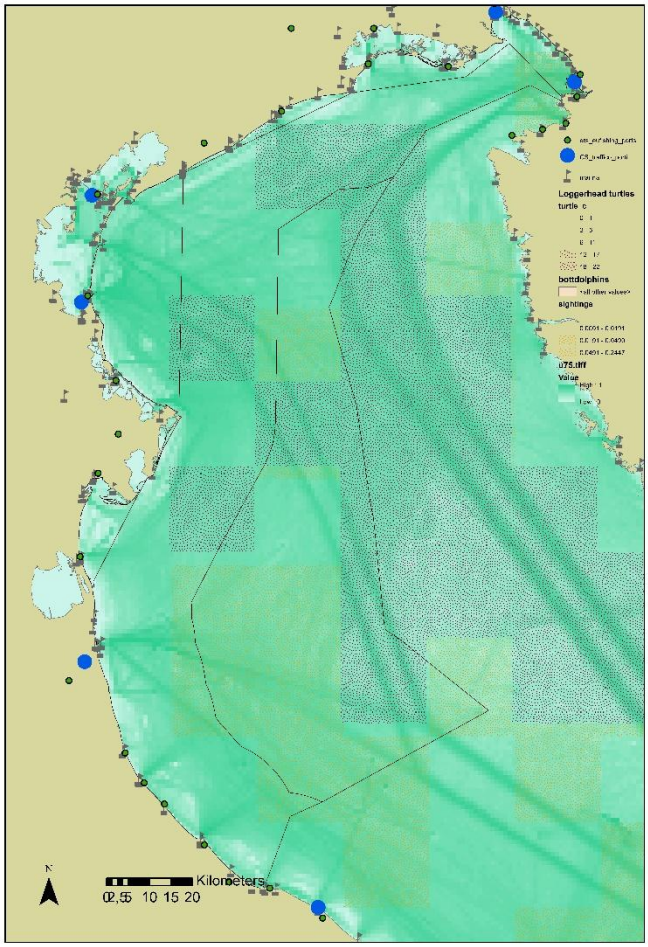



*Fig. E.1.2. 13 Spatial overlap between traffic lanes and dolphins and sea turtles' distribution in the case study area.*

Even cetaceans can negatively affect fishery activity. *Tursiops truncatus* has been widely observed in proximity of fishery vessels. This species, in fact, obtains benefits from the high abundance of preys that are caught by fishermen and on which they feed. This situation can lead to a decreasing efficiency in fishery activity not only for the subtraction of preys to fishermen, but also for the damages that dolphins provoke to the net and the fishing instruments (ISPRA report "Impatto e gestione della pesca in mare"). Avoid such interaction is important to ensure a more efficient and secure fishery activity.

The results obtained by the CEA model show that the fishery activity, in particular bottom and pair pelagic trawling, and the maritime transport are the human activities that mainly impact both marine

mammals and sea turtles. The main pressures derived by such activities and that negatively affect these marine groups are underwater noise and introduction of pollutants, marine litter and pathogens.

***Results***

Based on the comparison between the results of the marine spatial prioritization under multiple scenarios, the potential priority areas for conservation are identified in figure E.1.2. 14.

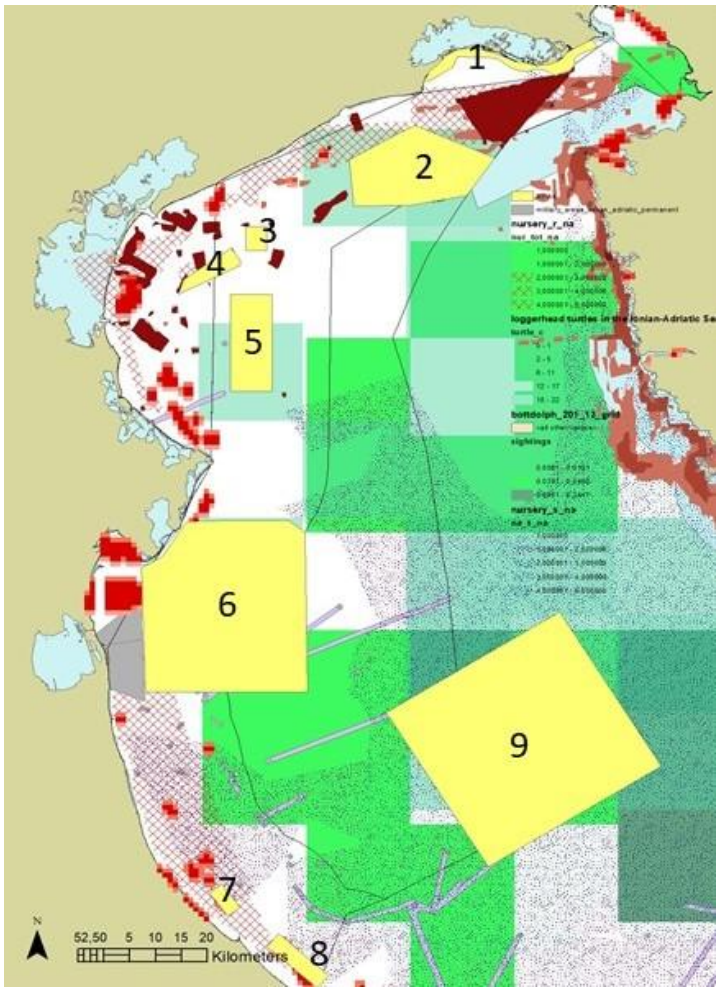



*Fig. E.1.2. 14: Potential priority areas for conservation.*

Each area is targeted to some conservation features, as reported in table E.1.2. 4.

*Table E.1.2. 4 Targeted conservation features per each potential area of conservation*

| | Potential new areas for conservation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Conservation features** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| **Seabed habitats** | | | | | | | | | |
| A5.531 - *Cymodocea* beds | x | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tegnue | | x | | x | | | | | |
| **Nursery and spawning habitats** | | | | | | | | | |
| *Engraulis encrasicolus* (European anchovy) recruits | x | x | x | x | x | x | x | x | x |
| *Engraulis encrasicolus* (European anchovy) spawners | x | x | x | x | x | x | x | x | x |
| *Mullus barbatus* (Red mullet) recruits | x | | | | | | x | x | |
| *Mullus barbatus* (Red mullet) spawners | | | | | | | | | x |
| *Pagellus erythrinus* (Common Pandora) recruits | x | x | x | x | x | x | x | x | |
| *Pagellus erythrinus* (Common Pandora) spawners | | | | | | | | | x |
| *Sardina pilchardus* (European pilchard) recruits | | x | x | x | x | x | x | x | x |
| *Sardina pilchardus* (European pilchard) Spawners | | x | x | x | x | x | x | x | x |
| *Scomber colias* (Atlantic chub mackerel) spawners | x | x | x | x | x | x | x | x | x |
| *Scomber colias* (Atlantic chub mackerel) recruits | x | x | x | x | x | x | x | x | x |
| *Scomber scombrus* (Atlantic mackerel) recruits | | x | x | x | x | x | x | x | x |
| *Solea solea* (Common sole) recruits | | | | x | x | x | x | x | |
| *Solea solea* (Common sole) spawners | | x | x | x | x | | x | x | x |
| *Trachurus mediterraneus* (Mediterranean horse mackerel) recruits | | x | x | x | x | x | | | x |
| *Trachurus trachurus* (Atlantic horse mackerel) recruits | x | x | x | x | x | x | x | x | x |
| **Special features - species** | | | | | | | | | |
| Sea Turtles - loggerhead turtles | x | x | x | x | x | x | x | x | x |
| Marine mammals (dolphins Adriatic) | | x | x | x | x | x | | | x |
| Seabirds (AIR) | x | x | x | x | x | x | x | x | x |
| Giant devil ray (Adriatic) | | x | x | | | | | | x |
| **Other seabed habitats** | | | | | | | | | |
| A4 | | x | | | | | | | |
| A5.23 - Infralittoral fine sands | x | | | | | | | x | |
| A5.25 - Circalittoral fine sands | x | x | x | x | x | | | | x |
| A5.26 - Circalittoral muddy sand | x | x | x | | x | | x | x | x |
| A5.35 - Circalittoral sandy mud | x | | | | | | x | x | |
| A5.36 - Circalittoral fine mud | | | | | | x | | x | |

## 2. Other effective area-based conservation measures (OECMs)

### *Definitions*

The recognition of the contribution of environmentally-valuable areas that are not MPAs to the achievement of marine conservation goals is expressed in the Aichi Target 11 of the Convention on Biological Diversity (CBD). This target refers to other effective area-based conservation measures (OECM) that could contribute to the achievement of conservation goals.

According to the World Commission on Protected areas of IUCN (IUCN WCPA, 2018), the OECMs are areas that contribute to conservation goals and objectives and deliver in-situ conservation. However, they differ from MPA by their management objectives (purpose and scope).

The IUCN defines three types of OECMs (IUCN WCPA, 2018):

- Type 1) Primary conservation: areas that meet all elements of an MPA but are not designated as such due to governmental priorities.

- Type 2) Secondary conservation: areas where conservation outcomes are actively pursued, but only as secondary management objectives.
- Type 3) Ancillary conservation: areas that deliver conservation outcomes as a by-product of management activities even though biodiversity conservation is not a management objective

***Framework for identifying OECM***

In order to identify OECMs, the IUCN proposed a screening tool that is based on the following criteria:

- Criterion 1. Ensure that the area is not already recognized and/or recorded as a protected area.
- Criterion 2. Ensure that Aichi Target 11, as opposed to other Aichi Targets, is the right focus (i.e., that the area is providing in-situ conservation of biodiversity).
- Criterion 3. Ensure that the area has the essential conservation characteristics of an OECM.
- Criterion 4. Ensure that the conservation outcome will be sustained in the long term.

In order to identify OECMs in the NA, we applied the process framework proposed by Shabtay et al. 2018, that guides the process of analyzing the management and the knowledge required to recognize an area as OECM. Moreover, in order to scientifically inform the process of OECM identification, we analyzed the reliability of data and information on which the analysis is based on. Peer-reviewed data were not available for all the potential sites under study, but it is required that OECMs should be scientifically robust (Diz et al., 2018). We applied the criteria proposed by Shabtay et al. 2018.

***Preliminary results for the NA***

In order to identify potential OECMs, we based the definition of potential "conservation outcomes" on the analysis performed for the definition of conservation targets in the NA (sec. 1 of this document).

Then, we identify all the areas that restrict access to navigation, including areas that restrict access to fishery. The types of restriction and related surface rates are reported in the following table E.1.2. 5.

*Table E.1.2. 5 Coverage of each restriction areas in NA in kmq.*

| **No access areas** | **typology** | **kmq** |
|---|---|---|
| | safety zone around platforms | 26.61 |
| | submarine exhaust pipes | 19.05 |
| | warning zones | 385.14 |
| | underwater pipelines | 151.77 |
| | anchoring areas | 46.38 |
| | military areas | 122.69 |
| | aquaculture sites | 46.00 |
| | aquaculture RER | 58.17 |
| | artificial reefs | 6.69 |
| | **tot** | **862.50** |
| NA Case study | | 10794.00 |
| | 3nm along the NA case study | 1628.04 |
| | 6nm along the NA case study | 3048.94 |

The areas that restrict access are distributed in the entire case study area, with high density in front of Emilia Romagna region (Fig. E.1.2. 15)

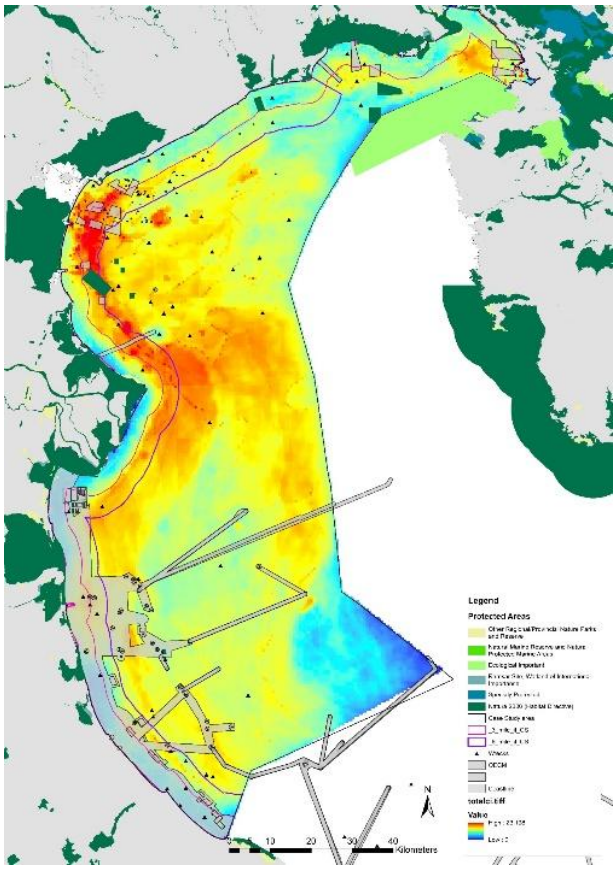



*Fig. E.1.2. 15 No access areas in NA*

In order to set the process of identification of OECMs in the NA, Shabtay et al. 2018 tested the potential identification of OECM in areas that restrict access and that are closed to existing areas managed for conservation, as the zone of biological conservation in front of Emilia Romagna and Veneto regions, and the Nature2000 site area of the Laguna of Marano-Grado. The areas restricting access were selected following the criteria of i) one per Region, and ii) of different types of restriction. In synthesis, the analysis shows that not all the areas that restrict access and fishing contribute to conservation, and to achieve conservation outcomes in the NA. The analysis must be produced on a case-by-case base, in order to verify the management regimes and provisions, potential threats to conservation because of the ongoing activities, and potential conservation outcomes in each site. Moreover, the knowledge and information available are scattered, resolving in significant uncertainties on the robustness of the selection process.

About the sites identified in this analysis of Shabtay et al. 2018, the results are the following:

1) In front of the Laguna of Marano and Grado, the two underwater pipelines for urban water discharge should not be suggested as OECM in the current planning cycle. Further examinations should be assessed in future planning cycles based on site monitoring on regular base.
2) In the Gulf of Venice in front of Chioggia, the aquaculture site could be considered as valuable for conservation and may be suggested as OECM after extensive monitoring. The LNG and gas platforms are found valuable for conservation and should be suggested as OECM. Yet, further monitoring and ecological modelling of the sites may be used in further

planning cycles to validate the decision. Wrecks should not be considered as OECMs since the site is not managed by a specific sector.

3) In front of the ER, the aquaculture site and the gas platform could be considered as valuable for conservation and may be suggested as OECM after extensive monitoring.

### 3. Global conservation strategy in the NA: measures proposal

***Priority areas for conservation***

The strategy is the result of the composition of multiple measures identified in the planning process. It emerges from all the contributions to conservation that have been depicted in multiple measures, including multiple benefits from aquaculture, fishery, and also targeted areas with conservation purposes, as new potential MPAs. The measures are elaborated in order to respond the criteria of representativeness, replication, and connectivity, through both multiplication of potential conservation sites of different type and also incorporating habitat redundancy, as well as to work to support connectivity by multiplying potential conservation sites of different type.

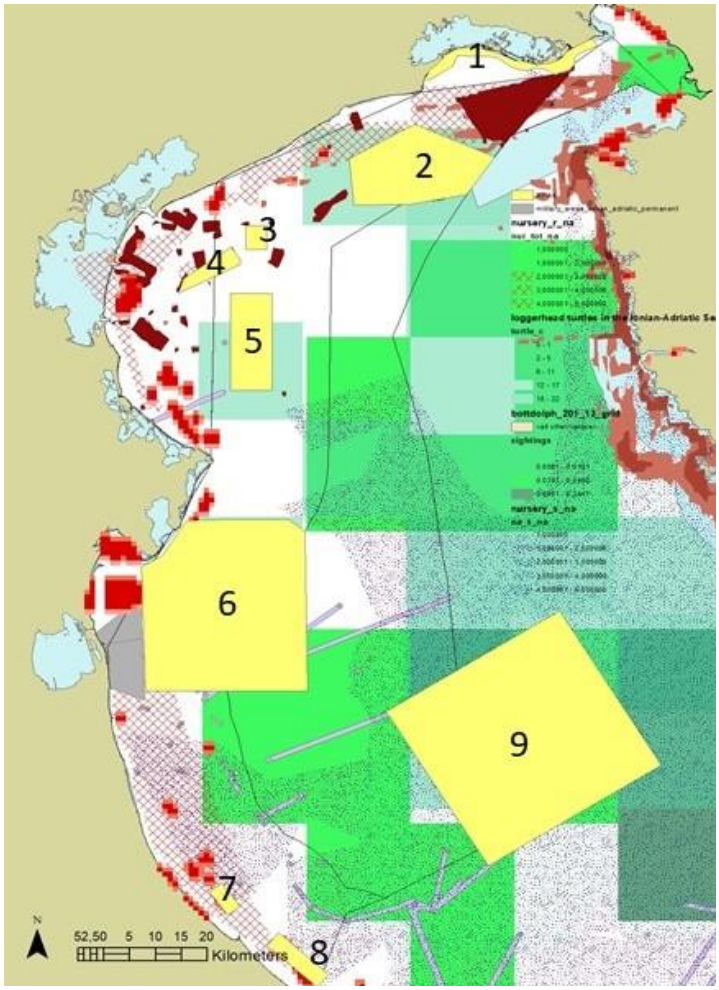



*Figure E.1.2. 14: Potential priority areas for conservation.*

***Specific measures targeting megafauna***

Since cetaceans as well as sea turtles are highly dynamic marine animals and since the environment where they live and that affect their distribution and behavior is even more dynamic, their protection should rely on a dynamic and adaptive approach that reflects the variability that characterizes the marine environment and its inhabitants. The Dynamic Ocean Management (DOM) is the opportunity to operationalize a multi-objectives and multi-criteria management decisions to monitor and protect cetaceans and sea turtles while managing mobile maritime uses, such as fishery and transport (Maxwell et la. 2015, Lewison et al. 2015). The measures here proposed should be considered for future management strategies and actions based on scientific data and technology that should be implemented and developed.

| | |
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| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area*<br><br>- Limitation of vessel speed and noise in particularly sensitive areas and on the base of the real-time data produced*<br>- Seasonal program related to fishery activity<br>- Obligation of selected fishing techniques | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area*<br><br>- Seasonal program related to fishery activity<br>- Acoustic system on the nets to discourage the cetaceans to approach the fishing instruments |
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br><br>- Monitoring programs to start the collection of long-term biological monitoring data:<br>- <u>sea turtles</u>: through direct observation of observers and by means of tracking techniques. In particular, in the proposed FRA identified to protect the soles, monitoring studies through observer and ad-hoc projects on the effect of the FRA not only on the protection of the soles, but also of cetaceans and especially turtles (more subjected to by-catch events due to gillnets) from by-catch episodes in the period during which fishery is prohibited (winter).<br>- <u>dolphins</u>: system of buoys and devices installed on gas platforms to collect data of presence and distribution in real-time<br>- Development of habitat suitability models fed by real-time satellite data for environmental parameters and by | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br><br>- Establishment of no take zones<br>- Establishment of corridors for megafauna where human activities are denied<br>- Definition of periods and areas where disturbances should be avoided.*<br>- Identification of alternative routes avoiding dolphins and turtles presence.* |

| | |
|---|---|
| monitoring data<br>- International agreements on mitigation measures for demersal megafauna<br>- Implementation of data portals where present and past collision events between vessels and cetaceans are registered.*<br>- Calculation of percentage probability of collisions and risk.*<br>- Interview with fishermen and logbook for each of the by-catch events.*<br>- Awareness campaign to encourage and favor the diminishing use of plastic and the cleaning of the coasts | |

**Integrated in the Dynamic Ocean Management strategy*

In this analytical study, four areas of particular interest for dolphins and sea turtles were identified (2, 5, 6 and 9). This is the first step from which monitoring studies should start to allow the collection of long-term scientific data and the development and implementation of technologies should be finance for the protection and conservation of both these marine animals on which the DOM approach should be based. Thus, these areas should not be considered as fixed areas, but on the contrary they will move following the real dynamism of the marine environment and the animals of priority concern in the area.

***Specific measures to address localized concerns: reorganization of the anchoring areas in front of the Venice Lagoon inlets to reduce the impacts on Tegnue habitats***

The analysis reports a potential overlapping of the anchoring areas in front of the Venice Lagoon Inlets, and the priority habitats of the Tegnue (fig. E.1.2. 16). The current analysis is based on a model of the probability distribution of the Tegnue in the Northern Adriatic (source: MEDISEH-MAREA). In order to control and reduce potential negative effects on the Tegnue, the following actions are suggested: 1a) to produce a specific study on the location of the Tegnue in the area, 1b) to re-design the current anchoring sites, in order to locate the sites in areas that do not insist on the Tegnue, 1c) to monitor the operation activities of ships anchoring, in order to reduce the potential impacts on the Tegnue, 1d) to explore potential advanced technologies and solutions in anchoring, that might reduce the impacts of anchoring on benthic habitats.

These proposed measures are urgent, because of the expected increase in maritime traffic of the Port of Venice, and related request for anchoring outside the inlets, due to the potential operations of the MOSE closures in the future.



*Fig. E.1.2. 16 Potential overlap of the anchoring areas in front of the Venice Lagoon Inlets and the priority habitats of the Tegnue*

***Description of potential tools to implement priority areas of conservation***

At present, the areas 1-8 cover 1714 km$^2$, out of which it is necessary to identify 829 km$^2$ of Marine Protected Areas. About potential management measures, a proposal is reported as following:

Area 1. We propose this area as MPA of Laguna of Marano Grado, to protect seagrass meadows of *Cymodocea nodosa* and *Posidonia oceanica*

Area 2. We identify this area as a priority area of conservation for sea turtles and dolphins. A potential implementation measure could be related to the designation of Marine Protected Area or other potential zoning measures as for example a zone with temporary regulations for maritime traffic according to a Dynamic Ocean Management approach.

Area 3. We propose this area as Zone of biological protection (ZTB) of nursery and spawning grounds.

Area 4. We propose this area as ZTB or as MPA to protect the Tegnùe.

Area 5. We identify this area as a priority area of conservation for sea turtles and dolphins. A potential implementation measure could be related to the designation of Marine Protected Area or other

potential zoning measures as for example a zone with temporary regulations for maritime traffic according to a Dynamic Ocean Management approach.

Area 6. We identify this area as area especially oriented to sea turtles' protection and monitoring. The management measures of the area have to be found in synergy with all the uses present in the area (i.e. aquaculture and military area). A Dynamic Ocean Management approach can be proposed also in this case.

Areas 7-8. We propose this area as OECM of type 2 or 3 through the potential positive environmental benefits from other uses. This area is suitable for aquaculture, can deliver multiple benefits to support fish populations, and in multi-use context (i.e. tourism and fishery). Another option could be to establish a MPA where multi uses are managed sustainably (tourism, fisheries and aquaculture). An MPA could give better communication for purpose of disseminating and communicating environmental multiple benefits deriving from marine conservation.

Area 9. This area has been proposed as Fishery Restricted Area for the Sanctuary of Soles (FRA). This area produces several environmental benefits on marine food webs and we propose monitoring measures to verify the environmental benefits of this FRA also for other aspects of marine conservation (e.g. megafauna conservation, potential risks of by-catch).

***Measure to identify and designate OECMs in the NA***

As resulting from the analysis, only few sites selected have the potential to be identified and subsequently recognized as OECM. Some measures are envisaged in order to identify and recognize OECM in the Northern Adriatic.

1) Proceed with site-specific monitoring of the areas that have the potential to become an OECM, as resulting from the analysis presented in par. 3
2) Discuss with the management authorities about the potential to become OECM, in relation to benefits (e.g., licenses renovated in time) and potential constraints (e.g. limits in diversification of the economic activity in place)
3) Establish and implement a monitoring program for the sites that might be consider as OECM
4) Establish a technical group to elaborate and define the legal form of agreement about the designation of OECM, with the legal offices of the Regional Administrations, the Ministries and the private companies involved in the management of the sites.

In this analysis, wrecks were not included because they are not currently managed by any specific authority. They could be potentially included in case of opportunities of multiple benefits deriving from activities as tourism.

### *E.1.2.5. Supporting synergies between uses: the potential of tourism in the NA*

Concerning the potential of tourism in the NA, we propose here to identify areas where to develop tourism in synergy with the following uses: small scale fishery, aquaculture, environmental protection, underwater cultural heritage, oil & gas decommissioning platforms. The implementation of measures has been based on the possible actions for multi-use development and overcome specific barriers, mainly administrative and legal, but also technological, that have been identified within the Mediterranean (Depellegrin et al., 2018; 2019; Schultz-Zehden et al., 2018) and the Northern Adriatic Case Study (Castellani et al., 2017) of the MUSES project - Multi-use in European Seas (https://muses-project.eu/).

The following maps (Fig. 1.2. 18a-f), substantially, take a picture of the current situation and they do not provide a representation of a planning scenario. The analysis is performed at a multi-use level for the single couple of combinations (Fig.1.2. 18a-e) and the whole overview considering of the uses in synergy with tourism (Fig.1.2. 18f), in order to identify the most interested areal for the tourism-driven multi-use activities.

| | |
|---|---|
| *Figure E 1.2. 18a. Tourism (indicator "tourism presence at 2016") and small-scale fishery (total number of operations carried out in 2017)* | *Figure E 1.2. 18b. Tourism and Aquaculture: in dark green high suitable areas, in light green medium suitable areas and orange low suitable areas* |

| | |
|---|---|
| *Fig. E 1.2. 18c. Tourism and environmental protection* | *Fig. E 1.2. 18d Tourism and underwater cultural heritage* |
| *Fig. E 1.2. 18e Tourism and oil and gas platforms* | *Fig. E 1.2. 18f Whole picture of all tourism-driven combinations* |

Tourism and Small-scale fishery

For the combination of tourism and small-scale fishery, two kinds of interested areas can be considered in fig. E 1.2. 18a above:

1. Areas where tourism (using the number of presences as indicator) is more developed and where the small-scale fishery effort is higher: along the Venetian coasts from Venice to Bibione and close to Rimini in the southern area. This means that these areas can be potentially further developed from a tourism-driven multi-use point of view: greater the small-

scale effort, greater the competition among fishermen cooperatives, thus greater the interest in diversifying the fishery product and therefore pescatourism activity.

2. Areas, which do not register the highest presence of tourism, but have potentialities for other types of tourism, like "Naturalistic/green/sport" tourism (e.g. Po Delta Park, Valli Comacchio, Sacca di Goro, Pialassa della Baiona, Caorle, Marano and Grado lagoons…): they currently provide a lower offering of products, but have good potentialities to be further developed.

In addition areas interested by the small-scale fishery measures can be considered: putting the trawling limit at 6 nm automatically doubles the area of activity for the small scale fishery, so potentially the area interested by this multi-use can be extended to that limit.

Tourism and Aquaculture

For the combination of tourism and aquaculture, two kinds of interested areas, where to develop the combination of tourism and aquaculture activities (see Figure E 1.2. 18b above), can be identified:

1. Areas where aquaculture sector is already in place: a) along the coast of Friuli Venezia Giulia; b) along the Venetian coast out of Venice; c) out of Delta del Po area; d) Goro; e) from Ravenna to Rimini;
2. In addition, broader areas, including high-medium-low suitable areas where to develop aquaculture.

Tourism and Environmental Protection

For the combination of tourism and environmental protection, the main areas have been identified on the basis of the current location of protected areas (see Figure E 1.2. 18c above): Miramare, Tegnue, ZTB "Fuori Ravenna", ATB-reef, Natura 2000 site "Paguro" and Bibione reef.

The Paguro case is a cross/transversal element both to this combination and to the following ones as it is indeed a submerged and wrecked platform.

A particular consideration has to be made for the artificial reef in Bibione http://www.vivibibione.com/b-reef/, currently the only case of artificial reefs used for tourism purposes. Possibly in the future other artificial reefs can be adapted to tourist activities: Bibione reef at around 3 nm from the coast of Bibione, area 1,5 km x 350 mt.

Tourism and Underwater Cultural Heritage

This combination concerns the touristic or recreational activities with the protection of underwater archaeology and its adjacent marine ecosystems. The existing examples are: the Natura 2000 site "Paguro" a gas platform wreck that collapsed in 1965 and the Bibione reef (see Figure E 1.2. 18d above).

In this analysis all wrecks are potentially good areas where to develop this combination. Considerations on priority UCH sites or on those where there is no interest for the promotion of this multiuse, have to be made on the basis of several criteria. The key barriers to the development are mainly related to the access of the sites.

Two types of touristic activities can be involved in this MU: dry footed access with land-based museums to display the richness of local UCH or use of glass bottom boats to UCH locations for the non-diving public. Another type is diving tourism where in situ access is given to scuba divers to view

UCH sites. The popularity of this MU can be limited due to the sporadic location of UCH sites which are, in some cases, too far from the coast to be suitable for diving. In the Mediterranean Sea, where the risk of theft is very high, archaeological authorities are often reluctant to provide information about and facilitate access to UCH sites. In general, the number of tourists that can engage in this MU is limited to the ones having specialised skills and certification (e.g. ISO, PADI, CMAS, SSI, NAUI).

Tourism and Oil and Gas decommissioning platforms

For the combination of tourism and Oil & Gas decomissioning (see Figure E 1.2. 18e above), the interested areas can be identified on the basis of two levels of considerations:

1. The decommissioning platforms can be converted into artificial reefs, as the so called 'rigs to reefs' concept (BOEM, 2012; EBN, 2016; Barbanti et al. 2017), promoting environmental conservation and biodiversity and allowing new tourism and recreational uses. Example SIC IT4070026 "Relitto della piattaforma Paguro". See "Oil & Gas critical issue".
2. All the platforms, and not only those in the decommissioning process, can be potentially in decommissioning and thus considered from possible future reuse in connection with touristic activities, not only rigs to reef option. See "Oil & Gas critical issue".

As already mentioned in section C.3.1, possible measures with tourism have to take into account:

1) increase of conflicts with other uses, generated by the increase of tourism, mainly for what concerns tourism transport and touristic activities (leisure boat, scuba diving etc.) in the marine areas.

2) increase of impacts on the coast and on the marine area, inevitably generated by the increase of tourism intensity, even if a sustainable approach has been adopted.

3) barriers to be overcome (Depellegrin et al., 2018a; Castellani et al., 2017; Schultz-Zehden et al., 2018). Among the main ones, are the legal and administrative barriers (e.g. procedures required to get licenses for pescatourism, funding availability and the need for adaptation of aquaculture vessels, fragmentation of competences among different institutions or among different divisions/departments of the same institution, and lack of cooperation):

- Strict regulation for safety and security of carrying tourists on boats
- Lack of financial support for boat adaptation
- Adaptation of boats to carry tourists
- Lack of national legal frameworks for aquaculture and tourism
- Lacking entrepreneurship
- High degree of specialization required by sectors involved
- Accessibility to UCH site requires particular skills (e.g. diving)

**Portfolio of measures**

| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area* | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area*<br>- Measures to reduce the marine litter generated by tourism activity and by |
|---|---|

| | |
|---|---|
| | the other activities (aquaculture, UCH, oil and gas) with which tourism is in combination<br>- Measures to reduce the impact tourism in coastal areas<br>- Measure to manage the tourism presence in coastal areas in order to prevent damage to the marine environment and other elements (e.g. UCH…) |
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br>- Environmental monitoring in correspondence of bathing areas<br>- Identify better practices for the management of the tourism sector in all its aspects (activities, facilities, pressures/impacts)<br>- Overcoming of the barriers (mainly legal and administrative but also technical etc..) to develop tourism-driven multi-uses | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br>- Identification of areas where to promote tourism and its synergies with other sectors (small scale fishery, aquaculture, environmental protection, UCH and oil and gas decommissioning)<br>- Identification of areas, where not to develop tourism activity, if any (e.g. areas particularly industrialized and/or polluted?) |

### *E.1.2.6. Other potential measures*

**Identifying areas for renewable energy production: the case of offshore wind in Emilia Romagna Region**

Based on wind climatology, the area most favoured for a possible wind energy exploitation appears to be the marine area in front of the Emilia-Romagna Region. The exploitation of this potential, even if not so high (specific producibility at 100 m m.s.l.between 1000 and 1500 MWh per MW installed; RSE, 2017) is favoured by the shallow water depth, by the type of seabed (silty-sandy) and by the synergies that can be activated with the infrastructures already present at sea and on land, including the presence of the Ravenna power station for the introduction of the generated energy into the grid.

In line with the aims of the study, the analysis overlooked the options for installing mini-wind turbines on existing structures (less than 10 kW), with clear and limited scope to support self-consumption, but was aimed at identifying areas that lend themselves to accommodate large size industrial wind plants, between 50 and 100 MW of installed power. Considering turbines with power ranging between 3 and 8 MW, a number of turbines constituting the range between 15 and 30 and a minimum distance of about 1 km, the search for optimal areas was directed towards rectangular-like areas having a surface between 10 and 20 $km^2$.

Three areas of interest have been identified (Fig. E 1.2. 19 and table E 1.2. 6), taking into account the following criteria:

- Results of previous studies (e.g. 4POWER, POWERADE, Coconet, RSE for MISE);
- Energy potential of the area;
- Distance from the shore (>6 nm) and water depth;
- Available infrastructures (e.g. Porto of Ravenna, platforms, terminal, sealines);
- Minimum dimension of the areas;
- Environmental and landscape aspects (e.g. visual conflicts);
- Potential conflicts and synergies with other uses.

The proposed spatial measure derives from the results of the analysis carried out within the RITMARE - ICM-MSP project in the Adriatic-Ionian Region (Barbanti et al., 2017; Barbanti and Perini, 2018).

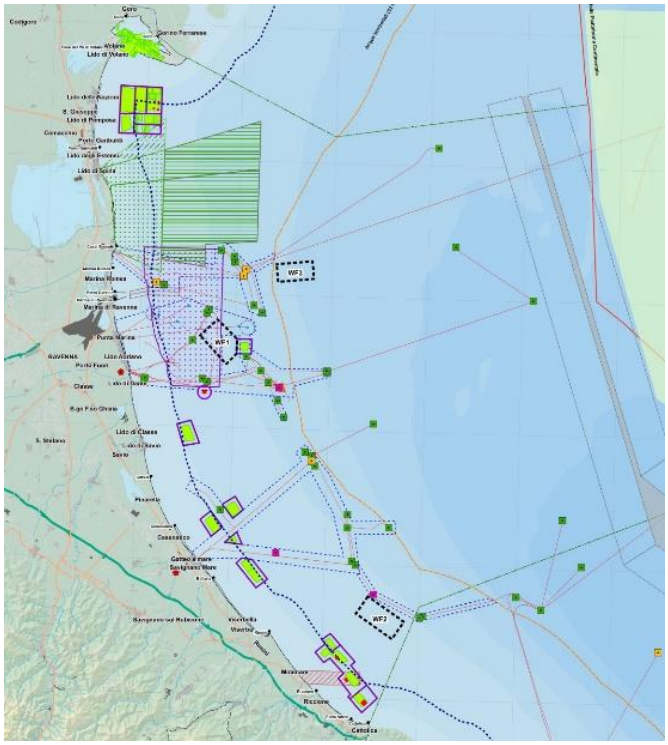



*Fig. E 1.2. 19 – Location of the three areas of interest for off-shore wind farms (WF1, WF2, WF3).*

Table 1 summarizes the salient characteristics of the three identified areas and the elements of potential conflict or synergy (e.g. decommissioning platforms, aquaculture plants) with other uses already present or expected in the future, considering also other spatial measures proposed in the present study.

*Table E. 1.2. 6 – Main features of selected areas of interest for off-shore wind farms.*

**Portfolio of measures**

| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area* | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area* |
|---|---|
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br><br>- Reduction / mitigation of impacts during construction based of Environmental Impact Study results<br>- Administrative procedures favouring a fast licensing and permitting process<br>- Economic incentives | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br><br>- Identification of areas of interest of offshore wind farm installation<br>- Definition of rules of coexistence / multi-use of areas for OWF (e.g. tourism, aquaculture, fisheries, O&G). |

### Reducing conflicts between military areas and other uses in Emilia Romagna Region

As described in the analysis of critical issues, conflicts of military uses of marine areas with other uses are limited within the Case Study Area to an area located in front of the Emilia-Romagna coast ("ECHO 346 Foce Reno"). Despite its relatively small extension, conflicts with fisheries, maritime transport and coastal and maritime tourism are locally important.

The proposed spatial measure derives from the results of the analysis carried out within the RITMARE - ICM-MSP project in the Adriatic-Ionian Region (Barbanti et al., 2017; Barbanti and Perini, 2018).

It provides for an area reduction of the maritime space occupied by the military polygon. In particular, it is proposed to evaluate the possibility of (Fig. E 1.2. 19):

- reduce zone B1 and B2, so that the maximum interdiction distance according to the orders issued is reduced from 11 to 7 nautical miles;

- reduce the A1 + A2 area, in order to allow transit and navigation in a wider portion of the sea, which, in the parts excluded from the restriction, would remain prohibited to fishing and anchorage due to the possible presence of unexploded munitions on the bottom, up to the munition reclamation, as required by current regulations.

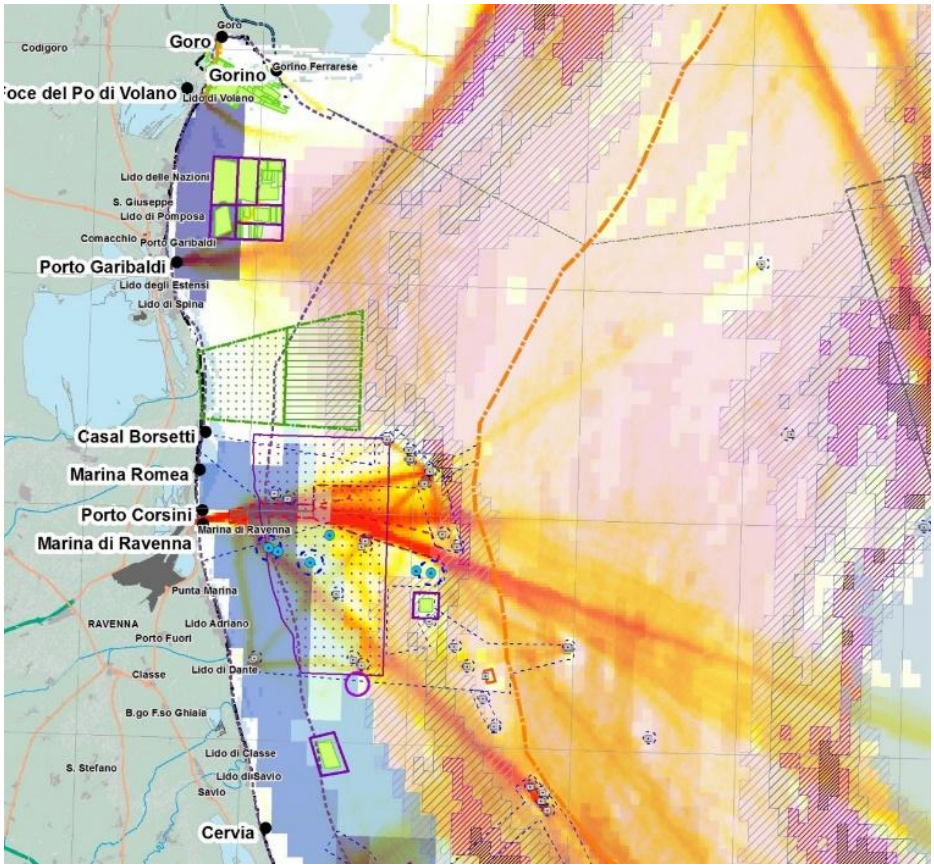



*Fig. E 1.2. 19 Proposed reduction of the military area. Other uses present in the area relevant in terms of conflicts and benefits in case of reduction of the military uses are also shown.*

The possible reduction of the military area and the related constraints would:

- facilitate navigation in the area, including leisure boating and sport fishing;

- increase fishing areas, both trawl and small-scale fishing;

- free areas potentially suited to aquaculture.

The military polygon represents a resource of fundamental importance for the training activities for the Army, being the only training infrastructure of central and northern Italy in which it is possible to use some specific types of weapons (individual and ward of various calibres). Furthermore, it is also functional for training activities conducted by other armed forces and bodies of the state. For the Foce Reno polygon there is a regulation accompanied by a specification for use which, on 30 May 1996, was signed by the commander of the 6th Territorial Operating Command and by the Councilor for the programming and planning of the Emilia-Romagna Region. The disciplinary, aimed precisely at regulating training activities on the local situation, provides in Article 2 for the tacit extension, unless one of the contracting parties makes a specific request for revision. From this it follows that any proposed variation must follow the procedural procedure envisaged by the aforementioned agreement, as already happened after 2013, in order to mitigate the impact on the free uses of the sea.

The proposal described here should therefore be considered as a supporting element for a discussion with the competent military authority and checked against its practicability from the point of view of the needs of military training.

**Portfolio of measures**

| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area* | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area* |
|---|---|
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br><br>- Monitoring the respect of rules for permanent and temporary prohibitions<br>- Remediation from unexploded munitions in A1+A2 areas out of military uses. | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br><br>- Reduction of the extension of areas A and B type.<br>- Further adjustments of military exercises schedules (e.g. hours of the day and days of the week), to limit conflicts with fisheries. |

**Managing in a MSP framework and perspective the oil and gas platform decommissioning issue in Emilia Romagna Region**

The proposed spatial measure derives from the results of the analysis carried out within the RITMARE - ICM-MSP project in the Adriatic-Ionian Region (Barbanti et al., 2017; Barbanti and Perini, 2018).

As described in the chapter C.3.1, the energy sector is well present in the area, and will continue to be, on the side of fossil sources (gas). Its compatibility with the system of uses, with particular reference to tourism, is not in question, as other analyses have already shown, without prejudice to the important problem of subsidence induced by the extraction platforms closer to the coast. The progressive decommissioning of platforms that reached the end of their productive life can be implemented with traditional methods of removal and conferment / recycling on the ground, but can also be addressed through forms of reuse, in place or in surrounding areas, which favour other uses, even combined, and also bring environmental benefits. Here we analyse these options and propose a preliminary spatial declination, which must necessarily be deepened with the sector operators and the competent Administrations.

The options for disposal and reuse examined and proposed belong to two different categories:

[A] Dismantling of platforms and their reuse in water to create artificial reefs ("rigs-to-reefs");

[B] Reuse for different uses of the platforms maintained in place, following their mining closure.

Option [A] - rigs-to-reefs

This option can be applied to all types of platforms to be dismantled in the area, as a total or partial alternative to the disposal and / or reuse of materials on shore. This option is widely practiced in the United States and other countries (https://www.bsee.gov/) and has already been implemented in the site called "Paguro", located about 12 nm from Marina di Ravenna in correspondence of a former methane extraction platform collapsed in 1965. In the area were subsequently disposed in the period 1990-2000 the steel jackets of about 20 other dismantled platforms. Subsequently, the site was included in the Natura 2000 Network (SIC IT4070026 "Wreck of the Paguro platform") and is now the destination of an intense underwater tourism activity.

The expected benefits of this option are:

- creation of suitable habitats for a variety of species both of hard substrate and of the original habitat;

- protection and support for areas of reproduction of some species;

- possible creation or integration in protected areas;

- opportunities for recreational activities (fishing, diving), tourism development, small professional fishing implementation, marine research and monitoring.

In addition to problems related to the current regulatory framework, the main aspect that must be analysed is that of the best identification of the site or sites for the creation of artificial reefs, mainly in relation to:

- Substrate characteristics;

- Ecological coherence with the present animal and plant habitats and communities and expected effects;

- Coexistence and relationships with areas with existing constraints (eg Natura 2000 sites, Biological Protection Areas (ZTB), Biological Protection Areas (ATB);

- Interferences with navigation;

- Interference with other uses (eg fishing and aquaculture, maritime traffic);

- Possible synergies with other uses, primarily tourism (boating, diving) and fishing (sport fishing, fishing tourism).

Considering these aspects, four areas have been preliminarily identified (Fig. E. 1.2 20) for the possible creation of artificial reefs by means of parts of dismissed platforms, whose salient features are reported in Table E 1.2. 7.

*Fig. E. 1.2. 20. Platforms to be decommissioned in front of the Emilia Romagna coast, with indication of the areas for possible on site and off site (rigs to reefs) reuse.*

*Table E 1.2. 7 - Salient characteristics of the areas provisionally identified for the creation of new artificial reefs using parts of dismissed platforms.*

| **Area** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|
| **Position** | North of the platform Porto Corsini MWA (dismissing) | Around the platform Diana (dismissing) | Within the Biologic Protection Area Bevano (artificial reefs) | Offshore the city of Riccione, close to artificial reefs |
| **Depth** | 13-14 meters | 15 meters | 14-15 meters | 12-14 meters |

| | | | | |
|---|---|---|---|---|
| **Seabed** | Silt (d50 = 5 phi)<br><br>EUNIS Habitat A5.35 (Circalittoral sandy mud) – A-5.36 (Circalittoral fine mud) | Fine silt (d50 = 6 phi)<br><br>EUNIS Habitat A-5.36 (Circalittoral fine mud) | Fine silt (d50 = 6 phi)<br><br>EUNIS Habitat A-5.36 (Circalittoral fine mud) | Coarse silt (d50 = 4.5 phi)<br><br>EUNIS Habitat A5.35 (Circalittoral sandy mud) |
| **Legal constraints** | Within the BPZ "Fuori Ravenna": trawling is forbidden and other fisheries are strictly regulated | Within the BPZ "Fuori Ravenna": trawling is forbidden and other fisheries are strictly regulated | Within the Biologic Protection Area Bevano: trawling isforbidden and other fisheries are strictly regulated | None |
| **Possible synergies with other platforms** | Options for reuse of the dismissing Porto Corsini MWA platform, conditioned however by the security area of the platform Porto Corsini MWT that remains operational | Options for reuse of the dismissing Diana platform (e.g. deposit, reception, monitoring and surveillance, etc.) | None | None |
| **Potential conflicts** | Low maritime traffic | Low maritime traffic | Low maritime traffic | Low maritime traffic |

Option [B] - Reuse for different uses of the platforms maintained in place, following their mining closure.

The starting point for evaluating reuse options is represented by the structural / morphological characteristics of the platforms to be decommissioned. For monotubular platforms, the only realistic use is that of environmental monitoring (observations of various kinds), of support for telecommunication / data transmission systems or as a possible connection point for wind turbines.

The Porto Corsini MWA reticular platform has dimensions and characteristics that could make it very interesting for the conversion to other uses. Even the position, only about 4 miles from the port of Ravenna, appears in this sense particularly valuable. The close presence of the Porto Corsini MWT 4-leg network platform (transit platform, without connected wells) and the structural features of the platform, its status and maintenance needs remain to be verified. In fact, the age of the platform, built in 1968, could make its maintenance in place and reuse problematic or too expensive. The area north of the platform was previously considered for the possible creation of artificial reefs (Area 1), which

could find synergies with the platform itself (logistic base and deposit to support artisanal and sport fishing and diving, visitor center, etc.). In the same range, traditional and innovative aquaculture activities could be carried out (mussels, oysters, fish, algae, multitrophic aquaculture), also with an experimental character. Beyond that, it is possible to hypothesize other uses of the platform directly related to coastal and maritime tourism: residential use, catering, yachting, etc. The platform could also perform an environmental monitoring function, within the framework of an integrated and multi-faceted observing system. function of the Adriatic, and could host laboratories and support structures for educational activities and scientific and industrial research. With regard to possible conflicts with other uses, it should be noted that the area is already forbidden to trawling (ZTB "Outside Ravenna") and it should be noted that it is affected by a very modest maritime traffic.

Finally, the 2 bitubular-cluster platforms in the area (Diana and Azalea A) with appropriate infrastructural interventions could be able to host on-board "light" support activities for activities that take place in their vicinity, as well as being able to host, also in this case, environmental monitoring systems and small laboratories. The hypothetical uses for these structures, appropriately adapted, could concern:

- Support for aquaculture activities;

- Support for wind energy production activities, both for generation in a wider context of wind farms, for storage in the form of hydrogen or for ground transport of energy produced;

- Support for LNG management and distribution activities for and for maritime transport.

The feasibility of these re-use options for platforms subject to next decommissioning, as a whole and in its many different aspects, is currently subject to an important series of barriers which, at least in the short term, compromise the real possibility of implementation. It is possible to identify legal and administrative-procedural barriers, socio-economic and environmental, which need to be addressed with specific actions and measures.

**Portfolio of measures**

| **INPUT MEASURES:** *measures that influence the inputs to human activities in a marine area* | **OUTPUT MEASURES:** *measures that limit the outputs of human activities in a marine area* |
|---|---|
| **PROCESS MEASURES:** *measures that specify the nature of the process of human activities in a marine area*<br><br>- Environmental monitoring of decommissioning activities and results<br>- Clearer legal framework allowing reuse on a case-by-case basis and defining liabilities<br>- Detailed technical and permitting guidances | **SPATIAL AND TEMPORAL DISTRIBUTION MEASURES:** *measures that specify where and when human activities can occur in a marine area*<br><br>- Identification of areas potentially vocated for artificial reefing.<br>- Consider and promote synergies with other sectors (MRE, LNG, aquaculture, tourism, leisure boating) during the planning and management phase. |

## E.2. LESSONS LEARNED AND CONCLUSIONS

According to Ehler and Douvere (2009), a maritime spatial plan must give an integrated vision of the spatial aspects and needs of sectoral policies in the areas of economic development, maritime transport, environmental protection, energy, fisheries, tourism and so on. A maritime spatial plan should be closely integrated with the public programs and highlight the spatial dimension of integrated management, derived from the system of existing policies and plans at local, regional, national, EU and international levels, providing a common vision and consistent direction, setting out shared principles, goals, objectives for the area and defining what these priorities mean in time and space.

The Northern Adriatic case study explored the possibilities, opportunities and weaknesses of applying MSP in the area to promote sustainable and long-term maintenance and development of coastal and sea uses. The exercise performed in the Italian Northern Adriatic clearly illustrates how the challenges to MSP implementation in intensively used areas can be addressed. This work may constitute a solid base for planning at national and regional level, in order to foster proper decisions and to support management and conservation actions of environmental components after a thorough understanding of present and future threats and impacts.

The definition of spatial limits for the Case Study has been elaborated considering needs and priorities that emerged from the Initial Assessment, as well as to foster a proper analysis on human uses, ecological processes, synergies and conflicts, and define recommendations to establish proper strategies and plans. The geographical extent of the case study area is meant to intercept external instances that might influence MSP in the case study, understanding processes (both ecological and social), connections (e.g. biological, physical, within and across communities and economies) at different scales (e.g. local, regional, national scales). Then, MSP issues, possible management and planning actions have been refined in focused analyses at local scales and, depending on the characteristics of the concerns, proposing approaches and planning measures with different spatial resolution. In the Case Study exercise, we have been able to understand which problems should be solved with strategic plans and which instead require more precise spatial measures (e.g. environmental protection).

The case study was built on the capitalization of previous projects which facilitated and strengthened data and knowledge gathering. Moreover the case study fostered the continuation of the process of involvement and confrontation dialogue with local and national stakeholders, capitalising on projects such as SHAPE, ADRIPLAN, RITMARE and MUSES, to build an effective and inclusive stakeholder engagement process. A robust capacity building process has been at the core of the exercise, through the exchange of best practices and knowledge.

As a first instance, the effectiveness of the planning decisions is strongly dependent from the quality of the data and information taken in account. Therefore, it is considered necessary for the purpose of the maritime space within the case study area to further improve the quality and the completeness of the data used to strengthen the assumptions made for the assessment. The difficulties encountered for the preparation of a solid knowledge framework, one of the important results of the study, reflect the level of available information on the predominant activities, pressures and environmental components. Lack of detailed quantitative data in some cases limited the possibility to produce accurate geo-referenced maps to support the MSP analysis. Using of a common and shared methodology in the construction of the information framework, establishing an infrastructure for spatial information to support planning and environmental policies (e.g. INSPIRE directive 2007/2/EC compliant), in the analysis of conflicts, synergies and impacts is very important to obtain an accurate and agreed identification of the main issues of the MSP process, and their description. Documentation and metadata storing and sharing should be considered a standard procedure during spatial data

management, including a common methodology and information on projections, scale accuracy, data types, confidence levels, sources and contacts.

An overall and long-term vision of environmentally safe, healthy, productive and biologically diverse seas sets the wide goals to an ecosystem-based marine spatial planning of human activities, supporting the identification of the environmental priorities that planning must take into account at different planning scales and in different sub-areas. The increasing demand of space for maritime traffic and connections, involving potential environmental consequences, the needs of a shared Adriatic management of fish resources, the potential expansion of hydrocarbon search and extraction operation, cannot be addressed properly without a common strategy involving sectoral policies and adequate spatialization of priorities and needs in the Case Study area and surrounding waters. The analysis of the specific wide and local characteristics and sectoral needs of the planning issues, needs and opportunities is therefore necessary to provide a rational basis for setting priorities, to coordinate actions in space and time and to manage and direct concrete measures to where and when they are needed most.

In order to achieve a proper focus on the issues and opportunities within the Case Study area, the involvement of stakeholders proved to be an indispensable although very difficult step of the MSP process. The activity was focused on identifying trends and needs and understanding the compliance with such trends and needs of the proposed measures. These activities as a whole highlighted the need to enforce and structure proper consultations within the MSP process, in order to enhance trust among stakeholders and decision-makers, encourage voluntary compliance with rules and regulations, share the understanding about problems and challenges of the area, and generate new options and solutions through the inclusion of diverse information (e.g. local knowledge and traditions).

# F. SUMMARY OF STAKEHOLDER ENGAGEMENT

**Stakeholder involvement in the Northern Adriatic case study**

Maritime Spatial Planning (MSP) is by definition an activity that can only succeed with the participation of all the involved actors, both public and private, at local, regional, national, international and EU level. Otherwise the prepared maritime spatial plans would fail to encompass the complex interactions between the actors involved thus needing to be revised in a second moment. Moreover, the stakeholder consultation should cover the different phases of the MSP process (from the initial assessment phase to the analysis and planning phase). The duration of SUPREME project, on the other end, did not allow for a large and comprehensive participatory process. Nevertheless, the project has undertaken a fruitful dialogue with key institutional stakeholders in order to identify the specific objectives and ongoing initiatives in the study areas and to address the proposed planning measures.

In the framework of the Northern Adriatic case study, the stakeholder involvement process includes four steps:

**1. Identify and map key relevant stakeholders**

Following the approach of preexisting projects on MSP such as ADRIPLAN - ADRiatic Ionian maritime spatial PLANning, all selected stakeholders have been divided into three broad categories: public institutions and relevant local authorities (such as Regions, System Port Authorities and Public Associations), economic entities of key sectors (such as Private Associations, Technological districts, Federations, Terminals and Private Companies), Civil society organizations (such as NGOs and foundations).

By using the above preliminary list, the project partnership, defined a group of *Institutional stakeholders* with a central role in the MSP process, which were constantly informed on the project goals and results in the framework of the MSP implementation process.

**2. The first Stakeholder Workshop: "The Northern Adriatic and the Maritime Spatial Planning"**

During the workshop held in Venice the 2nd March 2018 participants included key institutional stakeholders: the Ministry of Infrastructures and Transport and the Ministry for Environment, Land and Sea, the North Adriatic Sea Port Authority (Venice), the Eastern Adriatic Sea Port Authority (Trieste) and the Central and Northern Adriatic Sea Port Authority (Ravenna), the Friuli Venezia Giulia, Veneto and Emilia Romagna regions, as well as CORILA with its associated bodies CNR-ISMAR and University IUAV of Venice.

The meeting focused on three main objectives:

1. Identify objectives, priorities, conflicts and synergies in the Northern Adriatic area;
2. Evaluate data and knowledge gaps in the study area for MSP purposes and the role of institutional stakeholders to fill in the gaps;
3. Identify the relevant stakeholders to engage in the following steps of MSP process and the best methodologies for facilitating a participatory approach.

The participants shared the case study fiche summarizing the knowledge available in study areas as well as actions and outputs foreseen, then a summary table was elaborated for collecting data and spatial planning and programming tools. The workshops have been used as a basis for the formulation of the MSP objectives for the case study areas. Inputs provided by the stakeholders have been also

useful for identifying the criticalities of the area and part of the consequent planning measures proposal.

**3. First workshop results**

The main key MSP issues for the area stressed during the workshop were:

- Sustainable maritime and coastal tourism;

- A wide range of interacting uses (e.g. tourism, transport, energy, fisheries, aquaculture, conservation, military, sands for coastal defense and beach nourishment, etc.);

- Expected trends of blue growth, including Climate change;

- Relevance of Land-Sea Interactions;

- Potentials for Multi-Uses (e.g. tourism with fisheries, protected areas, UCH; O&G decommissioning with renewables, tourism and aquaculture);

Specific projects and objectives outlined by the stakeholders in the field of transport and energy were:

- Improve accessibility of ports and marinas;

- Development of internal water navigation for Emilia Romagna and Veneto Region;

- Improving security of traffic management;

- Improvement of maritime and land accessibility through infrastructural interventions (e.g. the Regulatory Plan of the Trieste Port Authority foresee the creation of a logistic Platform by 2019 and the development of other port infrastructures (extension of the container terminal of PIER VII and a new Ro-Ro terminal);

- Growth opportunities for LNG linked to the investments for the regasification and creation of a network for distribution and storage;

- New LNG platform close to Krk;

- Increase the knowledge on sand deposits for coastal defense.

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# APPENDIX I

## Governance analysis: Synergies between proposed planning measures and multi-level governance and policy

### The use of LNG in the maritime transport

The promotion of alternative fuels is affirmed by international, European and national legislation. High level instruments are relevant in the definition of the main drivers for adoption of LNG as an alternative fuel.

At an international level, the promotion of alternative fuel has been affirmed by many provisions (IGF code, SOLAS/STCW, MARPOL- Annex VI). More specifically, Annex VI of MARPOL Convention, lays down the criteria and the conditions for the prevention of air pollution from ships, for the control and the global reduction of emission and in some marine areas (emission control areas). In the same direction goes also the European action (EU Sulphur Directive, Alternative Fuel Infrastructure Directive). The increased awareness related to the need to reduce air pollution brings the EU to develop a legislation aimed at ensuring the continuous performance of the maritime transport sector and its contribution towards achieving resource efficient transport system. The use of LNG has the potential to reduce environmental impacts, and hence support the EU's sustainability objective. In its Communication of 3 March 2010 entitled "Europe 2020: A strategy for smart, sustainable and inclusive growth", the Commission aims at enhancing competitiveness and energy security by a more efficient use of resources and energy. The Commission's White Paper of 28 March 2011 entitled "Roadmap to a Single European Transport Area- Towards a Competitive and Resource Efficient Transport System" also called for a reduction in the dependence of transport on oil, and proposed a reduction of 60 % in greenhouse gas emissions from transport by 2050. The Deployment of alternative fuels infrastructure directive provides that a core network of refuelling points for LNG at maritime and inland ports should be available at least by the end of 2025 and 2030, respectively. Italy implemented the directive by the adoption of Legislative Decree No 257/2016. EU also adopted the Sulphur Directive (Directive 2016/802/EU) and its relevance in the context of LNG as fuel comes in the terms of article 8, according to which *"member states shall allow the use of emission abatement methods by ships of all flags in their ports, territorial seas, exclusive economic zones and pollution control zones, as an alternative to using marine fuels"*. Member States shall allow the use of emission abatement methods (EAMs) by ships of all flags in their ports, territorial seas, exclusive economic zones and pollution control zones, as an alternative to using marine fuels. Being an alternative fuel, LNG is eligible to be considered an Emission Abatement Method, and its use should be allowed in ships of all flags in ports, territorial seas and economic exclusive zones of the EU.

Italy implemented directive 2014/94/EU by adopting legislative decree No 257/2016, which contains, at Chapter I, dispositions concerning LNG infrastructures. Furthermore, in order to reduce the dependence on oil and mitigate the environmental impact in the transport sector, the decree lays down minimum standards for the construction of alternative fuels infrastructures. It is also approved the national strategic framework, which has, among its objectives, the achievement of alternative fuels infrastructure. More specifically, at section C, first subsection, it is provided LNG supply for maritime and internal transport, for road transport and for other uses. Port authorities play an important role in the implementation of international and European action on the use of LNG as an alternative fuel, and more specifically, on the development of the sector linked to availability, storage and primary and secondary distribution of LNG.

In conclusion, the use of LNG as an alternative fuel needs to be achieved by means of an array of policy initiatives, including the development of a sustainable alternative fuels strategy as well as of the appropriate infrastructures. Indeed, the use of LNG is one of the ways that the maritime industry may adopt in order to meet the limits increasingly restrictive, imposed by international, European and national legislation, of pollutant and harmful emissions to air. The here proposed measure, concerning the investments of LNG transformation, is linked to international, European and national actions for the reduction of air pollution and may be a useful tool in order to achieve the objective pursued by the different legislations. This is also strengthened by the development of international, European and national legislation.

| **Measure** | **Competent Authority** |
|---|---|
| Investments for LNG transformation. | European Maritime Safety Agency (EMSA), in accordance with the DG move of the European Commission, Member States and the representatives of the shipping industry in the European sustainable shipping forum context.<br><br>EMSA guidance on LNG Bunkering to Port Authorities and Administrations.<br>The main role of ports in the development of LNG bunkering facilities. The port authorities have to pay attention to the application and implementation of ANNEX VI of MARPOL Convention and directive 2014/94/EU, in order to assess the consequences and the impact on the port sector, arising from the implementation of these important provisions.<br>Port authorities have to optimise the use of instruments at their disposal in order to adopt adequate infrastructures for storage facilities and LNG facilities, and have to support the port sector and the companies which operates in the sector.<br><br>ARERA- The Italian Regulatory Authority for Energy, Networks and the Environment (Autorità di Regolazione per Energia Reti e Ambiente, ARERA) is an independent body created under Italian Law No 481 of 14 November 1995 for the purposes of protecting consumer interests and promoting the competition, efficiency and distribution of services with adequate levels of quality, through regulatory and control activities. Initially limited to electricity and natural gas, the Authority's scope of action has been extended by means of some regulatory interventions.<br>Functions: For the energy sectors, it establishes the tariffs for the use of infrastructures and guarantees equal access for operators; encourages the rational use of energy, especially with regard to the dissemination of energy efficiency and the adoption of measures for sustainable development. |
| **Law** | |

## International level

**IGF Code**: International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuel. Following the adoption by MSC86 (June 2009) of the Interim Guidelines on safety for natural gas-fuelled engine installations in ships (resolution MSC.285(86)), MSC 87 approved the expansion of the scope of the work on development of provisions for gas-fuelled ships to include ships fuelled by low-flashpoint liquid fuels.

**IGC Code**: International Code for the construction and equipment of ships carrying liquefied gases in bulk. Construction, equipment and operation of ships carrying liquefied gases in bulk.

**MARPOL Convention, Annex VI:** a progressive reduction globally in emissions of $SO_x$, $NO_x$ and particulate matter and the introduction of emission control areas (ECAs) to reduce emissions of those air pollutants further in designated sea areas. This reduction can be achieved by using LNG.

## European level

**Directive 2009/73/EC** concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC. Point 26: Member States should take concrete measures to assist the wider use of biogas and gas from biomass, the producers of which should be granted non-discriminatory access to the gas system, provided that such access is compatible with the relevant technical rules and safety standards on an ongoing basis.
Recital No 26 Member States should take concrete measures to assist the wider use of biogas and gas from biomass, the producers of which should be granted non-discriminatory access to the gas system, provided that such access is compatible with the relevant technical rules and safety standards on an ongoing basis.

Article 1- This Directive establishes common rules for the transmis-sion, distribution, supply and storage of natural gas. (…) The rules established by this Directive for natural gas, including LNG, shall also apply in a non-discriminatory way to biogas and gas from biomass or other types of gas in so far as such gases can technically and safely be injected into, and trans-ported through, the natural gas system.

**Directive 2009/28/EC** of the European Parliament and of the Council on the promotion of the use of energy from renewable sources.

**COM(2010)2020 final**, Europe 2020: A strategy for smart, sustainable and inclusive growth. The Commission aims at enhancing competitiveness and energy security by a more efficient use of resources and energy.

**Directive 2011/92/EC**, 13 December 2011, on the assessment of the effects of certain public and private projects on the environment.

**Directive 2014/94/EU** on the deployment of alternative fuels infrastructures, part of the EU Clean Power for Transport package, which established a comprehensive set of requirement for an internal-modal development of an alternative fuel infrastructure. Development of an alternative fuel infrastructure throughout the TEN-T Core Network, including LNG for waterborne applications.
Article 1. This Directive establishes a common framework of measures for the deployment of alternative fuels infrastructure in the Union in order to minimise dependence on oil and to mitigate the environmental impact of transport. This Directive sets out minimum requirements for the building-up of alternative fuels infrastructure, including recharging points for electric vehicles and refuelling points for natural gas (LNG and CNG) and hydrogen, to be implemented by means of Member States' national policy frameworks, as well as common technical specifications for such recharging and refuel-ling points, and user information requirements. Article 3: Each Member State shall adopt a national policy framework for the development of the market as regards alterna-tive fuels in the transport sector and the deployment of the relevant infrastructure. Ports can set rules by themselves, addressing specific operational aspects and their specific context.

**COM(2016) 49 final**, on an EU strategy for liquefied natural gas and gas storage. Point a) Exploiting the full potential of LNG and storage in the internal market; b. completing the internal gas market: commercial, legal and regulatory aspects; making the EU an attractive market for LNG. LNG has the potential in some cases to reduce environmental impacts, and hence support the EU's sustainability objective.
Action points: a) Building on the proposed revision of the Gas Security of Supply Regulation, the Commission calls on Member States to optimise the effectiveness and efficiency of the use of storage across borders through regional preventive action and emergency plans; and b) The Commission invites Member States to take action in the context of these plans to facilitate the availability of and access to storage on a wider regional level; c) The Commission calls on Member States ensure full implementation of Directive 2014/94/EU on alternative fuels, including the establishment of LNG refuelling points across the TEN-T corridors and at maritime and inland ports.

**COM(2016)501 final-** A European Strategy for Low-Emission Mobility- The EU will create enabling conditions and provide strong incentives for low-emission mobility. The actions announced in this communication are part of a holistic approach requiring the long-term engagement of all stakeholders, including Member States, which will have to do their part according to their responsibilities.

**EU Sulphur Directive- Directive 2016/802/EU** relating to a reduction in the sulphur content of certain liquid fuels (codifying Council Directive 1999/32/EC as regards the sulphur content of marine fuels, as amended by Directive 2012/33/EU). Limitation of sulphur content in certain fuels, with obligations on EU Member States, affecting EU flag ships and foreign flag ships visiting EU ports.
Article 8, according to which Member States shall allow the use of emission abatement methods (EAMs) by ships of all flags in their ports, territorial seas, exclusive economic zones and pollution control zones, as an alternative to using marine fuels.

**COM(2017) 34 final-** The role of waste-to-energy in the circular economy.

**EU Ports Regulation 2017/352**, of the European Parliament and of the Council of 15 February 2017, establishing a framework for the provision of port services and common riles on the financial transparency of ports. EU Regulation establishing a framework for the provision of port service, and common rules for transparency and on port services. LNG bunkering is within the scope and applicability of this regulation, either inside the port area or on the waterway access to the port.

Guidance on LNG Bunkering to Port Authorities and Administrations. The EMSA Guidance applies to Port Authorities/Administrations (PAAs) when involved in LNG Bunkering within their areas of port jurisdiction, either during the exploratory and planning phases or, at later stages of development, already in the context of actual LNG Bunkering operations. 2.1 LNG as Fuel. Trans-European Networks-Transport (TEN-T) have to adopt LNG refuelling points by 2025.

## National level

Legislative Decree No 164, 23 May 2000, provisions for the internal market in natural gas.
Article 2: Definitions, letter p) "LNG facility": a facility used for the liquefaction of natural gas or the importation, offloading and re-gasification of LNG.

Legislative Decree No 28, 3 March 2011, implementing directive 2009/28/CE on the promotion of the use of energy from renewable sources, and, more specifically, article 20, Connection of the biomethane production plants to the natural gas network; article 21: promotion of the biomethane which is injected to the natural gas network.

Ministerial Decree, 21 January 2011, grant of the concession of underground natural gas storage.

Decision No 210/2015/R/gas, with which the Regulatory Authority for Electricity, Gas and water system has established the directives concerning the placing on the market of biomethane in the transport networks and the distribution of natural gas.
Decisions from the Regulatory Authority for Electricity, Gas and water system No 46/2015/R/gas and No 204/2016/R/gas, concerning biomethane quality.

Legislative Decree No 257, 16 December 2016, implementing directive 2014/94/EU.
Chapter I- Provisions concerning LNG infrastructures, article 9- Dispositions concerning storage and transport infrastructures of LNG of national interest.
In order to reduce the dependence on oil and mitigate the environmental impact in the transport sector, the decree lays down minimum standards for the construction of alternative fuels infrastructures, including the recharging points for the electric vehicles and refuelling point of liquefied and compressed natural gas, hydrogen and liquefied petroleum gas.

Article 3: it is approved the national strategic framework. One of his objectives is the achievement of alternative fuels infrastructure.
Article 6- Provisions for the supply of natural gas for the transport. Paragraph 2: By 31 December 2030, in the inland ports, it has to be assured the deployment of the refueling points for LNG, in order to ensure the maritime navigation supplied by LN In the TEN-T Core Network (Regulation EU No 1315/2013, identifies, for Italy 14 core ports: Genova, La Spezia, Livorno, Napoli, Gioia Tauro, Taranto, Bari, Ancona, Ravenna, Venezia, Trieste, Palermo, Cagliari, Augusta).

Annex III of the legislative decree contains the National strategic framework on the use of LNG.
Section C: natural gas supply for the transport and for other uses.
First subsection: LNG supply for maritime and internal transport, for road transport and for other uses.
Point 5.8: use of LNG as a marine fuel. The international community is promoting the use of LNG for the maritime transport
Point 5.10: creation of a distribution network for LNG in the maritime and port sector.
The National Strategic framework aims at the identification of the national objectives related to the infrastructural development and the promotion of the policies concerning the use of alternative fuels, such as LNG.

Decree 2 March 2018, adopted by the Ministry of Economic Development, in coordination with the Ministry of Environment, Land and Sea and the Ministry of Agriculture, food and forestry- Promotion the use of biomethane and of the other biofuels in the transport sector.
More specifically: Art. 6 – promotion of the biomethane injected to the natural gas network devoted to the transport. Article 7- Promotion of the use of biofuels other than biomethane.

Project "Venice LNG facility", approved and financed by European Commission.
Cooperation agreement for LNG development signed in Sardegna. The objective is to promote the marine bunkering, i.e. the LNG marine refuelling.
Regional law (Sardegna) No 16, 1997, support for biofuels, such as GNL, as ad innovative and eco-friendly fuel.

## Monitoring of maritime traffic

The importance of a monitoring system of vessels traffic, and consequently a control of their speed, noise and quantity, has been argued by international, European and national authority.
It has been reported that the intensive maritime transport implies a various array of pressures on the environment and ships and port emissions, risk of accidents, underwater noise and the introduction of alien species through ballast water discharged. The intensive maritime transport may also have some negative consequences to maritime safety; for this reason, a monitoring system can also guarantee the safety people. In order to prevent or reduce these pressures and fight against the negative impacts that generate, it is desirable to take specific measures. The measures that we want to propose have an international, European and national legal basis.
At an international level, the SOLAS Convention aimed at the introduction of a system of monitoring of traffic ships, in order to achieve safety of life at sea, safety of navigation, protection of the marine environment, ports and installations offshore. The International Maritime Organization, adopting the Resolution A.857(20), on 27 November 1987, introduced the Guidelines for vessel Traffic Services. IMO argued that the reduction of vessels speed can reduce the pollution. IMO's action also aimed at a gradual reduction of air pollution from ships in the Mediterranean Sea and this can be achieved by limiting vessels quantity and speed. IMO adopted internationally recognized rules and standards for shipping and maritime transport, such as traffic separation schemes.
European Union action also aimed at monitoring maritime traffic, in order to achieve certain objectives, such as environmental protection, by limiting vessel quantity, speed and noise and by introducing a traffic separation scheme. Directive 2002/59/EC sets up a vessel traffic monitoring and information exchange system; this seeks to enhance maritime safety, port and maritime security, environmental protection and pollution preparedness.
It also permits the exchange and sharing of additional information, facilitating efficient maritime traffic and transport. European Union also established a European Maritime Safety Agency, in order to enhance safety and prevent pollution in maritime transport (Regulation No 1406/2002) and a Community vessel traffic monitoring and information system, introduced by directive 2009/17/EC. The EU's policy led to the adoption of an integrated maritime surveillance (COM(2009)538 final, Towards the integration of maritime surveillance: a common information sharing environment for the EU maritime domain), in order to generate a situational awareness of activities at sea impacting on maritime safety and security, border control, the marine environment, fisheries control, trade and economic interests of the European Union, as well as general law enforcement and defence so as to facilitate sound decision making.
In order to implement the objectives planned at international and European level, Italy also adopted a set of rules. On the one hand, Italy introduced a vessel traffic system. On the other hand, the Ministry of Transport and Infrastructure, in consultation with the ministry of environment, land and sea, adopted the implementing provisions concerning the Vessel Traffic Service.
Vessel traffic monitoring systems are linked to the legal concept of maritime safety, including safety, security and sustainable development. The purpose of monitoring systems is to prevent and reduce risk of accidents and hazards for motivation, human life and environment.
The measures we want to propose, such as the limitation of vessels quantity, speed and noise, in particularly sensitive areas and on the base of real-time data produced, the establishment of a continuous traffic separation scheme and the integration of transboundary VTS data, are supported by international conventions and by European policy, which aims at enhancing maritime safety and environmental protection (which can be reached by adopting such measures).

At a national level, it has been introduced a monitoring system and it has been adopted a general transport and logistic plan, which aims at monitoring maritime traffic.
The measures may be proposed to the VTSL (peripheral maritime bureau), established at a local level in order to interact directly with the maritime traffic and to carry out the functions of a VST center.
In conclusion, a modern system of maritime traffic control can be implemented by compliance with international, EU and national legislation and specific measures can be proposed and adopted by the competent authority in order to achieve the objectives that are pursued by different legislative levels.

| **Measures** | **Competent authority** |
|---|---|
| Limitation of vessels quantity, vessel speed and in sensitive areas, increased monitoring of the activity in sensitive areas.<br><br>Limitation of vessel speed and noise in particularly sensitive areas and on the base of real-time data produced.<br><br>Establish a continuous traffic separation scheme.<br><br>Integration of transboundary VTS data. | **European level**<br><br>European Maritime Safety Agency (the Agency), established by regulation (EC) No 1406/2002, for the purpose of ensuring a high, uniform and effective level of maritime safety, maritime security, prevention of, and response to, pollution caused by ships as well as response to marine pollution caused by oil and gas installations. |
| | **National level**<br><br>D.P.C.M. No 72, 11 February 2014- Rules of internal organization of the Ministry of Transport and Infrastructures.<br><br>More specifically, the general commanding of port authorities.<br><br>Article 13-Tasks and functions<br>Port authorities plays an important role in the monitoring of the vessel traffic. The general command of the port authorities shall perform the functions of the Ministry in a decentralised manner (more specifically, performs its function in the maritime traffic control, the supervision of the maritime safety, the coordination of the different activities, the supervision and monitoring of the safety of ships and of ports).<br><br>More specifically: Vessel Traffic Service, related to the Ministry of Infrastructure and Transport- Port authority.<br><br>The coast guard is the competent authority concerning VST; more specifically, coast guard aimed at supervising and monitoring the situation. Operational management implemented at a central level by port authority and coast guard.<br><br>At a decentralized level: maritime bureau, venues of VST.<br>First level: VTSC – Central among the Ministry of Infrastructures and Transport. Operation Centre of port authorities.<br>Secondo level: VTSA – Maritime Directorates (M.R.S.C.), Maritime Rescue Sub Center, established to supervise the maritime zone and to interface with VTSC.<br>Third level: VTSL – local level, among the peripheral maritime bureau, established to interact directly with the maritime traffic and to carry out the functions of a VST centre. |

## International level

**International Convention for the Safety of Life at Sea (SOLAS)**, 1974, adoption November 1074, entry into force may 1980.
One of the aims of the Convention is the introduction of a system of monitoring of traffic ships, in order to achieve safety of life at sea, safety of navigation, protection of the marine environment, ports and installations off-shore.

**SOLAS regulation V/8-2**- Vessel traffic services (VTS) contribute to safety of life at sea, safety and efficiency of navigation and protection of the marine environment, adjacent shore areas, work sites and offshore installations from possible adverse effects of maritime traffic.

**Resolution A.857(20),** adopted on 27 November 1987, of the International Maritime Organisation, Guidelines for vessel Traffic Services.
According with SOLAS regulation V/8-2, define the principles and general operational provisions for the operation of a vessel traffic service (VTS) and participating vessels. The purpose of the VTS is to improve the safety and efficiency of navigation and the safety of life at sea and the protection of the marine environment and/or the adjacent shore area, worksites and offshore installations from possible adverse effects of maritime traffic.

**Resolution MSC.139(76)** (adopted on 5 December 2002)- Mandatory ship reporting systems.

The international maritime organization (IMO) claims that the reduction of vessels speed can reduce the pollution, in the frame of the reducing of air pollution from ships in the Mediterranean Sea.
IMO established also internationally recognized rules and standards for shipping and maritime transport, such as traffic separation schemes.

## European level

**Directive 2002/59/EC** of the European Parliament and of the Council EU, maritime information and exchange system, incorporated into the package Erika II.
The directive sets up a vessel traffic monitoring and information exchange system. This seeks to enhance maritime safety, port and maritime security, environmental protection and pollution preparedness. It also permits the exchange and sharing of additional information facilitating efficient maritime traffic and transport. The directive should provide to monitoring of ships entering in the area of mandatory ship reporting systems, ensure the use of automatic identification systems (AIS) and ship's routing systems, monitor the compliance of ships with VTS and ensure that ships calling at a port of Member state are fitted with a Voyage Data Recorder (VDR) system.

**Directive 2002/84/EC** of the European Parliament and of the Council, amending the Directives on maritime safety and the prevention of pollution from ships.

**Regulation (EC) No 1406/2002**, establishing a European Maritime Safety Agency, in order to enhance safety and prevent pollution in maritime transport.

**COM(2007)575 final**-An integrated Maritime Policy for the European Union.

**SEC(2007)1278**, Commission staff working document, accompanying document to COM(2007)575 final.

**Directive 2009/17/EC** of the European Parliament and of the Council, amending Directive 2002/59/EC, establishing a Community vessel traffic monitoring and information system.

**COM(2009)538 final,** Towards the integration of maritime surveillance: A common information sharing environment for the EU maritime domain. Point 1: (…) The aim of integrated maritime surveillance is to generate a situational awareness of activities at sea impacting on maritime safety and security, border control, the marine environment, fisheries control, trade and economic interests of the European Union as well as general law enforcement and defence so as to facilitate sound decision making.

**Directive 2010/65/EU** of the European Parliament and of the Council, on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC. The purpose of this directive is to simplify and harmonise the administrative procedures applied to maritime transport by making the electronic transmission of information standard and by rationalising reporting formalities. The directive wants to simplify and harmonize the administrative procedures applied to maritime transport by making the electronic transmission of information standard and by rationalizing reporting formalities.

**COM(2011) 144 final**, White Paper, Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.

**Regulation (EU) No 1315/2013,** of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU.
Section 4: Maritime transport infrastructure and motorways of the sea- Article 21 Motorways of the sea: 1. Motorways of the sea, representing as they do the maritime dimension of the trans-European transport network, shall contribute towards the achievement of a European maritime transport space without barriers. They shall consist of short-sea routes, ports, associated maritime infrastructure and equipment, and facilities as well as simplified administrative formalities enabling short-sea shipping or sea-river services to operate

## Ballast water

The discharges of waste from ships pose an increasing threat to the marine environment, with costly environmental and economic consequences. The problem of ballast water has come to force, as a growing number of scientific studies provide evidence of the devastating effects on marine ecosystems and of the impacts on human health. The lack of regulation on ballast water discharge poses a serious threat to marine biodiversity and can cause serious health problems (in case of transport and the consequent spread of toxic agents) and damage to coastal business activities. Invasive aquatic species, which are transposed by ships, present a major threat to the marine ecosystems. Consequently, shipping has been identified as a major pathway for introducing species to new environments. The problem increased as trade and traffic volume expanded over the last few decades.
In the light of the above, the importance of the limitation and the monitoring of ballast water has been affirmed by international, European and national law. At an international level, the problem of ballast water has been raised by some provisions (such as Annex VI of MARPOL Convention, Guidelines for the control and management of ships' ballast water, Ballast Water Convention). BWC aims to prevent the spread of harmful aquatic organisms from one region to other, by establishing standards and procedures for the management and control of ships' ballast water and sediments. The BWC applies to all vessels including semi submersibles, floating offshore. The Convention will not be applicable to the ballast free ships, ships engaged in local trade only. The Convention requires all ships to implement a ballast water management plan. All ships have to carry a ballast water record book and are required to carry out ballast water management procedures to a given standard. Article 6 of BWC provides that the parties have to monitor the effects of ballast water management in waters under their jurisdiction.
At European level, directive 2000/59/EC promotes the reduction of the discharges of ship-generated waste and cargo residues into the sea, especially illegal discharges (but not only), from ships using ports in the Community, and the strengthening of the protection of the marine environment. The directive implements the relevant international norms, i.e. those contained in MARPOL. However, whereas the Directive focuses on operations in port, MARPOL mostly focuses on operations at sea. The Directive regulates the legal, practical and financial responsibilities at the shore-sea interface and complements MARPOL.
Italy implemented the directive by the adoption of the legislative decree No 182/2003. The decree provides the reduction of the discharges into the sea of ship-generated waste and cargo residues, by imposing to all ships to deliver their waste to port reception facilities before leaving the port. Article 5 provides that port authority must draw up a collection and management plan of ships' waste (including ballast water). Port authorities have an important role in the fight against ballast water. Moreover, BWC comes into force in 2017 and the Italian legislation has to comply with its dispositions.
In conclusion, the protection of the marine environment can be enhanced by reducing and monitoring ballast water and the here proposed measure may contribute to the achievement of this objective.

| Measure | Competent Authority |
|---|---|
| Limitation and monitoring of discharged ballast water | **International level**<br><br>At an international level, it has been established the Ballast Water Management System for Adriatic Sea Protection.<br><br>**National level**<br><br>Ministry for the Environment, Land and Sea, in collaboration with the ministry of Transport and Infrastructure.<br><br>**Regional Level**<br><br>Decision adopted by the Ministry of Environment, Land and Sea No 183/2018, which approved the agreement with which are assigned certain tasks to the American Bureau. The American bureau of shipping is the competent authority for the inspections and the ships verification visits (within the meaning of the legislative decree No 104/2011).<br><br>Legislative Decree No 182/2003, at article 5, provides that the port authority, after consulting the interested parties (and more specifically the local authorities, the office of the maritime health) shall draw up a plan relating to the ship-generated waste plan and cargo residues. The Region approved the plan and integrates it with the regional waste management plan.<br><br>Supervision and control (article 11 of the legislative decree No 182/2003). The maritime authority shall conduct some inspections related to the delivery of ship generated waste and cargo residues to the port reception facilities (article 7 and 10). |
| **Law** | |

## International level

**The international convention for the prevention of pollution from ships (MARPOL Convention, 1973),** as modified by the Protocol of 1978, was adopted by the International Conference on Marine Pollution convened by IMO.
The convention has been ratified by national law No 662, 29 September 1980. Annex V, Prevention of pollution by garbage from ships, seeks to eliminate and reduce the amount of garbage being discharged into the sea from ships.

**Guidelines for the control and management of ships' ballast water**, to minimize the transfer of harmful aquatic organisms and pathogens. These Guidelines were adopted by the IMO Assembly in 1997 (Resolution A.868(20).

**Resolution MEPC.174(58),** adopted on 10 October 2008, Guidelines for approval of ballast water management system (G8).

**International Convention for the Control and Management of ships ballast water and sediments (BWM),** adopted in 2004 and entered into force on 8 September 2017.
Ballast Water Management Convention aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments.

**Ballast Water Management Plan** (BWM Convention 2004 / Section B / Regulation B-1). The International Convention for the Control and Management of Ships, Ballast Water and Sediments provides for the adoption of some international guidelines (Marine Environment Protection Committee, MEPC).

**Resolution MEPC.289(71)** (adopted on 7 July 2017)- Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7).
The obligations undertaken by IMO Member States are basically: the obligation for shipowners to adopt ballast water treatment systems (BWTS) and equip their vessels accordingly; the obligation for each IMO State to directly verify compliance with the regulations on ballast water discharge by the ships calling at their ports; the obligation for each individual ship to carry a ballast water record book and an international ballast water management certificate.

## European Level

**Directive 2000/59/EC** of the European Parliament and of the Council on port reception facilities for ship-generated waste and cargo residues.
Article 1: The purpose of this Directive is to reduce the discharges of ship-generated waste and cargo residues into the sea, especially illegal discharges, from ships using ports in the Community, by improving the availability and use of port reception facilities for ship-generated waste and cargo residues, thereby enhancing the protection of the marine environment. The directive requires ports to develop Waste Handling Plans and provide Port Reception Facilities to the ships using their port.

**Commission Notice, Guidelines for the interpretation of Directive 2000/59/EC** on port reception facilities for ship generated waste and cargo residues.

**Directive 2000/60/EC** of the European Parliament and of the Council, establishing a framework for Community action in the field of water policy.
In particular, article 16, Strategies against pollution of water: 1. The European Parliament and the Council shall adopt specific measures against pollution of water by individual pollutants or groups of pollutants presenting a significant risk to or via the aquatic environment, including such risks to waters used for the abstraction of drinking water. For those pollutants measures shall be aimed at the progressive reduction and, for priority hazardous substances, as defined in Article 2(30), at the cessation or phasing-out of discharges

## Carriage dangerous goods

The regulation of dangerous goods transport aims at eliminating risks or at reducing them to a minimum. One the one hand, it emerges the importance and the need to regulate the transport of dangerous goods in order to prevent, as far as possible, accidents to persons or property and damage to the environment. On the other hand, the regulation should be framed so as not to impede the movement of such goods.
At international level, there are many provisions aimed at the protection of the marine environment by pollution. Annex III of MARPOL Convention (Prevention of pollution by harmful substances carried by sea in packaged form) contains general requirements for the issuing of detailed standards for the prevention of pollution by harmful substances carried by sea in packaged form. The UN Orange Book contains the UN Recommendations on the Transport of dangerous goods and it is a guidance document aimed at the harmonization of dangerous goods transport regulations. The recommendations are addressed to governments and to the international organization. Another important document is the International Maritime Dangerous Goods Code, which lays down detailed recommendations for individual substances, materials and articles. The code harmonizes the practices and procedures followed in the carriage of dangerous goods by sea. It represents an international guideline to the safe transportation of dangerous goods or hazardous materials by water or vessels. The European Union also affirmed the importance of the regulation and the protection of the transport of dangerous goods, by assuring a competitive and sustainable transport system. Regulation No 1315/2013 contains the guidelines for the development of the trans-European transport network and the section 4 contains some provisions related to maritime transport infrastructure and motorways of the sea. In this context emerges the importance to assure safety to maritime transport of dangerous goods.
In the same direction goes also the national legislation, which contains some provisions related to the transport of dangerous goods. For example, legislative decree No 196/2005 provides the obligation to give some informations concerning dangerous or harmful goods carried on board vessels/ships. Decree No 1105 of 8 November 2005 contains the rules concerning the transport of dangerous goods on merchant vessels during domestic transport. Decree No 278/2006 contains the authorization procedure of the embarkation and the maritime transport of dangerous goods. Decree No 481/2010, adopted by Ministry of infrastructures and transport, with the support of port authority, approved the packaging methods and procedure for maritime transport of dangerous goods, in accordance with paragraph 6.1.5 of IMDG Code, and at least, Decree No 585 of 21 December 2017, adopted by the Ministry of Infrastructures, contains some provisions related to international carriage of dangerous goods.
The here proposed measure (the possibility to conclude international agreements on dangerous goods) fits perfectly in the international, European and national legislative framework and represent a tool by which the objectives pursued (i.e. regulation of maritime transport of dangerous goods in order to protect environment from pollution) may be achieved.

| Measure | Competent Authority |
|---|---|
| International agreements on dangerous goods. | Ministry of Transport and Infrastructures.<br><br>Port authority, competent authority on safety of navigation.<br><br>D.P.C.M. No 72, 11 February 2014- Rules of internal organization of the Ministry of Transport and Infrastructures.<br><br>More specifically, the general commanding of port authorities.<br>Article 13-Tasks and functions- Port authorities: list of the functions carried out by the port authorities, such as the management of the maritime traffic control, the safety of the maritime transport, the monitoring and control related to the safety of ships. |
| **Law** | |

**International level**

**The International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)**, is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.
Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992). It contains the mandatory provisions for the prevention of pollution by harmful substances carried by sea in packaged form.
It contains general requirements for the issuing of detailed standards on packing, maring, labelling, documentation, stowage, quantity limitations, exceptions and notifications. For the purpose of his Annex, "harmful substances" are those substances which are identified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG Code) or which meet the criteria in the Appendix of Annex III.

Regulation 1 of MARPOL Convention prohibits the carriage of harmful substances in ships except in accordance with the provisions of Annex III, which are also amplified by the IMDG Code.

**Protocol I to MARPOL 73/78**, "Incidents involving losses of such substances from ships" must be reported by the master or other person having charge of the ship concerned. Each substance defined as harmful to the marine environment is identified as a marine pollutant or a severe marine pollutant in column 4 of its entry in the Dangerous Goods List and in the Index of the IMDG Code by the letters I' or 1'1'**.** Substances which may be considered harmful to the marine environment only if they contain certain quantities of marine pollutants or severe marine pollutants are identified by the symbol. in the Dangerous Goods List and in the Index.

**The International Convention for the Safety of Life at Sea, 1974 (SOLAS),** as amended, deals with various aspects of maritime safety and contains in part A of chapter VII the mandatory provisions governing the carriage of dangerous goods in packaged form or in solid form in bulk.

**Regulation 11-2/19 of the SOLAS Convention**, as amended, specifies the special requirements for a ship intended to carry dangerous goods, the keel of which was laid or which was at a similar stage of construction on or after 1 July 2002.

**UN Orange Book**: it contains the UN Recommendations on the Transport of Dangerous Goods Model Regulations, a guidance document developed by the United Nations to harmonize dangerous goods transport regulations. The Recommendations on the Transport of Dangerous Goods are addressed to governments and to the international organizations concerned with safety in the transport of dangerous goods.

**International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996**. The convention aims to ensure adequate, prompt and effective compensation for damage to persons and property, costs of clean up and reinstatement measures and economic losses resulting from the maritime transport of hazardous and noxious substances.

**European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), signed at Geneva on 26 May 2000**.
The agreement aims at: ensuring a high level of safety international carriage of dangerous goods by inland waterways, contributing effectively to the protection of the environment by preventing any pollution resulting from accidents or incidents during such carriage; and facilitating transport operations and promoting international trade in dangerous goods.

**IBC Code** (International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk), concerning chemical liquid substances.

**IGC Code** (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk), concerning liquified gas.

## Biodiversity and conservation

The importance of the conservation of living resources of the seas and biodiversity has been affirmed by international, European and national legislations. The conservation and the protection of the marine environment is a complex issue that required a broad and multidimensional approach.

At international level, there are many provisions related to biodiversity and marine protection. Bern Convention is a binding international convention in the field of nature conservation. Agenda 21, at chapter 17, provides that coastal states have to undertake measures in order to maintain biological diversity and productivity of marine species and habitats under national jurisdiction. A pillar of biodiversity is the Convention on Biological diversity, (more specifically, the Jakarta Mandate of Marine and Coastal biodiversity), which aims at the conservation of marine biological diversity and environment and a sustainable use of its components. The SPA/BD Protocol is the Mediterranean's main tool for implementing the 1992 Convention on Biological Diversity, as regards the in situ sustainable management of coastal and marine biodiversity. It has also been adopted a strategic action programme for the conservation of biological Diversity in the Mediterranean Region, which identifies a number of actions which shall be taken (there are many other provisions, such as the agreement on the conservation of cetaceans of the black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), the Protocol on integrated coastal zone management (ICZM) or the "Carta di Siracusa on Biodiversity").

The European action considers that biodiversity and conservation is connected to sea environmental and fishery protection. Actions related to biodiversity have been placed into the fishery policy (The conservation of biodiversity has been implemented to the fishery policy). An important directive in this respect is the directive 92/43/EEC of 21 May 1992, on the conservation of natural habitats and of wild fauna and flora. At article 2 it is provided that Directive shall be to contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies. The Habitats directive obliges EU Member States to take the necessary measures to establish a system of strict protection of all cetaceans present in European waters. Regulation (EC) No 338/97, on the protection of species of wild fauna and flora, which aims at the protection of species of wild fauna and flora and the guarantee of their conservation by regulating trade. All cetaceans are listed in Appendices I and II. The EU promotes also a biodiversity action plan in the areas of Conservation of Natural Resources, Agriculture, Fisheries, and Development and Economic Co-operation. Member States, by pursuing the objectives of the biodiversity strategy, will integrate the value of ecosystem services into policymaking. The EU policy aims at halting the loss of biodiversity, by safeguarding the EU's most important habitats and species and by restoring biodiversity and ecosystem services in the wider EU marine environment (COM(2006)216 final). The marine component of the Natura 2000 network will be an integral component of the overall Natura 2000 European ecological network. Conservation and biodiversity are also strictly linked to Water Framework directive, to Marine Strategy Framework Directive

and, at least, to Maritime spatial planning directive. The protection of marine environment and the transnational terrestrial habitats and biodiversity are included to the third pillar of EUSAIR, i.e. to the environmental quality.
At a national level, Law No 979, 31 December 1982, which contains some provisions concerning sea defense, provides the possibility to create some marine reserves. In the same direction goes also the law No 394, 6 December 1991, contains the main principles concerning establishment and the management of the protected natural areas. Its aim is to protect habitats and species and added to establish parks (article 2), composed by terrestrial, fluvial and marine areas. Italy implemented the ACCOBAMS Convention with the law No 27/2005, which contains, in the Annex II, some provisions related to habitat protection, management of interaction human-cetacean and the adoption of a conservation plan.
Legislative decree No 190, 13 October 2010, implementing directive 2008/56/EC, at article 1 (objectives), provides that the national legislation has to reinforce the conservation of the marine environment, by extending and integrating the protected marine areas. Italy has also adopted the national strategy for biodiversity (2011-2020), which identifies some measures and objectives that have to be pursued by national, regional and local authorities. The regions, in turn, have adopted some measures for the conservation of natural habitat and flora and fauna (for example Emilia-Romagna has adopted the decision of the regional government No 1191, 30 July 2007, related to the adoption of the directive which contains the criteria of identification, conservation, management and monitoring of Special areas of conservation and Special Protection Areas).
The measures proposed are necessary to pursue the numerous objectives that are pursued by international, European and national legislation. For example, the adoption of a monitoring programme, by which are collected biological monitoring data, is a useful and necessary tool which permits to monitor the situation and to achieve protection of the biodiversity.
For example, the measures aimed at the reduction of by-catch mortality of cetaceans and sea turtles are supported by the ACCOBAMS agreement, the Barcelona Convention, the European and national legislation, GFCM (General Fisheries Commission for the Mediterranean) and the AdriaMed (Scientific Cooperation which support the responsible fishery in the Adriatic Sea). The measures aimed at the reduction of collision between vessels and cetaceans are supported by ACCOBAMS agreement, the Barcelona Convention the Habitat directive and the agreement by which it has been created Pelagos Sanctuary.
In view of the above, it is strongly urging to adopt the measures identified during the report, in order to conserve the living resources (by adopting some monitoring systems) and to preserve the environment and the coastal zone.

| **Measures** | **Competent Authority** |
|---|---|

| | |
|---|---|
| Monitoring programs to start the collection of long-term biological monitoring data.<br><br>Development of habitat suitability models fed by real-time satellite data for environmental parameters and by monitoring data.<br><br>International agreements on mitigation measures for demersal megafauna. | **International level**<br><br>The International Union for Conservation of Nature (IUCN; officially International Union for Conservation of Nature and Natural Resources) is an international organization working in the field of nature conservation and sustainable use of natural resources.<br><br>The International Commission for the Conservation of Atlantic Tunas (ICCAT).<br>EAAM: European Association for Aquatic Mammals.<br>ECS: European Cetacean Society (Associazione Europea per i Cetacei).<br>AdriaMed (Scientific Cooperation which support the responsible fishery in the Adriatic Sea).<br>International whaling commission.<br><br>**National level**<br><br>Ministry of Environment, Land and Sea.<br>The D.P.R. No 178, 27 March 2001, which contains some provisions related to the Ministry of Environment, Land and Sea organization, shall assign to the Direction for the Sea defense the tasks related to the protection of the marine biodiversity and the endangered marine life.<br><br>CITES Scientific Committee shall perform the functions of a National Scientific Authority. CITES is the scientific national authority and it is established at the Ministry of Environment, land and Sea (composed by 18 members).<br><br>National Observatory for Biodiversity, with the aim to provide the necessary scientific and technical support to the joint committee. (composed by the representatives of the central government and by representatives of the Regions and the autonomous provinces).<br><br>Joint Committee for the biodiversity is composed by the representatives of the central government, the Regions and the autonomous provinces. the Committee is supported by the National observatory for biodiversity<br><br>The “tavolo di consultazione” is composed by the major environment, economic and productive associations and shall ensure the involvement of the different stakeholders.<br><br>The standing conference of the State, the Regions and the provinces is the competent authority for the adoption of political decision related to the Strategy, by concluding some agreements and understandings.<br><br>Monitoring of biodiversity and assessment of the strategy’s implementation.<br>The national strategy for biodiversity provides the elaboration of a report on the effectiveness and the implementation of the strategy. It has been established a list of 10 status indicators, which represents and values the biodiversity in Italy and 30 indicators for the evaluation of the effectiveness of the actions adopted for the achievement of the objectives of the strategy. |

**Law**

**International level**

**International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL)**, signed in 1954 and updated in 1973.

**Convention on Fishing and Conservation of the Living Resource of the High Seas, 1958**. Article 2: "conservation of the living resources of the high seas" means the aggregate of the measures rendering possible the optimum sustainable yield from those resources so as to secure a maximum supply of food and other marine products.

**The United Nations Environment Programme (UNEP)**, adopted during the United Nations Conference on the Human Environment held in Stockholm (1972), is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment.

**Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972**, the London Convention for short, is one of the first global conventions to protect the marine environment from human activities and has been in force since 1975.

**Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean,** adopted at Barcelona on 16 February 1976.

**RAMOGE agreement, signed by Principality of Monaco**, France and Italy in 1976, in order to protect and preserve the marine environment. It was conceived by a sub-regional implementation of the Barcelona Convention.

**Bern Convention on the Conservation of European Wildlife and Natural Habitats**, also known as the Bern Convention, is a binding international legal instrument in the field of Nature Conservation. The Convention was open for signature on 19 September 1979 and came into force on 1 June 1982.

**Montego Bay Convention**, signed on 10 December 1982 (UNCLOS), the most important Convention on the law of the sea.

**The United Nations Agreement** for the implementation of the provisions of the United Nations Convention on the Law of the Sea, 10 December 1982.
The Agreement elaborates on the fundamental principle, established in the Convention, that States should cooperate to ensure conservation and promote the objective of the optimum utilization of fisheries resources both within and beyond the exclusive economic zone.

**Agenda 21, Chapter 17.** It provided that coastal states undertake measures to maintain biological diversity and productivity of marine species and habitats under national jurisdiction. These measures might include surveys of marine biodiversity, inventories of endangered and management of protected areas and support of scientific research and dissemination of its results.

**Convention on Biological diversity,** signed in Nairobi on may 1992 and entered into force on 29 December 1993.
Article 1: The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits.
Article 2: "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
It has 3 main objectives: a) the conservation of biological diversity, b) the sustainable use of the components of biological diversity, c) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
At their second conference of parties in Jakarta in 1995, the Parties agreed on a programme of action for implementing the Biodiversity Convention with the respect to marine and coastal biodiversity. This programme is referred to as the

Jakarta Mandate of Marine and Coastal Biodiversity, or The Jakarta Mandate. It's a check-list of actions that the parties should take to fulfil their obligations under the biodiversity convention in marine and coastal environments.

**Integrated marine and coastal area management (ICAM),** approaches for implementing the Convention on biological diversity. The programme of work on marine and coastal biodiversity under the Convention on Biological Diversity aims to assist the implementation of the Convention at the national, regional and global levels.

**Barcelona Convention,** adopted in 1995. Mains objectives: to ensure sustainable management of natural marine and coastal resources; to protect the natural and cultural heritage (…).

**UNESCO Convention** on the protection of the underwater cultural heritage, 2001.

**Coastal Area Management Programme (CAMP)** is oriented at the implementation of practical coastal management projects in selected Mediterranean coastal areas, applying Integrated Coastal Zone Management (ICZM) as a major tool.

**The SPA/BD Protocol** is the Mediterranean's main tool for implementing the 1992 Convention on Biological Diversity, as regards the in situ sustainable management of coastal and marine biodiversity.

**Strategic Plan for Biodiversity 2011-2020.** This Plan provides an overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system and all other partners engaged in biodiversity management and policy development.

**Strategic Action Programme for the conservation of Biological Diversity (SAP BIO)** in the Mediterranean Region (2003).
The strategic actions aim to: a) protecting species and habitats, b) improving knowledge about marine and coastal biodiversity, c) reducing negative impacts on biological diversity, d) promoting sector-based policies that encourage biodiversity (tourism, agriculture, etc.), e) adopting institutional and legal measures, f) coordinating the biodiversity activities of the MAP centres.

**Convention on International Trade in Endangered Species of Wild Fauna and Flora**, also known as the Washington Convention (CITES) is a multilateral treaty to protect endangered plants and animals.

**International Convention for the regulation of whaling, signed in Washington**, D.C., on 2 December 1946.

The agreement on the conservation of cetaceans of the black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS); it's a legal conservation tool based on cooperation. Its purpose is to reduce threats to cetaceans notably by improving current knowledge on these animals.

**The Nairobi International Convention** on the removal of wrecks is a treaty of the International Maritime Organization (IMO) adopted in 2007. Its aim is to establish uniform rules for the prompt and effective removal of shipwrecks located in the exclusive economic zone (EEZ) of a state that may be hazardous to navigation or to the environment (signed by Italy on 23 September 2008).

**Protocol on integrated coastal zone management (ICZM) in the Mediterranean**, adopted on 21 January 2008, in Madrid, Spain. It has not yet been ratified by Italy.

**The "Carta di Siracusa on Biodiversity"** is a political document agreed at the G8 Environmental Ministers Meeting, adopted on April 2009.
The Carta is structured as follows: biodiversity and climate; biodiversity, economy and business, governance of biodiversity, science, research and policy. The safeguard of biodiversity is a fundamental element of policies for sustainable development.

**Recommendation GFCM/36/2012/3** on fisheries management measures for conservation of sharks and rays in the

GFCM area, which aims at the protection of coastal shark.

**Documento Rio+ 2012: The future we want.**
Point 91. We welcome the Nagoya Protocol adopted at the tenth meeting of the Conference of the Parties to the Convention on Biodiversity. We support mainstreaming of biodiversity and ecosystem services in policies and decision-making processes at international, regional and national levels, and encourage investments in natural capital through appropriate incentives and policies, which support a sustainable and equitable use of biological diversity and ecosystems.

### European level

There are two main areas concerned: sea environmental protection and fishery protection. Actions linked to biodiversity have been placed into the fishery policy (The conservation of biodiversity has been implemented to the common fisheries policy).

**Council directive, 92/43/EEC of 21 May 1992** on the conservation of natural habitats and of wild fauna and flora.
Article 2: The aim of this Directive shall be to contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies. The Habitats directive obliges EU Member States to take the necessary measures to establish a system of strict protection of all cetaceans present in European waters.
Annex I: Natural habitat types of community interest whose conservation requires the designation of special areas of conservation; annex II: Animal and plant species of community interest whose conservation requires the designation of special areas of conservation; annex III: Criteria for selecting sites eligible for identification as sites of community importance and designation as special areas of conservation; annex IV: Animal and plant species of community interest in need of strict protection (all cetaceans are listed in annex IV).

**Council Regulation (EC) No 338/97**, of 9 December 1996, on the protection of species of wild fauna and flora by regulating trade therein. All cetaceans are listed in Appendices I and II.

**Protocol concerning specially protected areas and biological diversity in the Mediterranean, 1999**. Article 4: The objectives of specially protected areas are: (a) to safeguard representative types of coastal and marine ecosystems of adequate size to ensure their long-term viability and to maintain their biological diversity; (b) to safeguard habitats which are in danger of disappearing in their natural area of distribution in the Mediterranean or which have a reduced natural area of distribution as a consequence of their regression or on account of their intrinsically restricted area (…).

**Directive 2000/60/EC,** establishing a framework for Community action in the field of water policy.
The purpose of the Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater which: (a) prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; (b) promotes sustainable water use based on a long-term protection of available water resources (…).

**COM(2001) 0162 final**, Biodiversity Action Plans in the areas of Conservation of Natural Resources, Agriculture, Fisheries, and Development and Economic Co-operation. Point 18. The Biodiversity Action Plan on Conservation of Natural Resources aims to ensure that existing and planned environmental legislation and instruments are used to their full potential in order to achieve the relevant objectives of the Biodiversity Strategy.

**Council recommendation of 30 may 2002**, concerning the implementation of Integrated Coastal Zone Management in Europe.

**Council Regulation No 812/2004 of 26 April 2004**, laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98.
Point 4: Some acoustic devices have been developed to deter cetaceans from fishing gear, and have proven successful in reducing by-catch of cetacean species in static net fisheries. The use of such devices should therefore be required in

areas and fisheries with known or foreseeable high levels of by-catch of small cetaceans, and taking into account the cost/efficiency of such requirement. It is also necessary to establish the technical specifications for the efficiency of the acoustic deterrent devices to be used in such fisheries (…).

**COM(2005)504 final**, Thematic Strategy on the Protection and Conservation of the Marine Environment.

**COM(2006) 216 final**- Halting the loss of biodiversity by 2010- and beyond. Sustaining ecosystem services for human well-being. Objectives: To safeguard the EU's most important habitats and species. To conserve and restore biodiversity and ecosystem services in the wider EU marine environment (…).

Protocol on Integrated Coastal Zone Management in the Mediterranean "(…) the biological wealth and the natural dynamics and functioning of the intertidal area and the complementary and interdependent nature of the marine part and the land part forming a single entity shall be taken particularly into account; the ecosystems approach to coastal planning and management shall be applied so as to ensure the sustainable development of coastal zones (…)".

**Commission Regulation (EC) No 865/2006** of 4 May 2006, laying down detailed rules concerning the implementation of Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein.

**Council Regulation (EC) No 1967/2006** of 21 December 2006, concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94.
This Regulation shall apply: (a) to the conservation, management and exploitation of living aquatic resources where such activities are pursued (…).

**COM(2007) 308 final**, Report to the European Parliament and the Council: An evaluation of Integrated Coastal Zone Management (ICZM) in Europe.

**COM(2007) 575 final**, An Integrated Maritime Policy for the European Union (IMP "Blue Book") and the action plan SEC(2007) 1278, Commission staff working document, Accompanying document to the COM(2007) 575 final, An Integrated Maritime Policy for the European Union.

Commission communication adopted on may 2007, Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. "Nature and biodiversity" are one of the priority themes for European actions.

**Directive 2008/56/EC** establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).
Article 1: Marine strategies shall be developed and implemented in order to (…) b) prevent and reduce inputs in the marine environment, with a view to phasing out pollution as defined in Article 3(8), so as to ensure that there are no significant impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea. 3. Marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations.

**Directive 2008/105/EC** on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council.

**COM(2008) 534 final,** A European Strategy for Marine and Maritime Research. A coherent European Research. Area framework in support of a sustainable use of oceans and seas.

Protocol on Integrated Coastal Zone Management in the Mediterranean (2009).

**Decision of the Council 2009/89/EC** of 4 December 2008, signed the Protocol on Integrated Coastal Zone Management in the Mediterranean to the Barcelona Convention.

**COM(2009) 40 final,** On a European Community Action Plan for the Conservation and Management of Sharks.

**Council decision 2010/631/EU**, concerning the conclusion, on behalf of the European Union, of the Protocol on Integrated Coastal Zone Management in the Mediterranean to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean.

**COM(2011)244,** Our life insurance, our natural capital: an EU biodiversity strategy to 2020. Very important document. 3.1. Conserving and restoring nature - The full implementation of the Birds and Habitats Directives (i.e. reaching favourable conservation status of all habitats and species of European importance and adequate populations of naturally occurring wild bird species) is critical to preventing further loss and restoring biodiversity in the EU; 3.3. Ensuring the sustainability of agriculture, forestry and fisheries; 3.4 Combating invasive alien species; 3.5 addressing the global biodiversity crisis; 3.6. Contributions from other environmental policies and initiatives.

**COM(2011) 571**, final Roadmap to a Resource Efficient Europe, point 4.2. Biodiversity. Member States will work towards the objectives of the Biodiversity Strategy by integrating the value of ecosystem services into policymaking (continuous).

**Commission Regulation (EU) No 791/2012,** of 23 August 2012, amending, as regards certain provisions relating to the trade in species of wild fauna and flora, Regulation (EC) No 865/2006 laying down detailed rules for the implementation of Council Regulation (EC) No 338/97.

**Commission implementing Regulation (EU) No 792/2012**, of 23 August 2012, laying down rules for the design of permits, certificates and other documents provided for in Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein and amending Commission Regulation (EC) No 865/2006.

**Directive 2013/39/EU** amending directives 2000/60/EC and 2008/105(EC as regards priority substances in the field of water policy.

**Regulation (EU) No 1380/2013**, on the Common Fisheries Policy. The Common Fisheries Policy (CFP)shall cover: (a) the conservation of marine biological resources and the management of fisheries and fleets exploiting such resources (…). The CFP shall ensure that fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies.

**Commission Regulation (EU) No 1320/2014 of 1 December 2014**, amending Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein.

**Regulation (EU) No 597/2014 of 16 April 2014**, amending Council Regulation (EC) No 812/2004 laying down measures concerning incidental catches of cetaceans in fisheries.

**Commission Regulation (EU) 2015/870** of 5 June 2015 amending, as regards the trade in species of wild fauna and flora, Regulation (EC) No 865/2006 laying down detailed rules concerning the implementation of Council Regulation (EC) No 338/97.

**Commission implementing regulation (EU) 2015/57**, of 15 January 2015, amending Implementing Regulation (EU) No 792/2012 as regards the rules for the design of permits, certificates and other documents provided for in Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein and in Commission Regulation (EC) No 865/2006 laying down detailed rules concerning the implementation of Council Regulation (EC) No 338/97.

**Commission implementing regulation (EU) 2017/1915** of 19 October 2017, prohibiting the introduction into the

Union of specimens of certain species of wild fauna and flora.

**Commission Regulation (EU) 2017/160** of 20 January 2017, amending Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein.

### National level

**Law No 979, 31 December 1982**, provisions concerning sea defense.
Article 25: establishment of marine reserves which have an interest for the natural, biochemical and physical characteristics, with particular regard to the marine flora (in accordance with the article it has been established the marine reserve Miramare in the gulf of Trieste (Decree 12 November 1986).

**Law No 394, 6 December 1991**, which contains the main principles concerning establishment and the management of the protected natural areas. Its aim is to protect habitats and species and added to establish parks (article 2), composed by terrestrial, fluvial and marine areas.

**Presidential Decree No 1639, 2 October 1968**, implementing regulation of law No 963, 14 July 1965, regulation of maritime fisheries.

Biological protection area, established by the Presidential Decree No 1639, 2 October 1968 (article 98).

**Law No 150 of 7 February 1992**, sanctioning the offences related to the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora in Italy, amended by Law No 59 of 1993, by Law No 426 of 1998 and by the Legislative Decree No 275/2001.

**Decrees of the Ministry for the Environment** of 19 April 1996 and 26 April 2001 listing all the species (dangerous live animals) whose introduction into the national territory is forbidden.

**Presidential Decree No 357, 8 September 1997,** implementing directive 92/43/ECC, on the conservation of natural habitats and of wild fauna and flora, amended by Presidential Decree No 120/2003.

**Legislative Decree No 275, 18 May 2001**, Reorganization of the penalty system concerning protected fauna and flora species, amending Law 150/1992.

**Decree No 469, 6 December 2001**, adopted by the Ministry of Environment, Land and Sea, which contains measures concerning captivity of dolphins belonging to the species Tursiops Truncatus (implementing the article 17, paragraph 6 of the Law No 93, 23 March 2001).

**Law No 27, 10 May 2005**, implementing ACCOBAMS convention. In the Annex II it planned the adoption of a conservation plan that interests the following fields: adoption and implementation of the national legislation; assessment and management of the interaction between man and cetaceans; protection of the habitats; research and continuing oversight.

**Law No 61, 8 February 2006**, establishment of an ecological protection zone beyond the outer limits of the territorial sea. In application of the Montego Bay Convention, there is the possibility to establish ecological protection zones.

**Decree No 184 of 17 October 2007,** adopted by the Ministry of Environment, land and sea, laying down "uniform minimum criteria in order to identify conservation measures concerning Special areas of conservation (ZSC) and Special Protection Areas (ZPS)".

2030 Agenda for sustainable development in Europe and the report "Financing the future". The action programme No 53, has been adopted on February 2017.

Objective 14- Conservation and permanent use of the oceans, the seas and the marine resources for a sustainable development. Point 14.2: By 2020, it is important to manage in a sustainable way and to protect the marine and coastal

ecosystem, in order to avoid adverse impacts, by reinforcing their resilience and act for their restoration in order to protect the marine environment.
Objective 15: To protect, to restore and to encourage a sustainable use of the ecosystem, point 3: biodiversity.
National strategy for biodiversity (2011-2020), adopted by the ministry of environment, land and sea. More specifically, point 7: marine environment. Letter j) to reduce the by-catch impact on the species included in the habitat directive and in the red list IUCN (cetaceans, sea turtles and elasmobranchs); k) to ensure the coastal protection of the nesting sites of the sea turtles (*Caretta caretta*), sea birds (Berta greater, Berta minor, Maragone dal ciuffo, etc.).

**Legislative Decree No 190, 13 October 2010,** implementing directive 2008/56/EC. Article 1- Marine strategies, letter d) provides that the national legislation has to reinforce the conservation of the marine environment, by extending and integrating the protected marine areas.

**Agreement 10 July 2014**, between the standing conference of the State, the Regions and the autonomous provinces- Guidelines for the recovery, rescue, custody and management of the sea turtles for the purpose of rehabilitation.

### Regional level

### Emilia Romagna

**Law No 9, 31 May 2002,** Rules concerning the administrative duties related to the maritime government-owned and the territorial sea.
Emilia-Romagna has to ensure the environmental protection and conservation, the development of the fishing and aquaculture activities, the granting, renewal or revocation of the concession in the field of the maritime government-owned and the territorial sea. The Region has to identify the conservation areas for the increase of the fishery resources and has to control the fishery resources in the biological protected areas (article 3).

**Regional Law No 7, 14 April 2004**, measures for the conservation of natural habitat and wild flora and fauna, as required by directive 92/43/EEC and 79/409/EEC.
Article 2- The Region adopts some guidelines, in order to ensure the maintenance or the restoration of a favourable conservation status.

**Decision of the regional government No 1191, 30 July 2007,** concerning the adoption of the directive which contains the criteria of identification, conservation, management and monitoring of Special areas of conservation (ZSC) and Special Protection Areas (ZPS).

### Veneto

**Law No 15, 12 July 2007**- Measures for the protection, the promotion and the development of the coastal zone and for the creation of marine biological protected areas, in order to ensure the safeguard, protection and restocking of the fish stocks.
The Region adopts some measures aimed at the safeguarding, protection and restocking of the fish stocks, in order to ensure the biological protection and the diversification and valorization of the resources.

**Decision of the regional government No 176**, 1st December 2015- Measures for the adoption and the approval of the conservation measures for the Natura 2000 sites for the designation of the special areas of conservation.

**Decision of the regional government No 786, 27 May 2016**. Approval of the conservation measures for the Natura 2000 sites (article 4, paragraph 4, directive 92/42/EEC).

### Friuli Venezia Giulia

**Regional Law No 14, 14 June 2007,** Measures aimed at the fulfilment of the obligations arising from the European

Community.

**Regional Law No 7, 21 July 2008**, Measures aimed at the implementation of the directives 2006/123/EC, 92/43/EEC, 79/409/ECC, 2006/54/EC and the regulation (EC) No 1083/2006.
Decision of the regional government No 922/2011- Guidelines for drawing up the Natura 2000 sites management plans, in accordance with the regional Law No 7/2008, article 10, paragraph 12.

**Decision of the regional government No 1964/2016**, in accordance with the regional Law No 7/2008, article 10- approval of the conservation measures for the Natura 2000 sites for the designation of the special areas of conservation in the Friuli Venezia Giulia Region.

## Fishery

The fishery management has an international, European and national dimension.
At international level, there are some provisions which aimed at the promotion and the supporting of responsible conservation of fisheries resources and fisheries management and development by the national policies, such for example the UN Convention on the Law of the Sea, which provides that coastal State may "adopt law and regulations relating to (…) d) the conservation of the living resources of the sea, f) the preservation of the environment of the coastal State. In the same direction goes also the Code of Conduct for Responsible Fisheries, adopted in 1995, which deals also with aquaculture development, integration of fisheries into coastal area management. The code is not binding, but it represents a guidance to States, fishing entities, governmental and non-governmental organization. Another important convention is the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem**,** adopted in 2001; at point 2 it is emphasised the need to adopt a management plan with incentives that encourage responsible fisheries and sustainable use of marine ecosystems, including mechanisms for reducing excessive fishing efforts to sustainable levels, monitoring the by-catch and discards of fishery and reducing adverse impacts of fishing practices on habitat and biological diversity.
The EU also gives importance to the Common Fisheries Policy. The principal objectives of CFP are the conservation and management of fishery resources, financial assistance to the fisheries sector and aquaculture. It raises issues concerning the management of natural resources, the impact of fishing on the winder marine environment.
The management of fisheries is intrinsically linked to the regulation of the impact of human activities on fish, in order to ensure that stocks of fish are maintained at levels that will sustain their continued exploitation as a resource indefinitely, an aim that is stressed by the FAO. This may require various measures to be taken and the measures proposed may perfectly help to achieve these objectives that are pursued.
Therefore, fishery is an important sector for Blue Growth in the Adriatic Region. More specifically, the social, cultural and economic contribution of fisheries is very important at a national, regional and local level. The fishery sector is a traditional sector important for maritime spatial planning, on a social and economic point of view. The measures proposed will promote and guarantee a greater sustainability of the fishery activity, preserving stocks and habitats, and to promote the trend already on-going towards small-scale fishery.
The Commission published the Action Plan for the conservation and sustainable exploitation of Mediterranean fisheries in October 2002. The plan had various elements, such as the facilitating management of fishery, a reduction in capacity and fishing effort, a change of the methods of fishing in order to conserve resources and protect the environment and the improvement of control and enforcement.

Council Regulation (EC) 1100/2007 introduced measures to rebuild stocks of European eel and envisaged a Management Plan being sent to the European Commission by each Member State.
An important document adopted by EU is the Regulation (EU) No 1380/2013 (Mediterranean Regulation), on the Common Fisheries Policy, which provides that Member States "in order to preserve the ecosystem, may adopt measures aimed at the conservation of the marine environment, measures, by the territorial sea, with limitations or bans concerning the fishery activity, for certain zones or periods. So, the measures we want to propose, may be supported by this provision. Regulation 1967/2006 provides that Member States must adopt management plant for fisheries using certain kinds of gear within its territorial sea. The regulation provides also the creation of fishing protected areas. These areas are "areas within which all or certain fishing activities are temporarily or permanently banned or restricted in order to improve the exploitation and conservation of living aquatic resources or the protection of marine ecosystems" (the measures proposed have an European basis). The Mediterranean Regulation contains some rules linked to the management measures and obligations, which intended to protect sensitive areas and habitats from fishing activities, and technical measures concerning the number, dimension and selectivity of the fishing gears. Member States have to adopt rules through long-term management plans for fisheries in their territorial waters. The EU adopted also some financial measures for the implementation of the CFP, for the supporting of the sustainable development of fisheries and the implementation of the Integrated Maritime Policy (Regulation (EU) No 508/2014).
The national legislation has also adopted some provisions in order to regulate and monitor fishing activities. Legislative Decree No 4/2012 (measures for the reorganization of fishery and aquaculture sector) at article 10, provides that "in order to protect biological resources and to prevent and discourage illegal fishing, it's forbidden to fish in areas prohibited by European and national legislation, to hold, transport and trade in areas and prohibited by European and national legislation, to fish quantity exceeding that laid down in European and national legislation".
It has also been approved the three-year national fisheries and aquaculture programme (2017-2019). It is the only planning tool concerning the aquatic production of Italian agricultural and food policy, and it provides, at point 5 (objectives and instruments), the sustainable development of fisheries, by reducing the fleet capacities, by containing the fish capture, by implementing the technical measures laid down in Regulation (EC) No 1967/2006, and by implementing the national and local management plan (concerning fish capture).
The directorial decree for sea fisheries and aquaculture established 8 management national plan for the trawling fleets, which regulates the activity and aims at the reduction of the fleets. Its aims are the recovery of fish stocks within biological limits by 2020 and the reduction of fishing capacity, implemented through a vessel decommissioning. The plan, for the years 2018-2020, provides for a reduction of fishing days. At regional level, there has been adopted numerous provisions.
The measures referred to this report fall within the above international, European, national and regional framework. All the measures proposed may contribute to the achievement of the objectives pursued by the legislation at the different levels, in consideration of the specificities of the areas.

| Measures | Competent authority |
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| Limitation of fishing activity and capacity to local fleets, in order to reduce total effects and foster local markets.<br><br>Review the limitations on allowable catches.<br><br>Reduce the potential of by-catch fostering selective gears and techniques.<br><br>Specify best practices to reduce trawling pressures on vulnerable species.<br><br>Specify commercial rules to sustain local markets.<br><br>Obligation of selected fishing techniques.<br><br>Seasonal program related to fishery activity.<br><br>Reduction of the trawling fishing effort. | **European level**<br><br>General Fisheries Commission for the Mediterranean (GFCM)- the mandate of the GFCM is to ensure the sustainability of fisheries activities through the adoption of adequate management measures. The Commission may adopt some recommendations for the conservation of the marine resources and the management of the fishery and plays an important governance role on the fisheries policy in the region.<br><br>The Regulation CE No 199/2008 establish a community framework for the collection, the management and the use of data collected related to the common fisheries policy.<br>The Commission, with the decision No 93/2010, adopts a community programme for the collection, the management and the use of the data collecte.<br>The national programme contains the procedures and the methods which have to be used for the collection and the analysis of the data.<br><br>**National level**<br><br>Ministry of Agriculture, Forestry and tourism.<br>Department of the competition policies and the food quality and fishery and, more specifically, the Directorate-General for fisheries and aquaculture.<br><br>Fishery district of the North Adriatic.<br><br>Port Authorities (bodies closely linked to the Ministry for infrastructures and transport) play an important role in the management of the fisheries sector.<br>It is important to have a dialogue with the Region and the port authorities, in order to collaborate with each other.<br><br>Central advisory committee on fisheries and aquaculture, composed by some members in order to pursuit the administrative functions.<br><br>**Control activities**<br><br>Ministry of Agriculture and Forestry- Directorate General of sea fishing and aquaculture (it is the competent authority in accordance with the article 5, paragraph 5 of the Regulation EC No 1224/2009, which coordinates the control activities).<br><br>Advisory Committee for fisheries and aquaculture (Legislative decree No 154/2004, article 3).<br><br>Local advisory committee for fisheries and aquaculture. (Provisions related to the skills, the mode of operation and composition of the committee and).<br><br>Collection of data in the fisheries sector: the Regulation No 508/2014 establishes a national data collection programme on fishery-<br><br>Central advisory committees for fisheries and aquaculture. The Commission gives his opinion on the decrees of the Ministry of Agriculture and Forestry.<br><br>Local advisory committees for fisheries and aquaculture. The Regions establish the committees by regulating its skills, mode of operation and composition and by |

providing the connection with the port authorities.

The legislative decree No 226/2001, at article 4, establishes the district of fishery, that targets the rational use of the biological resources.

The decision of the ministry of agriculture and Forestry 23 February 2010 establishes the district of the North Adriatic (subzone 17), which includes the Region of Friuli Venezia Giulia, Veneto and Emilia-Romagna. It promotes the collaboration between the companies and the producers in the fisheries sector for the development of the common actions that have to be taken in this sector.

Advisory committee for the regional fishery in Veneto (establishes in 2010). The Committee has an advisory competence related to some activities carried out in the fisheries sector.

| Law |
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| **International level**<br><br>**Convention on Fishing and Conservation of the Living Resource of the High Seas, 1958.**<br><br>**United Nations Convention on the Law of the Sea**, Montego Bay, 1982<br>The United Nations Agreement for the implementation of the provisions of the United Nations Convention on the Law of the Sea, 10 December 1982.<br>The Agreement elaborates on the fundamental principle, established in the Convention, that States should cooperate to ensure conservation and promote the objective of the optimum utilization of fisheries resources both within and beyond the exclusive economic zone.<br>It promotes the effective management and conservation of high seas resources by establishing, among other things, detailed minimum international standards for the conservation and management of straddling fish stocks and highly migratory fish stocks; ensuring that measures taken for the conservation and management of those stocks in areas under national jurisdiction and in the adjacent high seas are compatible and coherent (…).<br><br>**Code of Conduct for Responsible Fisheries**, which establishes and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development.<br><br>**Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem, 2001.** Point 2: There is a clear need to introduce immediately effective management plans with incentives that encourage responsible fisheries and sustainable use of marine ecosystems, including mechanisms for reducing excessive fishing efforts to sustainable levels.<br>(d) improve the monitoring of by-catch and discards in all fisheries to obtain better knowledge of the amount of fish actually taken; (e)support research and technology developments of fishing gear and practices to improve gear selectivity and reduce adverse impacts of fishing practices on habitat and biological diversity.<br><br>**ICZM Protocol,** it is the seventh Protocol in the framework of the Barcelona Convention, signed in Madrid on 21 January 2008.<br>Article 9, concerning economic activities, provides that "the parties agree (b) Fishing: (i) to take into account the need to protect fishing areas in development projects; (ii) to ensure that fishing practices are compatible with sustainable use of natural marine resources".<br><br>**Rio Document+(2012),** The future we want, point 83. We note that despite agreement to restore global fish stocks to sustainable levels by 2015, many stocks continue to be depleted unsustainably. We call upon States to re-commit to maintaining or restoring depleted fish stocks to sustainable levels and to further commit to implementing science-based management plans to rebuild stocks by 2015.<br>Point 84. We urge countries to combat illegal, unreported and unregulated (IUU) fishing by adopting and implementing effective tools, in accordance with international law. We note the agreement on port state measures to |

## The sustainable tourism

Tourism plays an important and central role for the economy. Though, the development of tourism has negative impacts on the local environment. So, the conservation of natural

resources and the sustainable development of communities will depend on the way the tourism industry and activity evolve and is managed.
Word Travel and Tourism Council (WTTC), World Trade Organization (WTO) and Earth Council adopted "Agenda 21 for the tourism: towards sustainable development" (1995), which promotes sustainable tourism development. Chapter 28 of Agenda 21 binds local authorities to implement at a local level the commitments made towards sustainable development by the international community. Local communities have to implement a sustainable development strategy and an action programme. In the same way, the Rimini Charter for sustainable and competitive tourism (2001) affirmed the importance to assure a sustainable tourism. Therefore, the Global Sustainable Tourism Council has identified the global sustainable tourism criteria, which are global baseline standards for sustainability in travel and tourism. In this framework, four pillars have been defined: sustainable management, socioeconomic impacts, cultural impacts, environmental impacts.
In *"The future we want"* (Rio+ Document, 2012) sustainable tourism is defined by paragraph 130 as a significant contributor *"to the three dimensions of sustainable development"*. Member States recognize *"the need to support sustainable tourism activities and relevant capacity-building that promote environmental awareness, conserve and protect the environment, respect wildlife, flora, biodiversity, ecosystems and cultural diversity, and improve the welfare and livelihoods of local communities"*. Paragraph 131 provides that Member States have to *"encourage the promotion of investment in sustainable tourism, including eco-tourism and cultural tourism, which may include creating small and medium sized enterprises and facilitating access to finance, including through microcredit initiatives for the poor, indigenous peoples and local communities in areas with high eco-tourism potential"*. The concept of sustainable tourism plays a key role nowadays.
At European level, it is important to highlight that one of the EUSAIR pillar is sustainable tourism, and more specifically the diversified tourism offer and sustainable and responsible tourism management. The sustainability of tourism must be in line with the overall orientation for sustainable development defined for the EU in the European Sustainable Development Strategy (SDS). EU also established the Tourism Sustainability Group (TSG).
EU identifies numerous challenges proper to the tourism sector that will have to be addressed. These mainly include *"sustainable conservation and management of natural and cultural resources, minimising resource use and pollution at tourism destinations including the production of waste, managing change in the interests of the well being of the community, reducing the seasonality of demand, addressing the environmental impact of transport linked to tourism (...)"*. The importance of sustainable tourism is reaffirmed in "Blue Growth". Tourism sector shows the need to reconcile development and environment. The promotion of sustainable growth of maritime and coastal activities and the sustainable use of coastal and marine resources, with which tourism is strictly interconnected, has been reaffirmed by the Integrated Coastal Zone Management (ICZM).
The Commission invites also the industry and other stakeholders to: a) develop and promote ecotourism and other sustainable tourism products; b) implement water efficiency measures included in the Water Blueprint; c) actively participate in projects that reduce waste, emissions, marine litter, natural resource use and in water and waste recovery / recycling.
The national legislation adopted the framework law on tourism, No 135, of 9 march 2001, related to the national reform on tourism. Then, it has been adopted the prime ministerial

decree (DPCM) of 13 September 2002, on the transposition of the agreement between State, Regions and autonomous provinces for the harmonization, enhancement and development of the tourist sector. Article 1 established numerous principles (such as the exploitation of environmental resources, cultural goods and local traditions), in order to achieve a sustainable tourism development. An important disposition is the tourism code, adopted by the legislative decree No 79, which implements directive 2008/122/EC. It has also been adopted the tourism strategic plan 2017-2022, which contains some innovative solutions for a sustainable tourism.

At regional level, the competent authorities adopted also some provisions in the tourism sector. Veneto Region, for example, adopted regional Law No 11, 14 June 2013, for the development and the sustainability of tourism, which, at article 1, subparagraph 2, letter a), provides the promotion of the economic sustainability development, in the context of exploitation of touristic resources, and guarantee of the enjoyment of cultural, historical, artistic, territorial and environmental heritage, and article 44, measures for sustainable tourism. Veneto Region also adopted a Tourism regional programme (PRT), a Tourism annual plan (PTA), a Promotion Plan of primary sector (PPSP), in order to plan and coordinate tourism sector and activities. PRT contains the objectives that the objectives to be achieved by the region, and the measures aimed at improving quality and competitiveness of companies. The PTA (Development and sustainability of the tourism), approved by DRG No 247, 6 March 2018, establish the availability of funds and award criteria of resources.

The importance of sustainable tourism has been argued repeatedly from the various legislation levels. Many important policies that have an effect on sustainable tourism development, such as zoning, environmental regulations, licensing, and economic incentives, are often in the hands of local authorities, acting within the framework of national. Local authorities have an important role in economic development and they are also the privileged partners in sustainable tourism development efforts because they are in contact with local communities. The decentralization of development policies and strategies is creating a further need to improve the ability of local authorities to use policy instruments for integrated, economic social and environmental development. It is important to enhance sustainable development, by strengthening the management and development of sustainable tourism in the study areas and by integrating tourism with other activities which are carried out, such as aquaculture, fishery, etc. All the measures proposed aim at ensuring a sustainable tourism, in order to reduce the impacts of tourism in coastal areas and to identify better practices for the management of the tourism sector in all its aspects. They are strongly required to overcome the barriers in order to develop a tourism-driven multi-uses, which is a necessary and required objective.

| Measures | Competent authority |
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| Environmental monitoring in correspondence of bathing areas.<br><br>Measures to reduce the impact tourism in coastal areas.<br><br>Measures to manage the tourism presence in coastal areas in order to prevent damage to the marine environment and other elements (e.g. UCH…).<br><br>Identify better practices for the management of the tourism sector in all its aspects (activities, facilities, pressures/impacts).<br><br>Overcoming of the barriers (mainly legal and administrative but also technical etc…) to develop tourism-driven multi-uses. | Ministry of Culture and Tourism.<br><br>The department of development and competitiveness, establishes with the decision Decree No 262, 3 October 2006, is the competent body which supports the government on the tourism policies (more specifically, the article 55 of the code of tourism contains the role and the functions of the department).<br><br>The Ministry of the regional affairs, the tourism and the sport is empowered to carry out the duties related to the coordination, guiding and monitoring functions<br><br>National agency of tourism established by presidential decree No 207, 6 April 2006.<br>The national tourism agency has been established with the law No 80, 14 May 2005 (ENIT).<br>ENIT adopts some measures for the promotion of tourism in Italy and for the support of the tourism products of Italy at an european and international level.<br><br>Presidential Decree No 207, 6 April 2006, Regulation establishing the organisation of the National agency of tourism. It has been attributed to the President of the Council of Ministers, or to a delegated body, the competences in terms of tourism.<br><br>Standing committee for the promotion of tourism.<br><br>**Veneto**<br><br>Regional Law No 11, 14 June 2013, Development and sustainability of tourism.<br>At article 14 it has been establishes the regional observatory for tourism. |

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### International level

Word Travel and Tourism Council (WTTC), World Trade Organization (WTO) and Earth Council adopted **"Agenda 21 for the tourism: towards sustainable development"** (1995).

The United Nations Commission on Sustainable Development approved the Resolution Tourism and Agenda 21. Chapter 28 of Agenda 21 binds local authorities to implementing at a local level the commitments made towards sustainable development by the international community. Approach through which a local community defines a sustainable development strategy and an action programme to be implemented.

**Global code of Ethics for Tourism (1999):** it's a set of principles designed to guide key-players in tourism development, which aims to help maximise the sector's benefits while minimising its potentially negative impact on the environment, cultural and heritage and societies across the globe.

**The Rimini Charter for sustainable and competitive tourism (2001)**.

**The Global Sustainable Tourism Council** has identified the global sustainable tourism criteria, which are global baseline standards for sustainability in travel and tourism. Four pillars: sustainable management, socioeconomic impacts, cultural impacts, environmental impacts (including consumption of resources, reducing pollution, and conserving biodiversity and landscapes).

### European Level

**The Charter of European Sustainable cities and towns towards sustainability (Aalborg Charter, 1994)** is an urban environment sustainability initiative. Point I. 14: Administrative instruments and for urban management for the implementation of a sustainable development.
The use the political and technical instruments and tools available for an ecosystem approach to urban management. We shall take advantage of a wide range of instruments including those for collecting and processing environmental data; environmental planning; regulatory, economic, and communication instruments such as directives, taxes and fees; and mechanisms for awareness raising including public participation.

**The EU Strategy for the Adriatic and Ionian Region (EUSAIR**) is a macro-regional strategy adopted by the European Commission and endorsed by the European Council in 2014. One of his pillar is sustainable tourism, more specifically diversified tourism offer and sustainable and responsible tourism management.

**COM(2003) 716 final**, Basic orientations for the sustainability of European tourism. The sustainability of tourism must be in line with the overall orientation for sustainable development defined for the EU in the European Sustainable Development Strategy (SDS). Subsequent to the Communication, it has been established the Tourism Sustainability Group (TSG).

**COM(2007) 621 final**, Agenda for a sustainable and competitive European tourism. There are a lot of challenges proper to the tourism sector that will have to be addressed. These mainly include "sustainable conservation and management of natural and cultural resources, minimising resource use and pollution at tourism destinations including the production of waste, managing change in the interests of the well being of the community, reducing the seasonality of demand, addressing the environmental impact of transport linked to tourism (…)".

**COM(2010) 352 final**, Europe, the world's No 1 tourist destination - a new political framework for tourism in Europe. Tourism is a sector which needs to reconcile development and environment.

**COM(2012) 494 final**, Blue Growth opportunities for marine and maritime sustainable growth, point 5.3 Maritime, coastal and cruise tourism: A healthy environment is fundamental to any form of 'blue' tourism and favours the growth potential of new forms of tourism. High quality bathing waters and pristine coastal and marine habitats have a high recreation value.

## Renewable energy-Marine energy

The importance of renewable energy sector has been affirmed by international, European and national legislation. Energy is a strategic sector with a great potential for jobs and growth and a pillar for the economy. At international level, many provisions promoted the use of renewable energy, and, more specifically, of marine energy, because oceans and seas represent an important source that should be exploited. For example, the 2030 Agenda for sustainable development, adopted by resolution A/RES/70/, provides 17 sustainable goals and, more specifically, the goal No 14 provides the conservation and the sustainably use of the oceans, seas and marine resources for sustainable development. The importance of renewable energy has been affirmed also by European Union. The European Commission has strengthened its support for the development of ocean energy, which has been identified as a key technological area within the Strategic Energy Technology Plan of the European Union. By 2020 the technological and financial barriers may be overcome.
The support of the deployment of ocean energy meets the directives and recommendations of the EU, which established a common framework for Member States for the promotion of the use of energy from renewable sources (EU 2009/28/CE Directive). Directive 2012/27/EU provides that *"during the assessment, planning or licensing procedures for renewable energy installations, Member States should take account of all Community environmental legislation and the contribution made by renewable energy sources towards meeting environmental and climate change objectives (recital No 44)"*. So, the coherence between the objectives of this Directive and the other Community's environmental legislation should be ensured.
The directive of MSP also aims at promoting the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources (Directive 2014/89/EU). In the same direction goes also the European Strategic Energy Technology Plan, which prioritized the key actions for the ocean energy sector, aiming at confirming the EU global leadership in the field. The Ocean Energy Strategic Roadmap 2016 focuses on the barriers that are still hindering the industrial roll-out and the final commercialisation of ocean energy technologies (technology development, finance, consenting and environmental issues, and the availability of grid infrastructure). An important role is also played by the development at the level of public support offered in the short and medium-term by the EU, Member States and regional authorities concerning the elimination of current barriers to project deployment. The EU introduced clear rules and provides better visibility for investors and strengthened coordination between the administrations of each country.
At national level, Italy also prioritized and incentivized the deployment of renewable energies by adopting a set of rules and regulation, which transposed the EU 2009/28/CE Directive into the Italian national legislation. Furthermore, the principles and the objectives of the regulatory framework are contained in the National Action Plan for Renewable Energies of 2010; in 2013 it is adopted the National Energy Strategy, which was recently updated in 2017. The regulatory measures for the operative implementation of the National Strategy and Plan have been issued in D.M. 23/06/2016. Moreover, legislative decree No

387/2003 introduced the simplified authorization procedure for energy production from renewable sources currently in force. In particular, article 12 of D. Lgs. 387/2003 and its subsequent amendments, prescribe that the construction and operation of such plants, as well as their modification, upgrade, total or partial restoration, reactivation, and necessary works and/or infrastructures and interconnection facilities, are subject to a single authorization (autorizzazione unica), which is issued by a single responsible authority. Furthermore, with the adoption of the legislative decree No 28/2011, which implements directive 2009/28/CE, Italy prioritized and incentivized the deployment of renewable energies by adopting a set of rules and regulations. The Italian actors may also participate in co-funded EU programmes and access to co-funded financial instruments. Technological and financial barriers are also present in Italy and their overcome is strictly linked to a public support of the national government, of the regions and the administrations, in order to provide a stable and sustainable financing and to create new tools of access to credit.
In conclusion, Italy has made great steps in the ocean energy sector. Policy interventions and investments would now fully disclose the potential offered by the marine energy sector, in terms of economic growth, high-skilled job creation and strategic positioning of the Italian industry in the competitive global market. Italy is trying to overcome the obstacles which prevent the development of marine renewable energies (such as financial, technological, legal, environmental, industrial) and the adoption of the here proposed measures may contribute to do all this.

| **Measures proposed** | **Competent authority** |
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| Reduction of impacts during construction.<br><br>Administrative procedures favouring a fast licensing and permitting process.<br><br>Economic incentives. | Ministry of economic development, in liaison with the Ministry of Environment, Land and Sea.<br><br>Regulatory Authority for electricity and gas.<br><br>Legislative Decree No 367/2003, article 16-National observatory of the renewable sources and the energy end-use efficiency. Monitoring and consultation on renewable energy sources and on energy end-use efficiency.<br><br>At article 9 it is established the promotion of the research and dissemination of renewable sources. The Ministry for productive activities, in liaison with the Ministry of Environment, Land and Sea, the Ministry of Agriculture and Forestry, conclude a five-year agreement with ENEA for the implementation of measures aimed at the research and the dissemination of renewable energy sources and on energy end-use efficiency.<br><br>ENEA it the national agency of new technologies, energy and sustainable economic development (established by legislative decree No 115, 39 May 2008), which offers a scientific and technological support to the companies, to the public administration in the sector of energy, environment and sustainable economic development (Law No 221, 28 December 2015).<br><br>The Italian Regulatory Authority for Energy, Networks and the Environment (Autorità di Regolazione per Energia Reti e Ambiente, ARERA) is an independent body.<br>Functions: monitors, supervises and controls the service quality, safety, access to networks, tariffs, incentives for renewable and similar sources, including in collaboration with the Tax Police and other bodies, including the Fund for Energy and Environmental Services (CSEA) and the Energy Services Manager (GSE). |

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| **International level**<br><br>**The United Nations Framework Convention on Climate (UNFCCC)** is an international treaty adopted at the Earth Summit on 9 May 1992.<br><br>**The Energy Charter Treaty** provides a multilateral framework for energy cooperation that is unique under international law (1994).<br><br>**Kyoto Protocol,** international agreement linked to the United Nations Framework Convention on Climate Change, adopted in December 1997, which aimed to reduce the emission of gases that contribute to global warming and which commits its Parties by setting internationally binding emission reduction targets.<br>The Kyoto protocol was the first agreement between nations to mandate country-by-country reductions in | |

## Marine litter

The problem of marine litter has gained importance in the last years because it poses a complex and multi-dimensional challenge with significant implications for the marine and coastal environment and for human activities.
The issue of marine litter got strengthened with the entering into force of the Barcelona convention LBS Protocol (2008) and the Integrated Coastal Zone Management (ICZM) Protocol in 2011, and with the coming into effect in 2009 of the Mediterranean Sea as a

Special Area (under Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL).
The European Union, by the adoption of the directive on port facilities for ship-generated waste (2000/59/EC) and cargo residues, introduced the obligation to adopt a waste reception and handling plan. Then, it was adopted the Marine Strategy Framework Directive (MSFD), the environmental pillar of the European integrated maritime policy, which requires European Member States to monitor marine litter and implement a programme of measures to reduce its occurrence, in order to achieve or maintain good environmental status (GES) in the marine environment by 2020 (and beyond). Marine litter is listed as the tenth of 11 qualitative descriptors for determining a GES, which states that the properties and quantities of marine litter do not cause harm to the coastal and marine environment. The EU has a wide range of initiatives on land-based waste management, which could have a significant impact on the amount of waste in the marine environment. For example, the Packaging and Packaging Waste Directive outlines a range of requirements to reduce the impact of packaging waste on the environment. It contains provisions on the prevention of packaging waste, on the re-use of packaging and on the recovery and recycling of packaging waste. Other initiatives include the Waste Framework Directive, the Landfill Directive and the Urban Waste Water Directive.
In this international and European frame, national policy has also a crucial and important role. The main sources of coastal litter are linked to aquaculture activity, tourism activities, coastal urban centers, which are regulated by national and regional provisions. At national level, it can be detected that Italy has not a policy related specifically to marine litter. The national legislation has policies for the management of coastal solid but the enforcement of the policies is weak mostly because of the poor coordination between different national and local administrations dealing with solid waste issue. For this reason, it is strongly required a strategy in order to assist coastal local authorities to improve the management of marine litter, by limiting the different sources of waste, in order to prevent the introduction of litter into the marine environment (litter is present on the beaches, floating in the water and on the sea bed). It is also required the development of a public awareness and education campaign on the management of marine litter with the overall objective to contribute to the protection of the environment and the sustainable development of the Mediterranean.
In order to implement the European action, Italy adopted a programme of measures by DCPM 10 October 2017. The DCPM introduced some measures related to the reduction of marine litter. More specifically, the programme provides the planning and the realization of (a) measures aimed at improving the management of waste generated by fisheries and aquaculture, included decommissioned gears, facilitating the reuse, recycling and recovery; (b) measures aimed at the regularization of waste disposal in marine waters; (c) measures aimed at reducing ballast water; (d) green economy measures concerning cleaning of sea bed. In addition to this, it is gradually emerging the importance of public awareness and education in the fight against marine litter. All these measures are in keeping with the regional plan for the marine litter management in the Mediterranean. Italy also introduced some monitoring programmes concerning waste disposal on the seabed. Furthermore, the national provisions are trying to adopt some measures concerning litter mitigating, removing and a behavior changing (education campaigns, economic/incentive tools).

The adoption of the here proposed measures may improve the quality of marine and coastal environment, in accordance with international, European and national provisions, which recognize the importance of dealing with the problem of marine litter. In conclusion, a variety of instruments at international, regional and national levels have been developed in order to fight against marine litter. The actions aimed at the reducing the marine litter, which is controlled and eliminated to the maximum practicable extent through regional and national activities. Marine litter could be prevented and controlled through an effective collaboration of education and outreach programmes, strong regulations and policies, effective enforcement, and adequate support infrastructures. The enhancement of public awareness and education plays also a very important role in the marine litter management and it is important that all the levels cooperate with each other in fighting this problem.

| **Measures** | **Competent Authority** |
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| Measures to reduce the marine litter generated by tourism activity and by the other activities (aquaculture, UCH, oil and gas) with which tourism is in combination.<br><br>Awareness campaign to encourage and favor the diminishing use of plastic and the cleaning of the coast.<br><br>Measures to reduce (methodologies and/or technologies) and to prevent the loss of marine litter generated by aquaculture activities, including nets, ropes and other trashes.<br><br>Development of cost efficient and sustainable measures and methodologies for retrieving the marine litter generated by aquaculture.<br><br>Measures to reduce the production of marine litter from fishing vessels.<br><br>Better practices of waste management related to operational activities. | **International level**<br><br>UNEP/IOC Guidelines on Surveying and Monitoring of Marine Litter developed, in cooperation with the intergovernmental Oceanographic Commission (IOC), guidelines on surveying and monitoring of marine litter in order to provide a long-term platform for scientific monitoring.<br>The activities related to ML prevention are mainly in charge to the General Direction for Waste and Pollution of the IMELS.<br><br>**National level**<br><br>The activities related to ML revival action at sea, monitoring, outreach fall under the responsibility of the General Direction for Nature and Sea protection of the Italian Ministry of Environment Land and Sea.<br><br>The ministry of Environment Land and Sea has been established by law No 349, of 8 July 1986, and it is the competent authority for the implementation of the marine strategy.<br><br>**Competent authorities for the application of the measures:** Ministry of environment, land and sea;<br>Ministry of Agriculture, regional authorities and port authorities.<br><br>**Supervision and Control**<br><br>Port authorities-Surveillance and prevention of pollution of marine waters from hydrocarbons and other harmful substances. The ministry of transport shall cooperate with port authorities in order to reinforce the control activity.<br><br>The monitoring activity, provided for in article 11, subparagraph 3-bis, legislative decree No 190/2010, has been given by the Ministry of Environment, Land and Sea to the regional environment agencies, under the Convention signed in 2014.<br><br>The regions, under the framework agreement signed in 2014 with the Ministry of Environment, Land and Sea, play an advisory role in order to approve (monitoring plans) the work done by the Agencies.<br><br>The agencies, through 3 conventions signed between the MELS and the three cluster lead aid agencies of the subregions (Mediterranean, Adriatic and Ionian Sea), have to carry out the activity (operational activity programme).<br><br>The coordination of the monitoring activities is assigned to the Coordination Commission (consisting of the MELS, the Regions and the three subregions) and to a “cabina regia” (consisting of three representatives of the MELS and two representatives for each subregion). The technical support is given by ISPRA, CNR and other research institutes.<br><br>For the Adriatic subregion, ARPAE (Emilia Romagna Region)-oceanographic structure Daphne, composed by 7 agencies, has been appointed as the cluster lead aid agency.<br><br>Awareness-raising activities: the stakeholders are the tour and bathing operators, operators related to the maritime transport, aquaculture and fishery. It is important to enhance the role of the fishermen. |

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| | The ARERA (the Italian Regulatory Authority for Energy, Networks and Environment) is an independent body. Law No 205 of 27 December 2017 allocated to the Authority regulatory and control functions over the waste cycle, including sorted, urban and related waste. |

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**International level**

**International Convention for the Prevention of Pollution of the Sea by the Sea by Oil** (Oilpol convention, 1954).

**International Convention on Civil Liability for Oil Pollution Damage, 1969.**
This Convention shall apply exclusively to pollution damage caused on the territory including the territorial sea of a Contracting State and to preventive measures taken to prevent or minimize such damage.

**Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972,** the London Convention for short, is one of the first global conventions to protect the marine environment from human activities and has been in force since 1975.

**International Convention for the Prevention of Pollution from Ships (MARPOL),** adopted on 2 November 1973 at IMO; modified by London Convention TSPP (Tanker safety pollution prevention). MARPOL has been updated by amendments through the years.
Annex I: Regulations for the Prevention of Pollution by oil.
Annex III: Prevention of Pollution by Harmful Substances carried by Sea in Packaged form.
Annex IV: Prevention of pollution by sewage from ships.
Annex V: Prevention of pollution by garbage from ships.

**Barcelona Convention** for the Protection of the Marine Environment and the coastal region of the Mediterranean adopted in 1995. His aims are to prevent, reduce and control marine litter generation and its impact on the coastal and marine environment.

**United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982**, Part XII "Protection and Preservation of the Marine Environment".

**Basel Convention on the control of transboundary movements of hazardous wastes and their** disposal (1989, global).

**International Convention on Oil Pollution Preparedness**, Response and Co-operation (OPCR), 1990, in order to establish measures for dealing with pollution incidents, either nationally or in cooperation with other countries. A Protocol to the OPRC relating to hazardous and noxious substances (OPRC-HNS Protocol) was adopted in 2000.

**United Nations Convention on the Law of the Sea (UNCLOS**), entered into force in 1994. Articles 192–237 of Part XII are dedicated to the protection and preservation of the marine environment. While the provisions do not explicitly refer to marine litter, they place a general obligation on states to protect and preserve the marine environment, which can be used in the context of marine litter regulation.

**Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources, 1996**, entered into force in 2008. The Protocol recognizes the importance of dealing with the problem of marine litter. The Annex I of the amended Protocol defines marine litter as "any persistent manufactured or processed solid material which is discarded, disposed of, or abandoned in the marine and coastal environment".
In 2007, OSPAR published Guidelines for the implementation of Fishing for Litter (FFL) projects in the OSPAR area. FFL has two main aims: the physical removal of marine litter from the seabed and to raise awareness within the fishing industry that it is not acceptable to throw litter overboard.

**Nairobi International Convention on the Removal of Wrecks is a 2007 treaty of the International Maritime Organization (IMO)**. His aim is to establish uniform rules for the prompt and effective removal of shipwrecks located in the exclusive economic zone (EEZ) of a state that may be hazardous to navigation or to the environment.

UNEP/MAP was the first ever Regional Sea Programme to develop a regional plan on the management of marine litter in 2013.

**Military areas**

In the North Adriatic, and more specifically in front of the coast of Riccione and Chioggia, are undertaken many military activities. The report has identified many negative aspects associated to these activities.
On the point, it is useful to pint out the following. The Ministry of the Defence may authorize military training in specific areas, in order to assure the national security. Without any authorization, the military activity is unlawful.
The national legislation has adopted some dispositions related specifically to military activity and the environmental protection, which underlines the importance of the monitoring of the military activities in order to protect environment. The national legislation provides also the adoption of a Memorandum of Understanding between the IMELS and the Ministry of Defence, with which they shall assist one another in the programming and monitoring of the military activities. The technical committee will also collaborate with them in order to achieve the objectives pursued by the marine strategy.
The Emilia-Romagna Region has one of the biggest military activity site, know as "ECHO 346 Foce Reno". The military training produced a lot of negative effects to the environment, with negative impacts to fishery, maritime transport and marine environment. Port authority of Ravenna and Port Authority of Garibaldi Port adopted some ordinances, by which identify the days and the hours designed for the military exercise. In view of the various elements emerged during the report, it is necessary to intervene in the area, by monitoring the respect of the rules for permanent and temporary prohibitions and by limiting further the military exercise.
The measure proposed complies perfectly with national legislation, which considers it essential to monitor the military activities, and more specifically the permanent and temporary prohibitions. It is also considered useful to limit the area in which are carried out military activities
The measure proposed must be discussed with the competent military authority (in the present case, it is the port authority of Ravenna and Garibaldi Port) and their practicability has to be verified taking also into consideration the needs of the military training. It will be also useful to estimate the economic benefit resulting from the reduction of the constraints, by taking into account, for example, time and fuel saving due to the reduction of the navigation, the economic viability of the small-scale fishing and new aquaculture areas.

| **Measures** | **Competent Authority** |
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| Monitoring the respect of rules for permanent and temporary prohibitions. | Ministry of Defence gives the information related to the making safe, the remediation and the monitoring of the soil, the underground, the groundwater, the surface and marine waters, the sediments.<br><br>Ministry of Environment, Land and Sea. The Ministry supports the actions aimed at the remediation and environmental restoration of the areas affected by the military activities.<br>The Ministry of Environment, Land and Sea is the competent authority in carrying out the activities related to the marine environment policies. The Ministry has a technical committee, which pursued the objectives related to the marine strategy (imposed by the international and european legislation).<br><br>Ministry of Infrastructure and Transport- Port authority of Garibaldi Port.<br><br>Regional environmental regional monitoring center for military sites. (Legislative Decree No 152/2006, article 241-bis, paragraph 4-quinquies). The Regions in which there are based the military site have to establish a regional environmental regional monitoring centre for the military sites.<br><br>ISPRA, in coordination with the regional agency for prevention, environment and energy (ARPAE), controls the compliance with the rules related to waste management. (Legislative Decree No 152/2006, article 241-bis, paragraph 4-octies).<br><br>Technical board composed by the Ministry of environment and the ministry of defence, which have to analyse the aspects of the environmental protection, pollution prevention and the responsibility related to military activities carried out in the military sites. |
| **Law** | |

## European level

**Directive 2008/98/EC, on waste and repealing certain Directives.**
Article 1: This Directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use.
Article 36, paragraph 1. Member States shall take the necessary measures to prohibit the abandonment, dumping or uncontrolled management of waste.

**Directive 2008/56/EC,** establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)**.**
Article 2 (scope), paragraph 2. This Directive shall not apply to activities the sole purpose of which is defence or national security. Member States shall, however, endeavour to ensure that such activities are conducted in a manner that is compatible, so far as reasonable and practicable, with the objectives of this Directive.

## National level

**Presidential Decree No 90, 15 March 2010**, Consolidated text containing the army regulations.

Article 268 provides that the CISAM (Centro Interforze Studi per le Applicazioni Militari) is the competent authority for the granting of the authorization, the supervision and the control of the activities set out in the legislative decree No 230/1995 on ionising radiation.

**Legislative decree No 152/2006 s.m.i**., at article 184, paragraph 5-bis, provides that the Ministry of Defense, in collaboration with the Ministry of Environment, land and sea, adopts some decisions, which contains the measures aimed at the management, the storage, the custody and the granting of the authorization of the waste treatment plants produced by the military activities.
Article 241-bis goes in the same direction of the article 184 and establishes the importance of the monitoring and the management of the military activities carried out in the national and territorial waters.

The environmental monitoring (of the activities pursued in the military sites) may be carried out via the negotiation of protocols agreed between the Ministry of defense, the Ministry of health and the Ministry of Environment, Land and Sea.
In 2015 it has been concluded a Memorandum of Understanding between the Ministry of Environment, Land and Sea and the Ministry of Defence related to the military activities. The point 5 provides that the two ministers have to work together for the protection of the marine environment form the impacts related to the military activities, by collaborating also with the technical committee (establishes by the Legislative Decree No 190/2010).

**Legislative Decree No 66, 15 March 2010,** code of army regulations.

**Decree 30 March 2010**, approved by Ministry of health. Definition of the criteria for the bathing prohibition (implementing the Legislative Decree No 116, 30 May 2008, which implements the directive 2006/7/EC).

## Regional level

## Emilia Romagna

The military training produced a lot of negative effects to the environment, with negative impacts to fishery, maritime transport and marine environment. Port authority of Ravenna and Port Authority of Garibaldi Port adopted some ordinances, by which identify the days and the hours designed for the military exercise

The main military activities are concentrated in the site for ground-sea shooting exercise “ECHO 346 Foce Reno”.

Sea areas falling within the shooting range are forbidden to anchorage, navigation, fishing and any other use of the sea, in accordance with the procedures established by Ordinance 30 May 1996.

It has been adopted a regulation and an ordinance aimed at the regulation of the military training activities and which provides the tacit renewal over the years of the regulation and the ordinance.

Ravenna Port Authority and Garibaldi Port Authority adopt periodical ordinances which closes the days and the hours intended to the military training and which ban the use of the sea.

**Ordinance No 04/2013**, Provisions related to the mussel seed capture installations in the ECHO 346 zone.

**Decision of the regional government No 540**, 18 April 2016, aimed at the protection of the bathing water (which implements the Legislative Decree No 116/2008 and the Ministerial Decree 30 March 2010).

**Ordinance No 14/2018**, article 4: in order to safeguard life at sea during the military training, the ECHO 346 zone has to be under surveillance all the time, in order to promptly detect any danger and stop the military training when necessary.

## Offshore platforms

In the area of the study there are some offshore platforms for the extraction of hydrocarbons. One problem which needs to be addressed is what to do with the platforms when the extraction has come to an end. Indeed, this condition has certainly an impact on various activities in the sea, such as any interference with the safety of navigation, or any environmental impact, with the result that it is urgent to conduct the removal.
In the international legislation, IMO creates the international standards used as guidelines for coastal states in formulating and establishing the provisions regarding removal of any disused offshore installation. UNCLOS also maintained the requirement of removal as the main rule, but introduced the possibility of partial re-use.

At EU level, the European Commission reviewed the existing regulatory frameworks on offshore safety of the Member States, in order to ensure high health and safety standards as well as environmental standards. The EU, in its communication "Facing the challenge of the safety of offshore oil and gas activities" (October 2010) claims that the existing divergent and fragmented regulatory framework applying to the safety of offshore oil and gas operations in Europe, along with current industry safety practices, did not provide adequate assurance for risks from offshore; therefore, it was necessary to act, in order to minimize the accidents. For this reason, the EU adopted the directive 2013/30/EU, on safety of offshore oil and gas prospection, exploration and production activities. With the EU Directive, the Commission wants to overcome the differences of the regulatory frameworks and practices in Member States, by providing a clear, comprehensive and transparent system through which the safety and sustainability of offshore operations can be ensured. The accession of the European Union to the Offshore Protocol and the adoption of the directive brought the EU to deal with the implementation of these two instruments, which aimed at regulating offshore oil and gas activities. The objectives of the two documents are similar, but they have a different focus: Offshore Protocol, negotiated and adopted in 1994, aims at *protecting against pollution from offshore activities* and provides general obligations for daily operations, whereas the directive intends to ensure the *safety of offshore activities* by providing a detailed regulation of major accident prevention.

The national legislation addresses every stage of the platform's lifecycle-from the exploration phase to the dismantling of offshore installations. The national legislations also aim at addressing the environmental impacts of offshore exploration and exploitation. In this sense, a number of provisions have been undertaken, such as the provisions related to licensing, which is defined as *the exclusive right to prospect or explore for or produce hydrocarbons in a geographical area,* the provision concerning sea defence (Law No 979, 31 December 1982), the agreement between the Ministry of industry and regions on how to prospect, research and produce hydrocarbons. Another important provision is the Legislative Decree No 145/2015 on safety of offshore oil and gas operations and which implements directive 2013/30/EU. Most recently, it has been adopted the Ministerial Decree 7 December 2016, which contains the measures for the release of the permitting in order to prospect, research and produce liquid and gaseous hydrocarbons and the Legislative Decree No

104/2017, which implements Directive 2014/52/EU. Legislative Decree No 104/2017, at article 25, subparagraph 6, provides that that with a ministerial decree are adopted "some guidelines for decommissioning of offshore oil and gas platforms, in order to protect environment". The decree provides to draw up a draft regulatory decision, in advanced procedure for approval, which contains some dispositions for the decommissioning or the reuse of the platforms and which will enable to identify the best available technologies for the decommissioning, compatible with the environment and technically and economically sustainable (reuse for uses other than the mining activity). So, the Oil and Gas Companies, in view of a project for the exploitation of a new shallow water oilfield, have to consider to reuse existing offshore structures removed from previous service site.

In view of the above, the measures proposed, such as the environmental monitoring of decommissioning activities and results, a clearer legal framework allowing reuse on a case-by-case basis and defining liabilities and a detailed technical and permitting guidelines, are necessary in order to apply national guidelines adopted in 2017 by Italian government.
Furthermore, these measures may be introduced in an international, European and national framework which promotes the environmental monitoring of decommissioning activities and the reuse of decommissioning platforms.

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| Environmental monitoring of decommissioning activities and results.<br><br>Clearer legal framework allowing reuse on a case-by-case basis and defining liabilities.<br><br>Detailed technical and permitting guidances. | **International level**<br><br>The International Maritime Organisation is a specialized agency of the United Nations, which has as its aim the promotion of cooperation between States for matters concerning shipping.<br>IMO is the global standard-setting authority for the safety, security and environmental performance of international shipping.<br><br>CLYPEA, network for the offshore safety, established in 2014, in order to assure a continuous improvement of the safety standards for the offshore oil and gas operations.<br><br>**European level**<br><br>The European Union Offshore Oil and Gas Authorities Group shall serve primarily as a forum for the exchange of experiences and expertise between national authorities and the Commission.<br><br>**National Level**<br><br>Ministry of economic development - General direction for the environmental safety of the mining and energetic activities- Mining national office for the hydrocarbons and the geo-resources (DGS UNMIG).<br><br>The DGS UNMIG promotes the regulation and the control of the oil and gas operations. The Direction has to ensure the safety by the platform audits, a technical analysis and environmental monitoring activities.<br>The inspection role shall be exercised by the UNMIG sections and the chemical laboratory of analysis.<br><br>Committee for the safety of offshore oil and gas operations, which shall analyse the risk assessment of the oil and gas operations (supervision and monitoring activities).<br><br>Technical commission for hydrocarbons and mineral resources (technical advisory body), which promotes the safety of offshore oil and gas prospection, exploration and production activities.<br><br>ENI (Ente nazionale idrocarburi) plays an important role in this sector. |

**Law**

**International Level**

**International Convention for the Prevention of Pollution of the Sea by the Sea by Oil** (Oilpol convention, signed in 1954 and updated in 1973).

**Geneva Convention on the Continental Shelf 1958 (global).** Art. 5.5: Total removal of offshore platforms "5. Due notice must be given of the construction of any such installations, and permanent means for giving warning of their presence must be maintained. Any installations which are abandoned or disused must be entirely removed".

**International Convention on Civil Liability for Oil Pollution Damage, 1969**.
This Convention shall apply exclusively to pollution damage caused on the territory including the territorial sea of a Contracting State and to preventive measures taken to prevent or minimize such damage.

**Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, the "London Convention"-** Article 3, paragraph 1 (a), "Dumping" means: (i) any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; (ii) any deliberate disposal at sea of vessels, aircraft, platforms or other man- made structures at sea.

**Barcelona Convention for the protection of the Mediterranean Sea against pollution 1976** (regional).

**The United Nations Convention on the Law of the Sea (UNCLOS, 1982)**. It aims to protect and to preserve sea environment and to conserve and manage marine living resources. UNCLOS maintained the requirement of removal as the main rule, but introduced the possibility of partial removal and hence effectively some disposal at sea.

**OSPAR Convention for the Protection of the Marine Environment of the North East Atlantic, 1982**, Annex III: On the prevention and elimination of pollution from offshore sources. Article 5, paragraph 1. "No disused offshore installation or disused offshore pipeline shall be dumped and no disused offshore installation shall be left wholly or partly in place in the maritime area without a permit issued by the competent authority of the relevant contracting party on a case by case basis".

**Protocol for the Protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil** (Offshore Protocol), adopted in Madrid, Spain in 1994 and entered into force on 24 March 2011.
The Offshore Protocol requires the operator to measure the effects of the activities on the environment in the light of the nature, scope, duration and technical methods employed in the activities and of the characteristics of the area.

**MARPOL Convention**: The Mediterranean Sea has been classified, under MARPOL, as "special" areas for oil since 1983. Annexes I (Oil).

**IMO Resolution A.672 (16), 1989**- Guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the exclusive economic zone. These guidelines define mainly technical criteria for platforms which may be considered. The IMO Guidelines define mainly technical criteria (water depth and weight criteria) for platforms which may be considered for only partial removal and specifies the necessary water clearance after partial removal to ensure the safety-of navigation.

**International Convention on Oil Pollution Preparedness, Response and Co-operation (OPCR),** 1990, in order to establish measures for dealing with pollution incidents, either nationally or in cooperation with other countries.
A Protocol to the OPRC relating to hazardous and noxious substances (OPRC-HNS Protocol) was adopted in 2000.

**OSPAR Decision 98/3**, on the Disposal of Disused Offshore Installations.

**Decision IG.22/3, February 2016- Mediterranean Offshore Action Plan** in the framework of the Protocol for the Protection of the Mediterranean Sea against Pollution resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil

## Aquaculture

Aquaculture may affect significantly the environment if not properly regulated and monitored. For this reason, it was considered necessary to intervene and adopt some provisions relating to aquaculture activities.
The international community gives importance to aquaculture activity. At international level, the resolution CFCM/36/2012/1 -on guidelines on allocated zones for aquaculture (AZA)- provides that contracting Parties and Cooperating non-contracting Parties of the GFCM, shall include in their national marine spatial planning strategy of aquaculture development and management schemes for the identification and allocation of specific zones reserved for aquaculture activities. The selection of the areas which will be used for aquaculture has an important role in ensuring the sustainable development of this activity. Zones to be allocated to aquaculture activities shall be classified as "areas suitable for aquaculture activities", "areas unsuitable for aquaculture activities" and "areas for aquaculture activities with particular regulation and/or restriction". AZAs, once established, shall be based on legal and regulatory provisions integrated into the national legislation or other adequate national administration level and on inter- ministerial coordination in order to ensure their effective implementation. The ICZM Protocol also contains some provisions related to aquaculture activities, such for example the regulation of aquaculture, by controlling the use of inputs and waste treatment. The CCFR (FAO, 1995), at article 9, defines responsible aquaculture and the principles for an aquaculture to be sustainable. The key notion is a sustainable aquaculture, which has to protect the environment.
Some environmental impacts of aquaculture, (e.g. nutrient and organic matter enrichment, contamination by hazardous substances), are also specifically addressed in EU legislation.
At European legislation, aquaculture has an important role and it is strictly related to fishery and biodiversity. In the Biodiversity action Plan for fisheries (COM(2001)0162), at point 5 (Aquaculture), are contained some guidelines referred to aquaculture activities. Therefore, the EU promotes a strategy for the sustainable development of European aquaculture. The aquaculture activity is related to EUSAIR, and more specifically, to Blue Growth Pillar, which requires that aquaculture has to be sustainable, in order to promote economic growth.
The Regulation (EU) No 1380/2013, at article 34, provides the promotion of sustainable aquaculture, reaffirming a number of principles. The keys points are the following: a) the promotion of the competitiveness of EU aquaculture production; b) the establishment of conditions for sustainable growth of aquaculture; c) the improvement of the sector's imagine and governance, by better implementation of EU legislation, reducing the administrative burden, d) the ensuring of proper stakeholder participation and appropriate information to the public, e) the ensuring of an adequate monitoring of the aquaculture sector; f) the integration of aquaculture activities into marine, coastal and inland spatial planning. In 2013 EU adopted the Strategic Guidelines for the sustainable development of EU aquaculture, composed by the following points: 3.1. Simplify administrative procedures; 3.2. Securing sustainable development and growth of aquaculture through coordinated spatial planning; 3.3. Enhancing the competitiveness of EU aquaculture. The Member States have to support

business growth through adequate allocation of the funds given by EU to aquaculture (proposition of the CMO and EMFF), to support educational programmes covering the needs of the aquaculture sector. The EU provides also the adoption of a Multiannual national strategic for the promotion of a sustainable aquaculture. Regulation (EU) No 508/2014, at article 48, contains a detailed list concerning the productive investments in aquaculture.
The European Maritime and Fisheries Found, with reference to the operational programme for Italy (2014-2020), identifies certain objectives, such as the strengthen of institutional capacity and the simplification of administrative procedures; the ensuring of the development and the sustainable growth of aquaculture by a coordinated spatial planning and the potential increase of the sites, the promotion of the competitiveness of aquaculture; d) to promote fair competition for operators, exploiting competitive advantages.
The national legislations also introduced some measures related to aquaculture activities. The national legislations provide that, in order to exercise aquaculture activities, it is necessary the granting of an authorization, which has to respect the environment and the landscape and in accordance with the planning acts, adopted by local and national authority, in order to ensure a sustainable use of marine resources. The ministerial decree No 79, 14 February 2013 (and ministerial decree 2017), for example, contains the discipline of the procedure for the release and the renewal of the authorization of aquaculture facilities located to a distance longer than one kilometer from the coast.
It has also been adopted the strategic national aquaculture plan, which is an instrument of rule for aquaculture activities planning and has been written and adopted by the Italian Ministry of Agriculture, Food and Forestry Policies, supported by scientists and representatives from the Regions.
The plan identifies four macro objectives: to reinforce and simplify the administrative procedures, to assure the development and the sustainable growth of aquaculture by a coordinated planning and an increase of the sites; to promote competitiveness of aquaculture; to promote the conditions of a fair competition for the operators and to improve the organization of the market of aquaculture products.
Italy adopted also a three-year national fisheries and aquaculture programme (2017-2019). The programme provides, at point. 5.2, some measures related to aquaculture. Furthermore, the plan provides for the reduction of the various conflicts between fishery, tourism and other activities and aquaculture.
Another important disposition that is necessary to highlight is the agreement signed between the Ministry of Agriculture, Forestry and Tourism and ISPRA (Istituto superiore per la protezione e la ricerca ambientale), approved by the ministerial Decree 27341/ 2016, in order to support administration for the implementation of national and European programme related to fishery and aquaculture. At regional level, the Regions adopted laws and some decisions of the regional government related to aquaculture activity.
Managing the fishery and aquaculture system is complex and it is regulated at an international, EU, national, regional and local level. The process of producing national and regional policies for managing fishery resources, strongly conditioned by common fishery policy, is currently going through an “adjustment” phase. The measures proposed meet the need of the European action in the field of aquaculture and shall pursue the objectives of an intelligent, sustainable and inclusive growth, affirmed by Europe 2020 and Blue Growth.

The measures meet also the need of national and regional legislation, in a coordinated and implemented approach. It is evident that the measures proposed are sustained by European and national legislation. More specifically, the adoption of these measures may really contribute to the achievement of the objectives pursued by European, national and regional legislation.

| **Measures** | **Competent Authority** |
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| Environmental monitoring in correspondence of aquaculture activities.<br><br>Better practices of waste management related to operational activities.<br><br>Development of cost efficient and sustainable measures and methodologies for retrieving the marine litter generated by aquaculture.<br><br>Identification of suitable areas where to allocate new aquaculture farms.<br><br>Identification of "constraints area" where not to place new farms. | **European level**<br><br>General fisheries commission for the Mediterranean (GFCM). Regional body for fishery in the Mediterranean. The GFCM has been supporting the sustainable development of aquaculture and the responsible management of marine, brackish and inland aquaculture in the area of application, in a way that is consistent with an ecosystem approach to aquaculture and that takes into account the specific regional, subregional and local characteristics.<br><br>**National level**<br><br>Ministry of Agriculture, Forestry and tourism.<br><br>Port Authorities, bodies of the Italian Ministry of Infrastructure and Transport, are competent authorities for administrative and technical monitoring and controlling of marine fisheries, and are operationally subordinate to the the MiPPAF.<br><br>Italian Aquaculture Platform, (ITAQUA), set up at the Ministry of Agricultural and Forestry policies. The platform is shall be managed by the Directorate-General for fisheries and aquaculture.<br><br>Central advisory committee (legislative decree No 154, 26 May 2004).<br><br>Local advisory committees.<br><br>Stakeholders: Associazione piscicoltori italiani. API aims at the protection, development and consolidations of all fish farming activities, both in inland waters and in marine/brackish waters. it therefore promotes all economic, scientific, technological, insurance, professional, union and legal activities necessary to achieve this objective. API's interest in science is expressed through collaboration with various scientific institutes to increase the knowledge available to fish farms. The association promotes research and studies aimed at solving specific technical problems, in collaboration with competent public bodies and research institutes, and also cooperates with the media. It also has close and permanent relationships with the regional, national and European institutions, both public and private. |

**Law**

### International level

Oslo-Paris Convention (OSPAR).

**The Bern Convention** is a binding international legal instrument in the field of nature conservation.

**Code of conduct for responsible fisheries**, article 9: Aquaculture development. Article 9 of CCRF (FAO; 1995) defines responsible aquaculture and the principles for an aquaculture to be sustainable.

**Resolution CFCM/36/2012/1on guidelines on allocated zones for aquaculture (AZA)-** Contracting Parties and Cooperating non-contracting Parties of the GFCM (hereafter referred to as CPCs) shall include in their national marine spatial planning strategy of aquaculture development and management schemes for the identification and allocation of specific zones reserved for aquaculture activities.

Zones to be allocated to aquaculture activities shall be classified, inter alia, as, "areas suitable for aquaculture activities", "areas unsuitable for aquaculture activities" and "areas for aquaculture activities with particular regulation and/or restriction"; guidelines shall be developed to this end; (…).
7. AZAs, once established, shall be based on legal and regulatory provisions integrated into the national legislation or other adequate national administration level and on inter- ministerial coordination in order to ensure their effective implementation. (…) 8. For every AZA, an allowable zone of effect of aquaculture activities could be defined in the close vicinity of each farm. Such zone shall be accompanied by a Environmental Monitoring Programme. (…) 9. The Environmental Monitoring Programme shall be flexible and adaptable, taking into account scale (time and space) approach, and monitoring shall be mandatory.

The ICZM Protocol the seventh Protocol in the framework of the Barcelona Convention.
Article 9: economic activities- The parties agree (c) Aquaculture: (i) to take into account the need to protect aquaculture and shellfish areas in development projects; (ii) to regulate aquaculture by controlling the use of inputs and waste treatment.

### European level

**Directive 2000/60/EC** of the European Council and of the Council, establishing a framework for Community action in the field of water policy.

**COM(2001)0162 final**, Biodiversity Action plan for fisheries, point 5 Aquaculture.
95. The main precautionary measures with respect to aquaculture concern: guidelines for aquaculture outputs which encompass chemical, physical and biological criteria; guidelines on use, containment and transport of farmed organisms; the integration of aquaculture into catchment and coastal area management as one of several sectoral users of natural resources; utilization of thorough EIA procedures governing location of farming operations; increasing the efficiency of resource use and productivity in general at the farm level, thus reducing potential effects; assessment of impact.
96. Actions are required to reduce localised problems (such as the anoxic layer on the sea bed which can cause locally severe reduction in biodiversity) and promoting measures to reduce to a minimum the use of veterinary medicinal products in aquaculture (taking account of animal welfare considerations).

**COM(2002)0511**, A strategy for the sustainable development of European aquaculture, by: creating long term secure employment, in particular in fisheries dependent areas, assuring the availability to consumers of products that are healthy, safe and of good quality, as well as promoting high animal health and welfare standards, ensuring an environmentally sound industry and a market development, taking into account marketing and information Governance and environmental aspects.
Regulation(EC) No 762/2008, on the submission by Member States of statistics on aquaculture and repealing Council Regulation (EC) No 788/96. Article 1 -Obligations of the Member States Member States shall submit to the Commission statistics on all the aquaculture activities conducted in freshwater and saltwaters on their territory.