

Transferability Plan at Adriatic basin scale

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Abstract

This document describes in details all the sub-activities carried out under activity 5.6, including the report in details on the transferability analysis and plan developed .

The activity will assure wider and long-lasting effects of the results obtained, addressing approaches to mitigation measures and scenarios in Adriatic basing and, also, other Mediterranean areas. It analyzes if and how identified measures in the study area can be transferred in other areas of the Adriatic and if and how they can become part of existing and under development policies, plans and projects.

1. Introduction

The SOUNDSCAPE project is funded by the 2014-2020 Interreg V-A Italy - Croatia CBC Programme funded by the European Union within the “Call for proposal 2017 Standard, Priority Axis: Environment and cultural heritage within the specific call objective 3.2 - Contribute to protect and restore biodiversity. The main objective of the project is to create a cross-border technical, scientific and institutional cooperation to face together the challenge of assessing the impact of underwater environmental noise on the marine fauna and in general on the Northern Adriatic Sea ecosystem.

Within the project, the Work package 5 aims at integrating results from the established underwater noise observing system (WP3) and the analysis of ecological targets, sensitivities and possible effects (WP4) to produce soundscape maps, carry out a preliminary risk analysis and inform possible policy actions for straightforward management of underwater noise in accordance with the MSF and MSP Directives.

The action 5.4 "Development of mitigation measures to reduce underwater noise and its effects on biological targets" includes the identification of possible measures (structural, i.e. reduction of noise generation acting on ships and other sources; behavioral, i.e. reducing ship velocity in certain areas; spatial, i.e. adapting navigation routes). This task capitalizes from the other project activities in order to take into account the soundscapes assessed through the underwater noise propagation modeling (Action 5.2) integrated with the results of the WP4, providing a thorough definition of the sensitivities of target organisms to underwater noise, and the most recent knowledge on species and habitats distribution, with particular regard to Natura 2000 sites, gathered within WP3.

In particular, the Activity 5.4 considers the analysis of the current international, European, Italian and Croatian national regulations, with particular attention to EU directives, present strategies, framework and positions of the European Commission, and scientific bibliography, including International project outputs and gray literature. Following, the activity 5.6 aims to assure wider and long-lasting effects of the results obtained, addressing approaches to mitigation measures and scenarios in the Adriatic Sea basin but, also, in the Mediterranean wider area. The activity will focus on if and how identified measures in the study area can be transferred and become part of existing and under development policies, plans and projects under EUSAIR, ICZM Protocol, MSP Directive, Program of Measures of MSFD, Fishery Management Plans, etc.

The transferability plan at basin scale will be made available through the connection with the ongoing maritime spatial planning National processes, which are currently being implemented in EU countries.

2. Management needs to address UWN

2.1. Synthesis of proposed measures

The Northern-Central Adriatic hosts major urban settlements, intensive maritime activities (commercial ports and medium-small marinas), a complex fishery system integrated with a growing marine farming activity and extensive offshore gas extraction, that along with increasing touristic pressure makes the basin the most affected by cumulative human pressures in the Mediterranean Sea.

Multi-source intense anthropogenic pressures affect its valuable ecological resources and are a known source of impacts that affect bottlenose dolphins and turtles in the Adriatic sea, potentially determining a wide set of consequences on species and population, from direct mortality to behavioral changes. Among these, anthropogenic underwater sound emissions may determine critical exposure to continuous noise, putting at risk the whole Adriatic ecosystems through numerous interfering mechanisms, such as masking of signals from conspecifics, preys or predators, that could result in multiple potential impacts at population and ecosystem levels to fishes, invertebrates, reptiles and mammals (Duarte et al. 2021). In an heavy anthropized marine environment as is the Adriatic Sea, these impacts could be of important for population and ecosystems already affected by the cumulative pressure exerted by the multiple human activities insisting in the basin.

The growing focus on the ocean-based economy will lead to an increased density of traffic in the next years, with special emphasis on several parts of the Adriatic Sea, as well as partly to the change in the nature of traffic. 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. The development of nautical tourism is also characterized by extremely positive trends and its future growth is expected in the future. Therefore, a “business-as-usual” development of the ocean-based economy will inevitably lead to ever-increasing noise from more shipping, coastal development and tourism but, also, seismic surveys, military operations, dredging, pile driving, likely contributing to increasing impacts on marine ecosystems (Duarte et al. 2021).

The conservation objectives for highly mobile and adaptable marine species such as *Tursiops truncatus* and *Caretta caretta* can be achieved only through the application of systematic monitoring and adaptive management measures in such a large and connected area. This foster the need of a continuous mapping of the distribution of target species and their life cycle, together with the promotion of research strategies aimed at a better understanding of their responses to chronic noise exposure. Management should take into account the strong seasonal fluctuations of the Adriatic populations and accordingly applying specific technological measures and limitations.

The analysis of extra noise derived from anthropogenic activities shows how the Adriatic soundscapes are widely influenced by the complex system of maritime transportation. Pressure index maps show that

higher pressure areas correspond to areas having higher abundance (average values) of the considered target species (see SOUNDSCAPE Report *D 5.4.1 Development of mitigation measures to reduce underwater noise and its effects on biological targets* for detailed information).

Maritime transport may exert a wide suite of pressures on the whole Adriatic area. The influence derives from the wide extension of the routes due to the wide presence of shipping and cruise ports at sub-basin level (e.g. ports of Koper, Venice, Trieste, Ravenna, Rijeka, Ploče, Ancona, Split). Such transboundary influences have transnational connotations to be considered in management options aimed to increase the overall sustainability of the sector. Maritime traffic generally produce sound as a by-product. Shipping activities management should ensure that environmental impacts are avoided or minimized, through technological and/or regulatory measures, as demonstrated by recent progress in the shipping industry. Improved regulatory frameworks to manage UWN and promote efficient solutions needs to be developed focusing on the peculiar consideration that, unlike other sources of pollution, anthropogenic noise is not persistent in the environment once sources are removed and well-planned actions can have near-immediate positive effects (Duarte et al. 2021).

In first instance, regulating the speed of the vessels in the Northern Adriatic Sea could help to reduce noise. Considering the speed reduction of cargo vessels, which has been determined to be the main source of UWN in the Adriatic high waters, could immediately provide an important benefit to some of the most biologically sensitive areas. Speed limits application could be managed properly at the very beginning within the existing traffic separation schemes (TSS), that could also promote a coordinate effort in testing the combined effectiveness of other behavioral measures, such as convoying vessels. In addition, incentive immediate maintenance and retrofit actions for machinery treatments as a requirement for cargo vessels entering in the TSSs could further reduce the UWN emissions.

Speed reduction in attention areas could be in first instance applied on seasonal basis. This is due to the evidences of seasonal fluctuations in the species distribution, especially in Italian waters. However, the time-span of the speed limits should also carefully consider that both dolphins and turtles are almost permanently present in Croatian waters (e.g. along Istrian peninsula and in the e Kvarner Gulf) and, also, the differences in sound transmission due to the summer thermocline.

Management options aimed to increase the overall sustainability of the sector should promote the implementation of traffic monitoring networks. Real-time monitoring systems constitute a solid baseline in order to structure a coordinate control of maritime traffic. To meet the challenge of managing underwater noise highly mobile sources and receptors, maritime traffic management should ideally become adaptive and dynamic, integrating multiple data types (e.g. biological, remotely-sensed, traffic data, modeled species' distribution data) and modeling processes into fluid decision-making. While traditional marine spatial management techniques such as shipping lanes or area closures can achieve similar objectives as dynamic management, traditional spatial closures are not responsive to rapid changes. The continuous mapping of the spatial-temporal distribution of noise levels generated by human activities at sea and real time modeling of soundscapes could help the dynamic management of

an area through faster and efficient application of management measures, especially close to protected areas. This kind of assessment of the source contributions needs the introduction and integration of VMS and AIS recording systems in order to assess the distribution of different types of vessels, including information on typology, location, speed, length, etc.

Anthropogenic noise around offshore shipping lanes is dominated by large (>25 m) commercial ships, whereas shallower coastal waters and inland waterways also host many smaller vessels that are more variable in speed and highly mobile. A relevant number of small vessels (i.e. recreational and coastal fishing vessels) are not required to have an AIS, and are therefore not accounted within AIS-based models. Results hence particularly compelling in the coastal areas where smaller vessels operate most an urgent expansion of the use of the AIS system to small boats (at least over 12 m).

A recommended precautionary measure is to limit the speed of recreational boats in selected areas. Negative reactions to target species can be caused by high-speed vessels, especially within protected areas and/or in the presence of species subject to protective measures. Therefore could be an appropriate precautionary approach not allowing vessels - or specific types of vessels, e.g. vessels not adopting specific technical noise mitigation measures or behaviors - in particularly sensitive areas. These conditions could be, adaptively and with progressive implementation, required to access specific portions of the basins, especially in presence of critical environmental conditions.

A common strategy ports could support and incentive (through, in example, discounts on port dues) vessel with specific features (i.e. fuel, technologies and environmental management practices), in order to reduce polluting emissions and aiming for quieter ships. These management options require an efficient and joint effort, especially in the framework of EU MSP directive (2014/89/EU) and MSFD Directive (2008/56/EC). The indication for a wider Northern Adriatic managed area in the offshore for the protection of species of conservation interest with an adequate multi-level governance systems concerted between Adriatic countries (e.g. SPAMI) and relative management opportunities could also support the common enforcement of multiple measures for an efficient protection.

Considering future trends and in order to prevent the expected increases in maritime activities, and especially in traffic, from causing an uncontrolled increase in emissions of radiated noise, long/mid-term strategies should consider interactions and contributions from measures provided to achieve other objectives such as reduction of carbon emissions and improvements in energy efficiency. Noise-reducing propeller and hull design options are available for many applications and should be considered, especially for new ships, including fishing, cruise and passenger vessels.

2.2. Addressing UWN in policies

Today, the increasing demand for coastal and maritime space for different human activities, and as a consequence, the increasing pressures on the coastal and maritime ecosystems and resources, require an integrated planning and management approach. Anthropogenic noise is a pollutant that must be addressed in policies to mitigate human impacts on the oceans. Management options aimed to increase the overall sustainability of the maritime traffic should be coordinated within National and International strategies, policies and voluntary agreements, also in coordination with IMO, aimed at improving and harmonizing traffic monitoring and management.

The vast majority of the international strategies and agreement focusing on underwater noise are based on voluntary acceptance of measures and often feature non binding options to member nations . In consideration of this, a successful strategy to manage UWN in the short term and prevent the expected increases in maritime activities, and especially in traffic, from causing an uncontrolled increase in emissions of radiated noise, should consider interactions and contributions from sectoral objectives and strategies, also set to achieve other targets such as reduction of carbon emissions and improvements in energy efficiency.

The following chapter briefly elaborates the main legal documents/strategies/policies/agreements identified as relevant tools in order to foster a homogeneous, albeit site-specific, dissemination of the main underwater anthropogenic noise reduction measures proposed by the SOUNDSCAPE project.

3. Policies, directives and strategies

3.1. Strategic policies

3.1.1. Protocol on Integrated Coastal Zone Management in the Mediterranean (ICZM Protocol)

The Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention) was adopted on 16 February 1976 in Barcelona and entered into force in 1978. The Barcelona Convention was amended in 1995 and renamed as the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. The amendments to the Barcelona Convention entered into force in 2004.

The Barcelona Convention and its seven Protocols adopted in the framework of the Mediterranean Action Plan (MAP) constitute the principal regional legally binding Multilateral Environmental Agreement (MEA) in the Mediterranean. As an international legal document, the ICZM Protocol drives the Mediterranean Countries to better manage and protect their coastal zones. It complements the existing set of Protocols of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. 'Integrated coastal zone management' means a sustainable management and use of coastal zones. Coastal zone is defined as the geomorphologic area either side of the seashore on which the interaction between the marine and land parts occurs. For the management purposes, the coastal zone is defined as the external limit of the territorial waters and with the land limit of the administrative coastal units.

In the process of implementing, the following principles should be considered:

- The terrestrial and maritime part of the coastal zone should be considered as a single entity;
- All the coastal elements (hydrological, geomorphological, climatic, ecological, socio-economic, cultural systems) shall be taken into account in an integrated manner;
- The ecosystem-based approach shall be applied (taking into account all the coastal elements but also their continuous interactions);
- Appropriate governance allowing participation of stakeholders shall be ensured;
- Cross-sector institutional coordination shall be required;
- Development of land use strategies, plans and programmes shall be required;

- The multiplicity and diversity of activities in coastal zones shall be taken into account, and priority shall be given, where necessary, to public services and activities requiring, in terms of use and location, the immediate proximity of the sea;
- The allocation of uses/activities in coastal zones should be balanced and unnecessary concentration and urban sprawl should be avoided;
- Preliminary assessments shall be made of the risks posted on coastal zones; and
- Damage to the coastal environment shall be prevented, and where it occurs, appropriately restored.

Within the ICZM protocol, the following objectives could facilitate the spreading of proper UWN measures:

- Ensure the sustainable use of natural resources, particularly with regard to water use;
- Ensure preservation of the integrity of coastal ecosystems, landscapes and geomorphology;
- Prevent and/or reduce the effects of natural hazards and in particular of climate change, which can be induced by natural or human activities.

A large number of actions must be considered to achieve these objectives. Specifically, within the ICZM protocol should be fostered all the measures concerning coastal and shallow-water measures, as vessel noise may be a particular issue in shallow water, i.e. where recreational boating in warmer summer months largely overlap with the breeding/spawning periods of marine species and/or small fishing activities are prevalent. These measures could be sustained also within specific actions intended to promote ecosystem-based long-term development planning of estuaries and delta systems, protect biodiversity, designate coastal and marine protected areas, tackle tourism and port economic development and also actions for awareness rising.

3.1.2. Maritime Spatial Planning (MSP Directive - 2014/89/EU)

Maritime spatial planning (MSP) is defined as “a process by which the relevant authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives” (Directive, 2014). It is enforced across the EU countries by the Directive 2014/89/EU defining a framework for MSP and obligations to EU countries to establish a maritime planning process. MSP results in a maritime spatial plan.

Responsibilities for designing the formats and contents of such plans, including institutional arrangements and allocation of maritime activities, are left to European Member States. In other

Mediterranean Countries, non-EU States, the UNEP/MAP Conceptual framework for marine spatial planning is a tool/instrument for the implementation of MSP, is considered as a tool of the ICZM Protocol.

The main MSP objective is to promote sustainable development and growth in the maritime sector considering economic, social, and environmental aspects as well as long-term changes due to climate change. Today, main economic sectors at sea include energy, maritime transport, fisheries, aquaculture and tourism sectors. MSP should manage spatial uses and conflicts in marine areas and encourage multi-purpose uses. Main MSP output is a comprehensive spatial management plan for a marine area including zoning, priorities in time and space and covering a 10 to 20 years' time horizon. The plan could include a zoning map and a permit system, to be used as management measures (e.g. permits for fisheries or tourism are issued based on the plan and zoning map). The management targets to address anthropogenic underwater noise should be included in National marine plans, guaranteeing a spatially-explicit application of strategic measures and limitations, including potential further identification as critical or important habitat for at-risk species deserving priority for conservation based on the best existing knowledge.

The MSP Directive (2014/89/EU) recognises the necessity for cross-border cooperation between Countries, as a part of the planning and management process, in order to ensure a coherent and coordinated management across the marine regions. The cross-border cooperation shall be established among EU Member States and with neighbouring third Countries, hereafter called transnational cooperation because such cooperation should take into account issues of transnational nature such as those related to maritime traffic.

The Directive stresses the application of the ecosystem-based approach aiming at the sustainable development of the maritime and coastal activities but also ensuring the sustainable use of marine and coastal resources. Specific proposals, actions and / or recommendations tackling UWN may be considered in the final stage of drafting the plans, and they will feed the implementation and update/adaptation process.

A comprehensive guide how to put MSP in practice could be found in a document "A Step-by-Step Approach Toward Ecosystem-Based Management" published by UNESCO (Ehler and Douvère, 2009). The guide identifies ten steps and describes their tasks and outputs, together with lessons learned from already developed maritime spatial plans. Another guiding reference, intended to be short and easy-to-use, is the 'Conceptual framework for MSP in the Mediterranean" (UN Environment/MAP, 2018).

3.1.3. Blue growth strategy and Sustainable Blue Economy

Blue growth is a long-term strategy adopted by the Commission in 2012 (COM(2012) 0494) to unlock the potential of the blue economy and support the development of sustainable marine and maritime economic activities. Subsequently, the Commission launched a communication on the role of innovation for the blue economy (COM(2014) 0254).

The strategy consists in the development of new sectors that have a high potential for sustainable jobs and growth, such as: marine biotechnology, marine renewable energies, aquaculture, maritime & coastal tourism and seabed mining reinforcing at the same time the consolidated traditional marine sectors which are naval transport, fishery, shipbuilding & ship repair and offshore oil & gas.

Blue Growth gives also the essential components to provide knowledge, legal certainty and security in the blue economy in the sea basin strategies to ensure tailor-made measures and to foster cooperation between countries (Arctic Ocean, Atlantic Ocean, Baltic Sea, Black Sea, Mediterranean Sea and North Sea).

Blue Growth supports many initiatives and European projects involved in the implementation of BG strategies and technological roadmaps in order to increase the knowledge and help addressing gap in knowledge in understanding the potential drivers of source levels and the effectiveness of the proposed technical measures.

In order to fully embed the blue economy into the Green Deal and the recovery strategy after COVID-19 pandemic, the Commission has adopted a new approach for a sustainable blue economy in the EU (Communication COM/2021/240: A new approach for a sustainable blue economy in the EU - Transforming the EU's Blue Economy for a Sustainable Future). The communication sets out a detailed and realistic agenda for the blue economy to play a major role to achieve the European Green Deal's objectives, and integrates ocean policy into Europe's new economic policy, shifting the focus from "blue growth" to a sustainable blue economy.

In particular, the commission will create a Blue Forum for users of the sea to coordinate a dialogue between offshore operators, stakeholders and scientists engaged in fisheries, aquaculture, shipping, tourism, renewable energy and other activities. It will develop synergies between their activities and reconcile competing uses of the sea.

Moreover, will be promoted the use of EU funds to green maritime transport by

- a) increasing the uptake of short-sea shipping instead of using more polluting modes;
- b) renovating the EU's maritime fleet (e.g. passenger ships and supply vessels for offshore installations) to improve their energy efficiency; and
- c) developing the EU's highly-advanced manufacturing and technological capabilities;

Within the the objectives to support the decarbonisation and depollution of energy production, maritime transport and ports, specific focus on UWN technical mitigation measures could be actively promoted.

Biodiversity conservation and protection actions could also foster the adoption of specific measures for the conservation of fisheries resources and protection of marine ecosystems, sensitive species and habitats, also addressing UWN impacts, knowledge gap and the designation of additional marine protected areas.

The promoted support to local participatory initiatives could also help a better understanding and acceptance of potential limitation to activities established in order to reduce their UWN emissions.

3.1.4. EU Strategy for the Adriatic and Ionian Region

The EUSAIR is a macro-regional strategy adopted by the European Commission and endorsed by the European Council in 2014. The Strategy was jointly developed by the Commission, together with the Adriatic-Ionian Region countries and stakeholders, in order to address common challenges together. The Strategy aims at creating synergies and fostering coordination among all territories in the Adriatic-Ionian Region (Italy, Croatia, Slovenia, Greece, Albania, Montenegro, Bosnia Herzegovina and Serbia).

The general objective of the EUSAIR is to promote economic and social prosperity and growth in the region by improving its attractiveness, competitiveness and connectivity. The Strategy plays an important role in promoting the EU integration of Western Balkans. It is built on 4 thematic pillars: Blue growth, Connecting the region, Environmental quality, Sustainable tourism.

The Adriatic Ionian Euroregion, as the largest network of regional and local authorities in the area, has followed and promoted since the beginning phases the EUSAIR process pushing the adoption of the strategy to the European Institutions and Member states and providing contributions to the consultation process.

Within the following objectives, the strategy for the transfer of SOUNDSCAPE results within the whole Adriatic basin and a common implementation of UWN reduction measures, including the adoption of good practices and knowledge frameworks, could be achieved:

- Strengthen maritime security and develop a competitive regional intermodal port system;
- Ensure the good environmental and ecological status of the marine and coastal environment by 2020, in line with the main EU strategies and the ecosystem approach of the Barcelona Convention.
- Contribute to the objectives 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 as much as possible, by identifying and managing threats to marine and terrestrial biodiversity.
- Increase knowledge about the sea: biodiversity, habitat mapping, monitoring protocols and shared data.
- strengthen the network of marine protected areas.
- Promote the download of good practices among the managers of marine protected areas.
- Implement Maritime Spatial Planning and Integrated Coastal Zone Management.

- Improve the management of waste, nutrients and pollutants by reducing their flows towards rivers and therefore towards the sea.

3.1.5. WestMed Initiative

The Initiative for the sustainable development of the blue economy in the western Mediterranean (WestMED Initiative, COM(2017) 183 final) was adopted by the European Commission on 19 April 2017 and endorsed by the Council of the EU on 26 June 2017. In its Conclusions on Blue Growth, the Council of the EU has also invited the participating countries, the European Commission and the Union for the Mediterranean (UfM) Secretariat to take forward its implementation in coherence with all the other initiatives, which are taking place in the region.

On December 4 2018, in Algiers, the 10 Ministers of the Western Mediterranean countries, together with the European Commission and the Union for the Mediterranean, adopted a declaration to strengthen regional cooperation on the WestMED initiative.

The signatories agreed on a common roadmap for the development of a sustainable blue economy in the sub-basin to generate growth, create jobs and provide a better living environment for Mediterranean populations, while preserving the services performed by the Mediterranean ecosystem.

In this roadmap, 6 priorities were agreed upon:

- Maritime safety and the fight against marine pollution
- Maritime cluster development
- Skills development and circulation
- Sustainable consumption and production
- Biodiversity and marine habitat conservation and restoration
- Development of coastal communities and sustainable fisheries and aquaculture

Within its WestMED Initiative framework for action (swd (2017) 130 final) UWN reduction measures could be enforced and good practices shared. In particular considering the aims for:

- Coordinate maritime traffic management services, with data sharing and development of decision support systems (Decision Support System tools) for emergency responses;
- Optimize the exchange of maritime data in the Western Mediterranean region in order to improve knowledge, ensure appropriate and efficient national funding and improve cross-border cooperation.

3.2. Environmental policies

3.2.1. Marine Strategy Framework Directive

The European Union's Marine Strategy Framework Directive (2008/56/EC) aims at protecting more effectively the marine environment across Europe. The Commission also produced a set of detailed criteria and methodological standards to help Member States implement the Marine Strategy Framework Directive. These were revised in 2017 leading to the new Commission Decision on Good Environmental Status. Annex III of the Directive was also amended in 2017 to better link ecosystem components, anthropogenic pressures and impacts on the marine environment with the MSFD's 11 descriptors and with the new Decision on Good Environmental Status.

The main goal of the Marine Directive is to achieve Good Environmental Status of EU marine waters by 2020. The Directive defines Good Environmental Status (GES) as “The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive” Article 3. GES means that the different uses made of the marine resources are conducted at a sustainable level, ensuring their continuity for future generations. In addition, GES means that:

- Ecosystems, including their hydro-morphological (i.e. the structure and evolution of the water resources), physical and chemical conditions, are fully functioning and resilient to human-induced environmental change;
- The decline of biodiversity caused by human activities is prevented and biodiversity is protected;
- Human activities introducing substances and energy into the marine environment do not cause pollution effects. Noise from human activities is compatible with the marine environment and its ecosystems.

To help Member States interpret what GES means in practice, the Directive sets out, in Annex I, eleven qualitative descriptors which describe what the environment will look like when GES has been achieved.

- Descriptor 1. Biodiversity is maintained
- Descriptor 2. Non-indigenous species do not adversely alter the ecosystem
- Descriptor 3. The population of commercial fish species is healthy
- Descriptor 4. Elements of food webs ensure long-term abundance and reproduction
- Descriptor 5. Eutrophication is minimised
- Descriptor 6. The sea floor integrity ensures functioning of the ecosystem

- Descriptor 7. Permanent alteration of hydrographical conditions does not adversely affect the ecosystem
- Descriptor 8. Concentrations of contaminants give no effects
- Descriptor 9. Contaminants in seafood are below safe levels
- Descriptor 10. Marine litter does not cause harm
- Descriptor 11. Introduction of energy (including underwater noise) does not adversely affect the ecosystem

Descriptor 11 directly address UWN as a pressure to the marine environment. As a follow up to the Commission Decision on criteria and methodological standards on good environmental status (GES) of marine waters (Commission Decision 2010/477/EU), the Marine Directors requested the Directorate-General for the Environment (DG ENV) in 2010 to establish a technical subgroup under the Working Group on GES (WG GES) in relation to the Marine Strategy Framework Directive 2008/56/EC (MSFD) for further development of Descriptor 11 Noise/Energy, the Technical Group on Underwater Noise (TG-NOISE), in order to develop common approaches and recommendations. The SOUNDSCAPE project's results and proposed mitigation measures should therefore be proposed in compliance MSFD Descriptor 11 and relative Programs of Measures. In particular, the SOUNDSCAPE project can provide to the implementation process of the Marine Strategy a very valid example of the set up of an efficient and coordinated observing system at basin scale, including data collection, harmonization and processing as well as of innovative processing and modeling calibration. The MSFD implementation is not covered in depth in this report, please see SOUNDSCAPE Report *D 5.5.1* for detailed information).

3.2.2. EU Biodiversity Strategy for 2030

The European Commission has adopted the EU Biodiversity Strategy for 2030 (COM(2020) 380 final) and an associated Action Plan, a comprehensive long-term plan for protecting nature and reversing the degradation of ecosystems. It aims to put Europe's biodiversity on a path to recovery by 2030 with benefits for people, the climate and the planet. A core part of the European Green Deal, the Biodiversity Strategy will also support a green recovery following the COVID-19 pandemic.

The strategy contains specific commitments and actions to be delivered by 2030.

- Establishing a larger EU-wide network of protected areas on land and at sea: the EU will enlarge existing Natura 2000 areas, that will be complemented with nationally protected areas with strict protection for areas of very high biodiversity and climate value.
- Launching an EU nature restoration plan: through concrete commitments and actions, the EU aims to restore degraded ecosystems by 2030 and manage them sustainably, addressing the key drivers of biodiversity loss. As part of this plan, the Commission will propose binding nature restoration targets by

the end of 2021, including actions aimed at the improvement of knowledge and monitoring of ecosystems and their services.

- Introducing measures to enable the necessary transformative change: the strategy highlights unlocking funding for biodiversity, and setting in motion a new, strengthened governance framework to ensure better implementation and track progress, improve knowledge, financing and investments and better respecting nature in public and business decision-making.

- Introducing measures to tackle the global biodiversity challenge: these measures will demonstrate that the EU is ready to lead by example to address the global biodiversity crisis. In particular, working towards the successful adoption of an ambitious global biodiversity framework under the Convention on Biological Diversity.

The strategy includes the EU Nature Restoration Plan, aimed at restoring ecosystems across land and sea. The plan also has the aims of restore the good environmental status of marine ecosystems, pushing towards the full implementation of the EU's Common Fisheries Policy, the Marine Strategy Framework Directive and the Birds and Habitats Directives and the application of an ecosystem-based management approach under EU legislation throughout the national maritime spatial plans and related area-based conservation-management measures, and reducing pollution, explicitly citing the underwater noise as a pressure addressed by MSFD.

The SOUNDSCAPE project's results proposed mitigation, monitoring and knowledge measures should therefore be transferred within the related key actions to be taken by the Commission, as in the EU Biodiversity Strategy for 2030 (COM(2020) 380 final) Action Plan.

3.2.3. Natura 2000 directives

The EU wide Natura 2000 ecological network of protected areas is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right. It stretches across all 27 EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the Birds Directive (79/409/EEC amended in 2009, 2009/147/EC) and the Habitats Directive (92/43/EEC).

Natura 2000 is not a system of strict nature reserves from which all human activities would be excluded. While it includes strictly protected nature reserves, most of the land remains privately owned. The approach to conservation and sustainable use of the Natura 2000 areas is much wider, largely centered on people working with nature rather than against it. However, Member States must ensure that the sites are managed in a sustainable manner, both ecologically and economically.

The Bird Directive places great emphasis on the protection of habitats for endangered and migratory bird species. It establishes a network of Special Protection Areas (SPAs) including all the most suitable territories for these species. All SPAs are included in the Natura 2000 ecological network.

The Habitats Directive ensures the conservation of a wide range of rare, threatened or endemic animal and plant species. The choice of sites is based on scientific criteria specified in the directive, to ensure that the natural habitat types listed in the directive's Annex I and the habitats of the species listed in its Annex II are maintained or, where appropriate, restored to a favourable conservation status in their natural range. Member States first carry out comprehensive assessments of each of the habitat types and species present on their territory. They then submit lists of proposed Sites of Community Importance (pSCIs). Site specific data are transmitted to the Commission using Standard Data Forms and must include information such as the size and location of the site as well as the types of species and/or habitat found on this site and warranting its selection. Once the lists of Sites of Community Importance (SCIs) have been adopted, Member States must designate them as Special Areas of Conservation (SACs), as soon as possible and within six years at most.

Marine SCIs and SACs networks may have a crucial role in protecting relevant species, habitats and ecosystems, especially if they are properly planned, managed and connected within networks. A common approach in the management of diffusive pressures, such as underwater noise, within SCIs/SACs and neighboring areas should take into account the best available knowledge on mitigation measures in order to ensure proper rules and good practices. In particular, within the sites regulations behavioral (i.e. speed reduction), technological (i.e. new designs and / or retrofits of entering vessels) and monitoring (i.e. live mapping of noise, pilot registration system for vessels, etc.) measures could be immediately enforced as a precautionary approach and properly tested. Moreover, these sites often guarantee a reliable source of data and knowledge on sensitive species, allowing to address relevant gaps in knowledge to underpin proper management decisions, especially regarding specific sensitivities to UWN of many categories of marine organisms (i.e. mammals, invertebrates, elasmobranchs, reptiles, fishes' early life stages) and their potential responses and potential for recovery.

3.3. Sectoral policies - Maritime traffic

3.3.1. International Maritime Organization (IMO) guidelines

The International Maritime Organization (IMO) approved voluntary guidelines for reducing underwater noise from commercial ships (IMO, 2014). These guidelines focused on design features that could reduce the primary sources of radiated underwater noise, namely the propellers, hull form, and on-board machinery. During the following years, IMO has adopted mandatory measures to reduce emissions of greenhouse gases from international shipping, under IMO's pollution prevention treaty (MARPOL) - the Energy Efficiency Design Index (EEDI) mandatory for new ships, and the Ship Energy Efficiency Management Plan (SEEMP), in support of the UN Sustainable Development Goal 13 (<https://sdgs.un.org/goals/goal13>).

In 2018, IMO adopted an initial strategy on the reduction of greenhouse gas (GHG) emissions from ships, setting out a vision which confirms IMO's commitment to reducing emissions from international shipping and to phasing them out as soon as possible. Reduction targets for 2030 and 2050 are:

- To reduce carbon emissions by at least 40% by 2030, pursuing efforts towards 70%, by 2050 compared to 2008's levels (IMO 2030).
- To reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008 whilst pursuing efforts towards phasing them out (IMO 2050).

The main measures focus on lower carbon or zero emission fuels and finding ways of utilizing renewable energy but, also, technical and operational measures such as slow steaming, weather routing, contra-rotating propellers and propulsion efficiency. Development and innovation within smart ship technology is essential in creating the framework that will facilitate the actualization of the IMO emissions targets, i.e. upgrading the fleet by investing in new hybrid and electric vessels, as well as retrofitting current ships with innovative technologies. Both newly designed and retrofitted ships aiming for reduced carbon emissions could also play a key role in the reduction of UWN emissions. Noise-reducing propeller and hull design options are available for many applications and should be considered within IMO strategies, especially for new ships, promoting experimentation and exchange of knowledge regarding the effectiveness of new technological measures on noise abatement and cavitation reduction and related tradeoffs.

3.3.2. Maritime traffic EU strategies and objectives

WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system (COM/2011/0144 final)

The EU Roadmap for a competitive and sustainable transport policy includes objectives that could increase the focus on underwater noise and allow for the inclusion of mitigation strategies within the entire transport system of the European community, fostering the adoption of appropriate noise reduction measures. In particular:

- Increase transport and support mobility by achieving emission reduction targets;
- Improvement of performance in terms of energy efficiency, development and diffusion of sustainable fuels and propulsion systems;
- Optimize the performance of multimodal logistic chains, provide a fully functioning core network of transport corridors at EU level, ensuring structures for efficient transfer between transport modes (TEN-T core network) by 2030, with a network high-quality and high-capacity by 2050 and a corresponding set of information services;
- Use transport and infrastructure more efficiently through the use of improved traffic management and information systems.

Integrated Maritime Policy (IMP) of the European Union (EU)

The EU's Integrated Maritime Policy (IMP) is a policy framework aiming to foster the sustainable development of all sea-based activities and coastal regions by improving the coordination of policies affecting the oceans, seas, islands, coastal and outermost regions and maritime sectors, and by developing cross-cutting tools. The main objectives and corresponding fields of action of the IMP (COM(2007) 0575) are:

- Maximising the sustainable use of the oceans and seas in order to enable the growth of maritime regions and coastal regions as regards shipping, seaports, shipbuilding, maritime jobs, the environment and fisheries management;
- Building a knowledge and innovation base for maritime policy through a comprehensive European Strategy for Marine and Maritime Research and the Horizon 2020 programme;
- Improving the quality of life in coastal regions by encouraging coastal and maritime tourism, creating a Community Disaster Prevention Strategy and developing the maritime potential of the EU's outermost regions and islands;
- Promoting EU leadership in international maritime affairs through enhanced cooperation at the level of international ocean governance and, on a European scale, through the European Neighbourhood Policy (ENP) (5.5.4) and the Northern Dimension (5.5.3);
- Raising the visibility of maritime Europe through the 'European Atlas of the Seas' internet application, as a means of highlighting the common European maritime heritage, and by celebrating an annual European Maritime Day on 20 May.

As part of the objectives of technological growth, research and innovation, opportunities must be sought for innovation in the marine sectors, also with regard to the reduction of noise emissions at sea. Given the transboundary nature of marine ecosystems and maritime activities, robust international cooperation is needed in order to achieve the above-mentioned IMP objectives, also favoring a common strategy for UWN mitigation.

Strategic goals and recommendations for the EU's maritime transport policy (COM/2009/0008 final)

Ensure constant progress towards a coherent and global approach aimed at reducing greenhouse gas emissions produced by international shipping, by intervening at a technical, operational and market level;

Ensure that Member States are able to achieve, by 2020, a "good environmental status" of marine waters under their sovereignty or jurisdiction, as required by the Marine Strategy Framework Directive;

Re-launch the Commission's "campaign for quality shipping", through partnership agreements with EU maritime administrations, broader maritime industries and users of maritime transport services;

Promote a European environmental management system for maritime transport (EMS-MT), which aims at the constant improvement of the environmental performance of the shipping sector;

Take into consideration the modulation of registration fees, port fees and other charges, in order to reward the commitment to achieve greener navigation;

Review the mandate and functioning of the European Maritime Safety Agency so that the scientific and technical assistance it provides to the Member States and the Commission is further strengthened;

Intensify the effectiveness of EU participation in IMO activities and strengthen international cooperation with the EU's shipping and trading partners, promoting a shared culture of maritime safety and common commitments, especially with neighboring countries

Ensure that all Member States are bound, in accordance with their respective commitments, by all relevant international conventions and that they comply with the IMO Implementation Code and IMO Member State Audit System;

Strengthen the EU strategy aimed at fully implementing the projects on motorways of the sea, further facilitating the launch of innovative integrated solutions in intermodal transport, simplifying administrative arrangements and supporting the initiatives proposed by the Commission to make transport greener;

Promote measures to facilitate better island connection and long distance passenger transport within the EU by targeting quality ferry and cruise services and ensuring the availability of adequate terminals;

Design new ship models and equipment to improve environmental and safety performance;

Trans-European Transport Network (TEN-T)

The Trans-European Transport Network (TEN-T) is a planned network of roads, railways, airports and water infrastructure in the European Union. TEN-T envisages coordinated improvements to primary roads, railways, inland waterways, airports, seaports, inland ports and traffic management systems, providing integrated and intermodal long-distance, high-speed routes. The EU works to promote the networks by a combination of leadership, coordination, issuance of guidelines and funding aspects of development. Within the TEN-T activities, specific objectives related to UWN emission could be included considering:

- the promotion of cost-effective and high-quality transport, which contributes to further economic growth and competitiveness;
- the efficient use of new and existing infrastructure; the cost-effective application of innovative operational and technological concepts;
- The increase sustainability through: the development of all modes of transport in a manner consistent with the creation of sustainable and economically efficient transport in the long term; a contribution to the goals of clean and low carbon and greenhouse gas emissions, fuel safety, reduction of external costs and protection of the environment; the promotion of low-carbon transport, with the aim of significantly reducing CO₂ emissions by 2050, in line with the relevant EU CO₂ reduction targets.

3.4. Sectoral policies - Fisheries

3.4.1. CFP and EMFAF

The EU Common fisheries policy (CFP) is a set of rules for sustainably managing European fishing fleets and conserving fish stocks. The European Maritime and Fisheries and Aquaculture Fund (EMFF) helps fishers to adopt sustainable fishing practices and coastal communities to diversify their economies, improving quality of life along European coasts. The EMFAF is the fund running from 2021 to 2027 in order to support CFP, the EU maritime policy and the EU agenda for international ocean governance. It is one of the five European Structural and Investment Funds (ESIF) which complement each other to deliver more jobs, welfare and growth in the EU. It provides support for developing innovative projects ensuring that aquatic and maritime resources are used sustainably and also helps achieve the UN's Sustainable Development Goal 14 ('conserve and sustainably use the oceans, seas and marine resources'), to which the EU is committed.

The actions towards the sustainability of fisheries foreseen by the EU Common Fishery Policy, CFP (EC 2013a,b) should hence explicitly include the reduction of noise emissions related to fishing vessels,

encouraging and supporting the adoption of technological solutions and avoidance of sensitive areas also throughout the economic support of the EMFAF.

Fisheries related noise pollution should be properly addressed as a pressure that augments fisheries pervasive impacts on marine ecosystems. Within the CFP and the Sustainable Blue Economy approach, at Community level the EMFAF could support fishing fleets in adopting cleaner engines and techniques, provided these renovations do not generate overcapacity and overfishing. In order to reduce the adverse impacts, particularly on sensitive species and seabed habitats. To minimise the environmental impacts of fishing on marine habitats, the Commission has brought in measures such as specifications for fishing gear and mesh sizes, closed areas and seasons. Within present and future action plan could be introduced measures, where necessary, to limit the use of fishing gear most harmful to biodiversity, including the use of bottom-contacting fishing gear, supporting the transition to more selective and less damaging fishing techniques. A correct application of spatial-temporal measures for the complex management of fisheries would lead to an immediate positive effect also towards the reduction of noise emissions from fishing vessels. This should be accompanied by a general application of good behavioral practices (e.g. low speed, vessel maintenance) and application of new technologies concerning propellers, machinery, hulls and gears, both during navigation and during fishing activities.

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