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***Joint Action: a stepping-stone for underwater noise
monitoring in Portuguese water***

***Deliverable 5.1 - Regulatory Framework for
underwater noise monitoring in Portugal***
Version 2



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| Date | 25/09/2020 |
| Level of dissemination | Public |

| Date | Version | Description | Autor | Review |
|------------|---------|---------------|------------|--|
| 26/05/2020 | V1 | Draft version | Erica Cruz | Joana Outeiro, Ana Paula Simão, Vera Lopes (DGRM), Leonor Galhardo |
| 25/09/2020 | V2 | Final version | Erica Cruz | |
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LIST OF ABBREVIATIONS

| | |
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| ACCOBAMS | Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area |
| APA | Agência Portuguesa do Ambiente |
| ASCOBANS | Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas |
| CBD | Convention on Biological Diversity |
| CMS | Convention on the Conservation of Migratory Species of Wild Animals |
| COP | Conference of the Parties |
| DEC | Decision |
| DGRM | Direção-Geral dos Recursos Naturais, Segurança e Serviços Marítimos |
| EC | European Commission |
| EIA | Environmental Impact Assessment |
| EU | European Union |
| GES | Good Environmental Status |
| HELCOM | Baltic Marine Environment |
| ICES | International Council for the Exploration of the Sea |
| ICNF | Instituto de Conservação da Natureza e Florestas |
| IMO | International Maritime Organization |
| IOGP | International Association of Oil & Gas Producers |
| IWC | International Whaling Commission |
| JOMOPANS | Joint Monitoring Programme for Ambient Noise North Sea |
| MoU | Memorandum of Understanding |
| MSFD | Marine Strategy Framework Directive |
| OSPAR | Convention for the Protection of the Marine Environment of the North-East Atlantic |
| TSG | Technical Sub Group |
| TUPEM | Título de Utilização do Espaço Marítimo |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UNEP | United Nation Environment Programme |
| WODA | World Dredging Association |



EXECUTIVE SUMMARY

This deliverable aims to review the regulatory framework for underwater noise at different levels focusing on those which more directly may have an impact on underwater noise management in Portuguese waters. It reviews Regional Sea Conventions relevant work, European Union Directives, such as the Marine Strategy Framework Directive, and recommendations issued by international bodies, as for example the ones provided by the International Maritime Organization.

Most of the recommendations reviewed results from the need to protect the marine environment, recognizing underwater noise as a marine pollutant with potential to affect the marine environment. Guidelines and recommendations, although not mandatory, play an important role by providing a relevant framework on underwater noise management both on assessing impacts, and proposing noise reduction and mitigation measures.

At National level there is no specific legal framework for underwater noise management. However, this can be addressed under relevant legislation for environmental impact assessment and marine spatial planning. Raising awareness activities about impacts and monitoring can play an important role on better-informed requirements and decisions.

SUMÁRIO EXECUTIVO

Este documento tem como objetivo rever o enquadramento legal sobre o ruído subaquático a diferentes níveis, com foco nos documentos que podem ter um impacto relevante na gestão do ruído a nível nacional. O documento baseia-se na revisão de Convenções Internacionais e Regionais, as Diretivas da União Europeia, como por exemplo a Diretiva-Quadro Estratégia Marinha, e as recomendações indicadas por organismos internacionais como por exemplo, a Organização Marítima Internacional.

A maioria das diretrizes resultam da necessidade de proteger o ambiente marinho, reconhecendo o ruído subaquático como um poluente marinho com potencial para afetar o ambiente marinho. Estas, embora na maioria dos casos não sejam obrigatórias, desempenham um papel importante, fornecendo uma estrutura relevante para a gestão de ruído subaquático, tanto na avaliação de impactos como na proposta de medidas de redução e mitigação de ruído.

A nível nacional, não existe um quadro jurídico específico para a gestão do ruído subaquático. No entanto, este tópico pode ser considerado ao abrigo de outra legislação relevante, tais como no contexto de avaliação de impacto ambiental e planeamento do espaço marítimo. A promoção de atividades de consciencialização sobre os impactos do ruído e a sua monitorização, podem desempenhar um papel importante na gestão do ruído, no sentido em que, promovem a tomada de decisão melhor informada.



1 INTRODUCTION

Underwater sound is a form of energy which occurs on the marine environment as a result of both natural processes and anthropogenic activities (Hildebrand, 2009). Anthropogenic sounds can be introduced intentionally (e.g. seismic surveys) or as a secondary result of an activity (e.g. shipping) (Abrahamsen, 2012; Bailey et al., 2010; Gisiner, 2016; McKenna et al., 2012; Reine et al., 2014). In the context of environmental policy these are usually referred to as noise due to the potential to cause negative impacts on marine life. Considering the services that we get from the ocean upon which activities, as for example fisheries, tourism, and recreational activities rely, having a good understanding on their impacts allows a better ocean management (Palumbi et al., 2009).

Sound travels far greater distances underwater than light, and for this reason, many marine animals use it as a main mechanism for survival, producing and perceiving sounds to communicate, protect themselves, find food, navigate and to understand their environment (Goodson & Sturtivant, 1996; Janik & Slater, 1998; Lobel, 1992; Arthur N. Popper et al., 2001; Stirling & Thomas, 2005). Several studies show that noise resulting from anthropogenic activities could have a negative impact on marine life (A. N. Popper & Hastings, 2009; Rako-Gospic & Picciulin, 2018) by damaging sensitive organs (Finneran, 2015; Kastak et al., 2005), masking acoustic signals (Pine et al., 2016; Vasconcelos et al., 2007), leading to behavioural changes (Blair et al., 2016; Luís et al., 2014), and by inducing physiological stress (Nichols et al., 2015; Rolland et al., 2012; Wysocki et al., 2006).

Underwater noise is a transboundary issue, both in the sense that it can affect species that are distributed across different regions and because it can propagate over great distances in the ocean. In the last years, concerns regarding the impacts of underwater noise have been reflected on a number of international, regional and national agreements, guidelines and regulations (Lewandowski & Staaterman, 2020). With the exception of the Marine Strategy Framework Directive (MSFD) these instruments are voluntary, i.e., not binding but are calling for action and have common goals and requirements (Lewandowski & Staaterman, 2020). Although there is no international agreement regulating underwater noise, these different kind of instruments and organizations have an important role addressing noise either within the framework of pollution or biodiversity conservation. The first focus on the source, and how it can be mitigated while the second focuses on the impact of noise on marine environment.



2 CONVENTIONS

Considering the transboundary aspects of underwater noise, international and regional conventions represent an important role on the establishment of a regulatory framework for the management of underwater noise. They set the main goals regarding protection of marine environment and promote underwater noise mitigation actions.

2.1 International Conventions

2.1.1 United Nations Convention on the Law of the Sea (UNCLOS)

The United Nations Convention on the Law of the Sea establishes the international regulatory framework for all the uses involving the ocean and its resources aiming to “promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment”. The Convention was opened for signature on 10 December 1982 in Montego Bay, Jamaica and entered into force in Portugal on 03 December 1997. Although its name is linked to the United Nations, this organization does not have a direct operational role in the implementation of the Convention, which is played by several organizations, such as the International Maritime Organization (IMO), the International Whaling Commission (IWC) and the International Seabed Authority.

Under this Convention "pollution of the marine environment means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities”. Considering that sound is a form of energy, with potential to affect the marine environment, it can be assumed as a pollutant. The framework for pollution prevention is set on Part XII of the Convention, which lays down the rules for protection and preservation of the marine environment. Several Articles highlight the need for multilateral and global efforts and cooperation on the assessment and monitoring of the potential effects of polluting activities.

The only reference to noise in the Convention relates to the use of explosives for research purposes (Article 246, in the Convention). Other considerations such as for example the reference to the conservation and management of the living resources of the high seas (Part VII, Section 2 in the Convention) and the rules and national legislation to prevent, reduce and control pollution of the marine environment (Part XII, Section 5), may indirectly apply to underwater noise, in the sense that noise can have a negative impact on several species. In practice, most of the considerations are applied through Regional Conventions and International Organizations.

2.1.2 Convention on the Conservation of Migratory Species of Wild Animals (CMS)

The [Convention on the Conservation of Migratory Species of Wild Animals](#), also known as the Bonn Convention, is an environmental treaty of the United Nations for the conservation and sustainable use of migratory animals and their habitats, laying the legal foundation for internationally coordinated conservation measures throughout a migratory range. In practice this act as a framework



Convention and the agreements may range from legally binding treaties to less formal instruments and can be adapted to the requirements of particular regions. Portugal is Party of this Convention since November 1983 and ratified some of its instruments, namely the agreements and Memorandums of Understanding listed below:

Ratified agreements with interest for underwater noise management

- Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) (1996)

Memorandums of Understanding (MoU)

- Monk Seal in the Atlantic (2007)
- Western African Aquatic Mammals (2008)
- Sharks (2016)

Portugal is still a Range state in several CMS instruments, meaning that exercises jurisdiction over any part of the range of a particular migratory species. These are:

- Aquatic Warbler
- Atlantic Turtles
- ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas)

Some of these instruments will be addressed in this document when there is any reference to underwater noise. The national focal contact point is Instituto de Conservação da Natureza e Florestas ([ICNF](#)), the national institute for the conservation of nature and forests.

Several initiatives related to underwater noise have been supported under this Convention. In October 2017, [UNEP/CMS/Resolution 12.14](#) on adverse impacts of anthropogenic noise on cetaceans and other migratory species was adopted. This “endorses the “CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities” attached as Annex and welcomes the Technical Support Information contained in UNEP/CMS/COP12/Inf”. These guidelines aim to ensure that decision-makers are presented with sufficient evidence to make an informed judgement of impacts of a proposed activity. Updated information may be consulted at <https://www.cms.int/guidelines/cms-family-guidelines-EIAs-marine-noise>.

2.1.3 Convention on Biological Diversity (CBD)

The Convention on Biological Diversity entered into force on December 1993 and it has three main objectives 1) the conservation of biological diversity; 2) the sustainable use of the components of biological diversity and 3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The national focal contact point in Portugal is ICNF.

Regarding underwater noise, an important step was taken in October 2014, when the conference of the parties to the Convention on Biological Diversity at its twelfth meeting adopted Decision XII/23 on Marine and coastal biodiversity: Impacts on marine and coastal biodiversity of anthropogenic



underwater noise and ocean acidification, priority actions to achieve Aichi Biodiversity Target 10 for coral reefs and closely associated ecosystems, and marine spatial planning and training initiatives.

In this decision Parties and other Governments, as well as local communities and other relevant stakeholders, were encouraged, “to take appropriate measures, as appropriate and within their competencies, and in accordance with national and international laws, to avoid, minimize and mitigate the potential significant adverse impacts of anthropogenic underwater noise on marine and coastal biodiversity”, through research, raising awareness and taking management actions. The complete text for this Decision is available at <https://www.cbd.int/doc/decisions/cop-12/cop-12-dec-23-en.pdf>, reference to paragraph 3.

In the decision of 2014 reference to other Agreements and organizations such as the CMS and IMO are made. Later, in December 2016 the Convention adopted Decision CBD/COP/DEC/XIII/10, which further addresses the impacts of marine debris and anthropogenic underwater noise on marine and coastal biodiversity, where the previous decision (Decision XII/23) is recalled. The complete text is available at <https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-10-en.pdf>. Currently, there is no specific working group on this subject.

2.2 Regional conventions

2.2.1 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)

The [OSPAR Convention](#) entered into force on March 1998, aiming to prevent and eliminate pollution in order to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected of the North-East Atlantic. According to the Convention, pollution means “the introduction by man, directly or indirectly, of substances or energy into the maritime area which results, or is likely to result, in hazards to human health, harm to living resources and marine ecosystems, damage to amenities or interference with other legitimate uses of the sea”. The topic of underwater noise is addressed by the Environmental Impacts of Human Activities Committee under at the Intersessional Correspondence Group on Underwater Noise.

Monitoring and assessment of underwater noise is split in impulsive noise and ambient noise. In 2015 OSPAR adopted an Ambient Noise Monitoring Strategy (Agreement 2015-05), assuming that monitoring should be undertaken at an acoustic basin scale. The first pilot study was established in the North Sea by [JOMOPANS project](#), funded by the Interreg North Sea Region, and expected to be extended to other regions. Currently the [JONAS project](#), funded by the Interreg Atlantic Region, is mapping noise and assessing exposure to a number of sensitive species in the wider Atlantic area. Based on the outcomes of these projects an indicator on continuous noise is being developed. Regarding impulsive noise, the [first regional assessment](#) was undertaken in 2017 as part of the Intermediate Assessment of the state of the North-East Atlantic. An impulsive noise impact indicator is currently under development, which will assess the impact of this pressure on specific indicator species. The assessment was based on the registry for activities like seismic surveys, pile driving



explosions and sonar and acoustic deterrents for the countries which data was made available: Belgium, Denmark, Germany, the Netherlands, Sweden and the United Kingdom.

The Guidance for Monitoring of underwater noise developed under the Common Implementation Strategy for the Marine Strategy Framework Directive was adopted by the OSPAR Commission ([OSPAR Agreement 2014-08](#)).

The relevant national contact point is [Direção Geral de Recursos Naturais, Segurança e Serviços Marítimos](#), the National Directorate for natural resources, security, and maritime services.

3 AGREEMENTS

3.1 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)

The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) is a legal conservation tool based on cooperation. Its purpose is to reduce threats to cetaceans notably by improving current knowledge on these animals. The Agreement was established under the auspices of the Bonn Convention, and entered into force in June 2001. In 2010, Parties to ACCOBAMS adopted a Resolution to extend the geographical scope of the Agreement Area to the Exclusive Economic Zones of Spain and Portugal.

Recognizing it as a threat for marine wildlife and the conservation of several species of cetaceans, several initiatives related with anthropogenic noise were led by ACCOBAMS, namely:

- Resolutions to support the implementation of measures for balancing human activities at sea and cetacean conservation: 2.16 (2004); 3.10 (2007); 4.17 (2010); 5.15 (2013); 6.17 & 6.18 (2016); 7.13 (2019). The last resolution sets out the guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area;
- Mediterranean Strategy on Underwater Noise Monitoring: This work aims, in collaboration with the Barcelona Convention, at laying down the methodological basis for a future implementation of a basin-wide monitoring programme on underwater noise;
- Stakeholder involvement: the “Guidance on underwater noise mitigation measures” was developed in 2013. This guide was conceived to support the implementation of noise mitigation measures by industry, and is the result of cooperation between representatives of the industry, scientists and NGOs.

3.2 Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)

The original agreement was concluded as the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas under the CMS, entering into force in 1994. In 2008 the area was extended, and the name adjusted to Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas. With this extension Portuguese waters became included, however Portugal remained as non-Party country.



Under this agreement underwater noise is recognized as a threat to cetacean species. In 2008 an Intersessional Working Group on the Assessment of Acoustics Disturbance was formed and based on their work, guidelines for best practice mitigation measures were released, focusing on three main activities: naval sonars, seismic surveys and pile-driving (Bräger et al., 2012).

In 2009, ASCOBANS passed a [Resolution 6.2](#) (Bräger et al., 2012) on noise from offshore construction activities for renewable energy production. Some of the Parties (e.g. Belgium, Germany, France and Poland) have already implemented regulations and guidelines, as for e.g. the use of ramp-up procedures for noise producing activities during wind park construction.

4 EUROPEAN UNION DIRECTIVES

In the European Union, underwater noise is addressed, by two main directives: the Marine Strategy Framework Directive (MSFD), which requires the monitoring of underwater noise levels and its adverse effects in EU waters and the Environmental Impact Assessment (EIA) Directive requiring the impact assessment of individual public and private projects .

4.1 Marine Strategy Framework Directive

“[The Marine Strategy Framework Directive](#) (2008/56/EC) aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. It is the first EU legislative instrument related to the protection of marine biodiversity, as it contains the explicit regulatory objective "biodiversity is maintained by 2020", as the cornerstone for achieving GES.” It was adopted in June 2008.

In order to achieve GES by 2020, each Member State is required to develop a strategy for its marine waters (or Marine Strategy), and review and update it every six-years (article 17), through a series of steps (Figure 4.1) including: assessing the environmental status of marine waters, determining GES, setting environmental targets, developing a monitoring programme, and, finally, establishing and implementing a programme of measures.



Figure 4.1- Implementation cycles of MSFD.

The MSFD established eleven qualitative descriptors of GES which must be further determined and assessed. Descriptor 11 concerns the introduction of energy, including underwater noise, and requires that it must be at levels that do not adversely affect the marine environment. A technical subgroup under the Working Group on GES was established in 2010 to provide advice on how Descriptor 11 should be determined and assessed (TSG Noise)

The criteria and methodological standards on good environmental status of marine waters and specifications and standardized methods for monitoring and assessment of predominant pressures are laid down in the Annex of the [Commission Decision \(EU\) 2017/848](#) of 17 May 2017, part I.

According to the Commission Decision (EU) 2017/848, GES for underwater noise must be assessed based on two criteria elements:

- Anthropogenic impulsive sound in water where the criteria is that the spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect populations of marine animals, which requires Member States establishing threshold values for these levels through cooperation at Union level, taking into account regional or sub-regional specificities;
- Anthropogenic continuous low-frequency sound in water where the criteria is that the spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals, which requires Member States establishing threshold values for these levels through cooperation at Union level, taking into account regional or sub-regional specificities.



Portugal presented its first Monitoring Programme (MoP) and Programme of measures (PMe) in 2014. The assessment of Portuguese PMe by the commission¹ is summarized in the Commission Environmental Implementation Review 2019 report which states that Portuguese PMe is not clear as to how pressures will be addressed as most measures concern monitoring and research efforts, which are not recognized as measures and therefore, it is not evident how the Good Environmental Status will be achieved (EC, 2019). In this report 3 priority actions are suggested for Portugal:

- Set timelines for attaining good environmental status if no such timelines have been reported.
- Provide more information about measures, establish more measures with a direct impact on the pressures and quantify by how much the pressure in question is expected to be reduced by these measures.
- Cooperate with other Member States sharing the same marine region or subregion to tackle predominant pressures.

4.2 Environmental Impact Assessment Directive

The EIA Directive (85/337/EEC) is in force since 1985 and establishes the adoption of procedures to assess the environmental effects of public and private projects which are likely to have significant effects on the environment. The 1985 Directive was amended three times being codified by Directive 2011/92/EU of 13 December 2011 which was in turn amended in 2014 by Directive 2014/52/EU. Until the approval of MSFD, the main legal framework to monitor underwater noise was this Directive and, indirectly, the Habitats Directive (92/43/EEC), which establishes a strict protection regime for all cetacean species. The need to prevent harm to marine mammals led to the adoption of noise monitoring programs in the Environmental Impact Assessments of maritime activities with potential risks for cetacean populations.

According the EIA procedure (Figure 4.2) the developer should provide to the competent authority information on the environmental impact, the EIA report, which could be previously identified in the scoping stage. After that the environmental authorities and the public are informed and consulted. After the consultation period the competent authority decides and informs the public about the decision which the public can challenge before the courts.

¹ European Commission, Commission Report assessing Member States' programme of measures under the MSFD – SWD(2018) 393 final, of 31.07.201

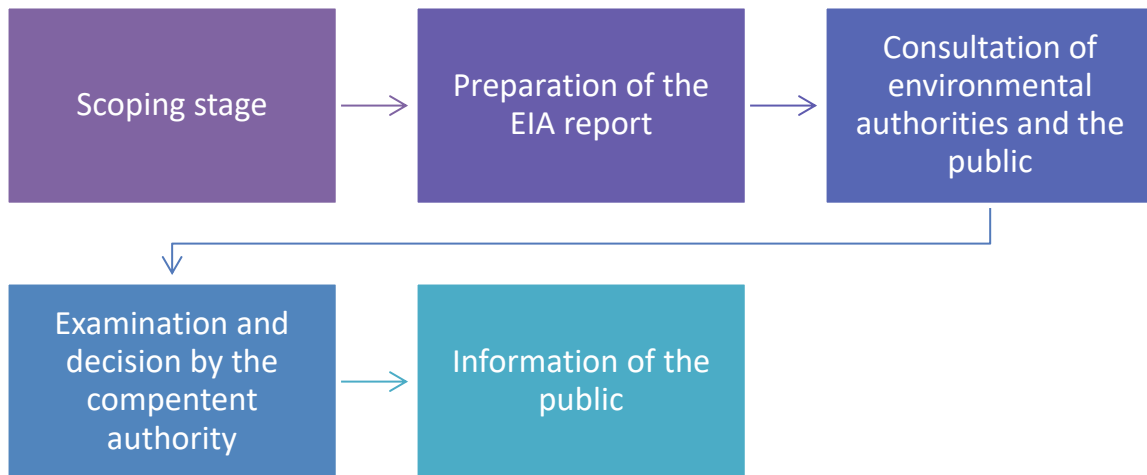


Figure 4.2 - Summary of the EIA procedure (source: [European Commission](#)²).

The Annexes I and II of the Directive establish the types of projects that should be subject to EIA, Annex I refers to projects with mandatory EIA and Annex II refers to projects subject to discretion of Member States, which have to decide whether if EIA is needed in the “screening procedure”. The criteria for this are established under Annex III. Some of the projects mentioned in the Directive correspond to projects that may directly or indirectly introduce underwater noise in the marine environment. Some examples are presented in Table 4.1.

In Portugal, the Directive was transposed by Decree-Law no. 152-B/2017, of 11 of December. In this document, besides the list of projects as described in Annex II of the Directive, the criteria for EIA requirement are established. More information about the legal framework for EIA can be found in in the Portuguese Agency for the Environment [website](#) - Agência Portuguesa do Ambiente (APA).

² <https://ec.europa.eu/environment/eia/eia-legalcontext.htm>



Table 4.1 - Examples of projects referred in the Annexes of the EIA Directive.

| Annex | Type of project |
|--|--|
| Annex I – Mandatory EIA | <ul style="list-style-type: none"> • “Extraction of petroleum and natural gas for commercial purposes...” (Item 14) • “Pipelines...” (Item 16) |
| Annex II – subject to screening procedure | <ul style="list-style-type: none"> • “Extraction of minerals by marine...dredging...” (Item 2 (c)) • “Deep drillings...” (Item 2 (d)) • “surface industrial installations for the extraction of coal, petroleum, natural gas and ores...” (Item 2 (e)) • Installations for the harnessing of wind power for energy production...” (Item 3 (i)) • “Shipyards” (Item 4 (g)) • “Swaging by explosives” (Item 4 (j)) • “Oil and gas pipeline installations...” (Item 10 (i)) • “Marinas” (Item 12 (b)) |

5 INTERNATIONAL ORGANIZATIONS

5.1 International Whaling Commission (IWC)

The International Whaling Commission, established in 1946, is the international body in charge of conservation of whales and the management of whaling. Nowadays, besides whaling management its work also addresses conservation issues including underwater noise. Portugal joined this Commission in 2002.

Anthropogenic noise is set as a priority threat in the Strategic Plan 2016-2026 of the Conservation Committee, and is also being considered at the Scientific Committee “to better understand the impact of noise on cetaceans, and the effectiveness of different approaches to reducing exposure”. The steps to be undertaken by the Commission are set up on the [2018 Resolution on Anthropogenic Underwater Noise](#).

Additionally, the Commission is actively engaged in discussions in other international fora including the United Nations consultative process on Ocean and the Law of the Sea and the International Maritime Organization, by regularly updating about the impact of underwater noise^{3,4}.

Updated information about the actions undertaken by IWC regarding underwater noise can be consulted in <https://iwc.int/anthropogenic-sound>.

³https://iwc.int/private/downloads/FVRfmJ7hut8I8bLYNN9zwQ/anthropogenic_noise_UNGA_submission_FINAL.pdf, accessed on 05/06/2020

⁴

https://iwc.int/private/downloads/TsFAGLE5I52oQACjvnxb0Q/MEPC_72_INF.9_Further_information_related_to_impacts_of_underwater_noise_on_marine_life_Internation.pdf, accessed on 05/06/2020



5.2 International Maritime Organization (IMO)

The International Maritime Organization is a specialized agency of the United Nations with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. Being the shipping industry an international industry, IMO is the forum that allows discussing the regulations and standards and its adoption and implementation at international level.

The issue of underwater noise is led by the IMO Marine Environment Protection Committee, which in 2008 agreed to develop non-mandatory technical guidelines to minimize the introduction of underwater noise, which were approved in 2014 - [Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life](#) (circular MEPC.1/Circ.833). These are focused on primary sources of underwater noise and, also include definitions and underwater noise measurements standards. On the adoption of the guidelines it was recognized the complexity of the issue and the lack of information, in particular on the measurement and reporting of underwater sound radiating from ships.

5.3 International Council for the Exploration of the Sea (ICES)

ICES is an intergovernmental marine science organization, meeting societal needs for impartial evidence on the state and sustainable use of the seas and oceans. It aims to advance and share scientific understanding of marine ecosystems and the services they provide and to use this knowledge to generate state-of-the-art advice for meeting conservation, management, and sustainability goals. It sets out 6 science priorities: 1) ecosystem science, 2) impacts of human activities, 3) observation and exploration, 4) emerging techniques and technologies, 5) conservation and management science and 6) sea and society. The work of ICES is accomplished through Expert Groups and workshops managed by the Steering Groups.

Underwater noise is addressed at Working Group on Shipping Impacts in the Marine Environment, which investigates management and mitigation measures that can be used to reduce or eliminate sources of ship-based pollution and synthesize scientific progress in addressing single stressors, such as pollutant discharge, underwater noise, and ship strikes.

The Council has a Data Centre with underwater noise dataset collections. One example is the underwater impulsive noise data portal launched in 2016 to support OSPAR and HELCOM in their regional assessments. Currently, an ambient noise database to support HELCOM on monitoring and assessment of the Baltic Sea (ICES, 2019) and potentially OSPAR is under development.



6 OTHER GUIDELINES AND RECOMMENDATIONS FOR SPECIFIC NOISE SOURCES

6.1 Dredging

The World Dredging Association (WODA) has submitted technical guidance on underwater sound in relation to dredging activities to the London Convention (Convention on the Prevention of Marine pollution by Dumping of Wastes and Other Matter 1972) and Protocol Scientific Groups, providing advice to decision-makers, stakeholders and scientists on how to manage impacts of underwater sound, primarily from dredging

The guidelines are available [here](#).

6.2 Offshore platforms and seismic surveys

The International Association of Oil & Gas Producers (IOGP) is dedicated to advance the views of the upstream industry to international regulators and legislative bodies and to share good practice in safety and the protection of the environment. To provide regulators, scientists and oil and gas companies with independent scientific information on underwater sound, IOGP formed the Sound Marine Life Joint Industry Programme (JIP). Based on the work carried out over the years and under JIP it developed PAMGuard, a software system for detecting the presence of marine mammals near seismic operations that allows operators to shut down to prevent any over exposure and, released recommendations for monitoring and mitigation for cetaceans during marine seismic survey geophysical operations.

7 NATIONAL LEGISLATION

Currently, there is any specific legislation for underwater noise management in Portugal. However, there are some legal instruments that can be relevant. Besides the EIA and MSFD Directives, there is the Decree-Law no.38/2015 of 12th of March, which develops the Law no.17/2014 of 10th of April, and establishes the need for the promoter applying for a TUPEM (Títulos de Utilização do Espaço Marítimo – a license for the use of maritime space) to present a proposal for environmental monitoring, subject to decision and approval by the entity with rights to do that, currently DGRM.

8 CONCLUSIONS

Several documents recognize underwater noise as a pollutant and the need to better understand its impacts on the marine environment but none of the recommendations provided by international conventions and bodies are binding to the parties. At the EU level the MSFD is the only legal framework requiring Member States (via EU level cooperation) to establish thresholds for underwater noise levels to assess the Good Environmental Status of EU marine waters, and to set targets and establish Monitoring Programmes and Programmes of Measures accordingly. This task reveals particularly challenging when there are still large uncertainties about the level of impacts and, even, on the measurement of underwater noise levels.



Some countries are doing an effort to advance regulation of underwater noise by adopting some of the international recommendations on national regulations. This might be related to the activities developed in their waters and the occurrence of sensitive species.

In Portugal there is no regulation for underwater noise management. Most of the work has been carried out under the EIA directive, but the MSFD has more recently become an important catalyst for tackling this pressure. The adoption of several recommendations and translation for national regulation will require a better understanding of the activities carried out in Portuguese waters and the impact on marine environment.

The application for the license to the use of maritime space (TUPEM) can play a key role on underwater noise management at national level. Raising awareness about underwater noise regarding several topics (e.g. impacts, monitoring solutions, management best practices) near relevant stakeholders will bring an opportunity for better informed decisions.

9 REFERENCES

- Abrahamsen, K. (2012). The ship as an underwater noise source. *Proceedings of Meetings on Acoustics*, 17(2012). <https://doi.org/10.1121/1.4772953>
- Bailey, H., Senior, B., Simmons, D., Rusin, J., Picken, G., & Thompson, P. M. (2010). Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. *Marine Pollution Bulletin*, 60(6), 888–897. <https://doi.org/10.1016/j.marpolbul.2010.01.003>
- Blair, H. B., Merchant, N. D., Friedlaender, A. S., Wiley, D. N., & Parks, S. E. (2016). Evidence for ship noise impacts on humpback whale foraging behaviour. *Biology Letters*, 12(8). <https://doi.org/10.1098/rsbl.2016.0005>
- Bräger, S., Brensing, K., Caddell, R., Detloff, K. C., Dolman, S., Evans, P., Frank, V., Haelters, J., Kless, R., Lucke, K., Nunny, L., Pavan, G., Simmonds, M., & Westerberg, H. (2012). *Final Report of the ASCOBANS Intersessional Working Group on the Assessment of Acoustic Disturbance Action Requested* (Issue April 2010).
- EC. (2019). *The Environmental Implementation Review 2019 - Portugal*. 43. http://ec.europa.eu/environment/eir/index_en.htm
- Finneran, J. J. (2015). Noise-induced hearing loss in marine mammals: A review of temporary threshold shift studies from 1996 to 2015. *The Journal of the Acoustical Society of America*, 138(3), 1702–1726. <https://doi.org/10.1121/1.4927418>
- Gisiner, R. C. (2016). Sound and Marine Seismic Surveys. *Acoustics Today*, 12(4), 10–18.
- Goodson, A. D., & Sturtivant, C. R. (1996). Sonar characteristics of the harbour porpoise (*Phocoena phocoena*): Source levels and spectrum. *ICES Journal of Marine Science*, 53(2), 465–472. <https://doi.org/10.1006/jmsc.1996.0066>
- Hildebrand, J. (2009). Anthropogenic and natural sources of ambient noise in the ocean. *Marine Ecology Progress Series*, 395, 5–20. <https://doi.org/10.3354/meps08353>
- Janik, V., & Slater, P. (1998). Context-specific use suggests that bottlenose dolphin signature whistles are cohesion calls. *Animal Behaviour*, 56(4), 829–838.
- Kastak, D., Southall, B. L., Schusterman, R. J., & Kastak, C. R. (2005). Underwater temporary threshold shift in pinnipeds: Effects of noise level and duration. *The Journal of the Acoustical Society of America*, 118(5), 3154–3163. <https://doi.org/10.1121/1.2047128>
- Lewandowski, J., & Staaterman, E. (2020). *action International management of underwater noise : Transforming conflict into effective action a*). 3160. <https://doi.org/10.1121/10.0001173>
- Lobel, P. S. (1992). Sounds produced by spawning fishes. *Environmental Biology of Fishes*, 33(4), 351–358. <https://doi.org/10.1007/BF00010947>
- Luís, A. R., Couchinho, M. N., & dos Santos, M. E. (2014). Changes in the acoustic behavior of resident bottlenose dolphins near operating vessels. *Marine Mammal Science*, 30(4), 1417–1426. <https://doi.org/10.1111/mms.12125>
- McKenna, M. F., Ross, D., Wiggins, S. M., & Hildebrand, J. A. (2012). Underwater radiated noise from



- modern commercial ships. *The Journal of the Acoustical Society of America*, 131(1), 92–103. <https://doi.org/10.1121/1.3664100>
- Nichols, T. A., Anderson, T. W., & Širović, A. (2015). Intermittent noise induces physiological stress in a coastal marine fish. *PLoS ONE*, 10(9), 1–13. <https://doi.org/10.1371/journal.pone.0139157>
- Palumbi, S. R., Sandifer, P. A., Allan, J. D., Beck, M. W., Fautin, D. G., Fogarty, M. J., Halpera, B. S., Incze, L. S., Leong, J. A., Norse, E., Stachowicz, J. J., & Wall, D. H. (2009). Managing for ocean biodiversity to sustain marine ecosystem services. *Frontiers in Ecology and the Environment*, 7(4), 204–211. <https://doi.org/10.1890/070135>
- Pine, M. K., Jeffs, A. G., Wang, D., & Radford, C. A. (2016). The potential for vessel noise to mask biologically important sounds within ecologically significant embayments. *Ocean and Coastal Management*, 127(April), 63–73. <https://doi.org/10.1016/j.ocecoaman.2016.04.007>
- Popper, A. N., & Hastings, M. C. (2009). The effects of anthropogenic sources of sound on fishes. *Journal of Fish Biology*, 75(3), 455–489. <https://doi.org/10.1111/j.1095-8649.2009.02319.x>
- Popper, Arthur N., Salmon, M., & Horch, K. W. (2001). Acoustic detection and communication by decapod crustaceans. *Journal of Comparative Physiology - A Sensory, Neural, and Behavioral Physiology*, 187(2), 83–89. <https://doi.org/10.1007/s003590100184>
- Rako-Gospić, N., & Picciulin, M. (2018). Underwater noise: Sources and effects on marine life. *World Seas: An Environmental Evaluation Volume III: Ecological Issues and Environmental Impacts*, 367–389. <https://doi.org/10.1016/B978-0-12-805052-1.00023-1>
- Reine, K. J., Clarke, D., & Dickerson, C. (2014). Characterization of underwater sounds produced by hydraulic and mechanical dredging operations. *The Journal of the Acoustical Society of America*, 135(6), 3280–3294. <https://doi.org/10.1121/1.4875712>
- Rolland, R. M., Parks, S. E., Hunt, K. E., Castellote, M., Corkeron, P. J., Nowacek, D. P., Wasser, S. K., & Kraus, S. D. (2012). Evidence that ship noise increases stress in right whales. *Proceedings of the Royal Society B: Biological Sciences*, 279(1737), 2363–2368. <https://doi.org/10.1098/rspb.2011.2429>
- Stirling, I., & Thomas, J. A. (2005). Relationships between underwater vocalizations and mating systems in phocid seals. *Aquatic Mammals*, 29(2), 227–246. <https://doi.org/10.1578/016754203101024176>
- Vasconcelos, R. O., Amorim, M. C. P., & Ladich, F. (2007). Effects of ship noise on the detectability of communication signals in the Lusitanian toadfish. *The Journal of Experimental Biology*, 210(Pt 12), 2104–2112. <https://doi.org/10.1242/jeb.004317>
- Wysocki, L. E., Dittami, J. P., & Ladich, F. (2006). Ship noise and cortisol secretion in European freshwater fishes. *Biological Conservation*, 128(4), 501–508. <https://doi.org/10.1016/j.biocon.2005.10.020>



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