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COMPILATION OF SUBMISSIONS ON EXPERIENCES IN THE USE OF MEASURES TO AVOID, MINIMIZE AND MITIGATE THE SIGNIFICANT ADVERSE IMPACTS OF ANTHROPOGENIC UNDERWATER NOISE ON MARINE AND COASTAL BIODIVERSITY

Note by the Executive Secretary

1. In decision XIII/10, the Conference of the Parties (COP) to the Convention on Biological Diversity recalled decision XII/23 and invited Parties, other Governments and competent organizations, including the International Maritime Organization, the International Seabed Authority, the Convention on the Conservation of Migratory Species of Wild Animals, the International Whaling Commission, other relevant stakeholders, and indigenous peoples and local communities to collaborate and share their experiences on the application of measures to avoid, minimize and mitigate the significant adverse impacts of anthropogenic underwater noise on marine and coastal biodiversity. In decision XIII/10, the Conference of the Parties also requested the Executive Secretary to continue the work on the compilation, synthesis and dissemination of these experiences.
2. Pursuant to this request, the Executive Secretary issued notification 2017-082, dated 31 August 2017, requesting information on experiences in the use of measures to avoid, minimize and mitigate the significant adverse impacts of anthropogenic underwater noise on marine and coastal biodiversity.
3. Submissions were received in response to this notification from Australia, Brazil, Canada, Colombia, European Union, Norway, Oman, Peru, Sweden, Trinidad and Tobago, Venezuela, the Baltic Marine Environment Protection Commission (HELCOM), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the International Whaling Commission (IWC), OceanCare, and the University of Maryland. The submissions received in response to the notification were compiled in the attached table describing various activities undertaken by Parties and relevant organizations related to anthropogenic underwater noise and its impacts on marine and coastal biodiversity.

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Australia	• Environmental Protection and Biodiversity Conservation Act 1999 (the EPBC Act) – Regulates actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES), which include World Heritage Sites, migratory species, nationally threatened species and communities, and Commonwealth marine areas. Such actions are subject to a rigorous and transparent environmental assessment and approval process. The Act includes Policy Statement 2.1, which provides standards and framework to minimize risk from seismic survey and guidance for survey operators • The North-East Shipping Management Plan – Under the Plan, Great Barrier Reef Marine Park Authority (GBRMPA) leads a number of initiatives relating to improving knowledge of impacts from shipping (wake, noise and copper leaching), remediation of impacts and incident. An action for the GBRMPA and the Australian Maritime Safety Authority is to keep under review opportunities to conduct research into noise monitoring tools and methods and implications for ship noise mitigation strategies. As part of this, the GBRMPA has finalised the underwater noise discussion and options paper developed by its expert consultants. • Great Barrier Reef Marine Park Regulations 1983 – requires GBRMPA to consider the potential impacts of an activity (including	• National collation of pressure data to improve understanding the pressures on the marine environment – The National Environmental Research Programme's Marine Biodiversity Hub project mapped environmental pressures in Commonwealth waters (such as fishing, shipping, seismic surveys and oil and gas infrastructure) on a national scale and identified the associated risks and impacts in relation to marine biodiversity. • Potential noise impacts on fish in the Southern Ocean – Commonwealth Scientific and Industrial Research Organisation (CSIRO), in conjunction with industry, investigate potential for noise impacts on fish associated with oil and gas exploration in the Great Australian Bight. Developing quieter technologies – Australian Research Council funded a project, commencing in 2015, to develop quieter propellers. The project aims to explore the generation of noise by composite propellers and to use this understanding to tailor the composite properties to reduce underwater noise. • Interactions between marine fauna and underwater noise, developing monitoring techniques for underwater operations and marine soundscape studies – Curtin University leads and collaborates in several multi-institutional projects addressing underwater noise, including on issues such as: - Assessing the potential impacts of anthropogenic sound on marine fauna; mapping distribution, abundance and behaviour of marine fauna species and their associated marine habitats as a baseline; - Quantifying underwater noise emission from marine operations; cataloguing sound repertoires of marine species (mammals and fish) and mapping their calling patterns to

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	underwater noise) on the environment and on the social, cultural and heritage values of the Marine Park. The regulations were recently updated (4 October 2017) to ensure more consistent and transparent considerations for applications including the consideration of direct, indirect and potential cumulative impacts of activities on the environment, biodiversity and heritage values of the Marine Park (now termed 'relevant impacts'). • Maritime Activities Environmental Management Plan – contains procedures to mitigate and manage associated impacts on the environment associated with noise from military activities. Potential areas of higher marine mammal abundances and locations with specific sensitivities (e.g. feeding, resting areas) are avoided for activities generating high noise levels. Since 2011, several sub-national states have introduced strategies, management plans and initiatives relating to marine conservation areas, including “<i>NSW 2021: a plan to make NSW number one</i>”, which sets out goals associated with protecting and conserving biodiversity, including establishing more conservation areas across New South Wales.	identify essential habitat and to better understand their responses to environmental drivers and anthropogenic activity; - Development of monitoring techniques (hardware and software) for marine fauna and underwater anthropogenic operations; and marine soundscape studies (monitoring, characterizing and quantifying). • Using a physiological approach to understand potential impacts of seismic surveying on marine invertebrates – The Institute for Marine and Antarctic Studies, University of Tasmania, in collaboration with Curtin University, has developed physiological methodologies for examining sub-lethal impacts of seismic surveys on key invertebrate species, with this group largely understudied. • National passive acoustic monitoring network – Since 2008, this network has been running under the Integrated Marine Observing System, which operates within the National Collaborative Research Infrastructure Scheme. This network has supported the collection of publicly available, fully calibrated ocean acoustic data with sites off the coast of NSW, western Victoria, South Australia, the Perth Canyon and several sites in the north west of Western Australia for 2-3 years. The program is to be temporarily “paused” over 2017/2018-2019, but may begin again in mid-2019. • Underwater noise on the Great Barrier Reef’s marine fauna The GBRMPA recently commissioned a substantial review to inform the process of developing a guideline for considering and managing the impacts of anthropogenic underwater noise on the GBR’s marine fauna. Key findings include: - Specific policy and guidance for managing the impacts of underwater noise in the Great Barrier Reef is lacking. - Underwater noise management policy and the application of such policy is less advanced in Australia compared to regulatory developments within the international arena.

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		- There are good opportunities to learn from and use the guidelines already developed, and which continue to evolve overseas as a basis for Great Barrier Reef policy/guidelines. • Integrated Marine Observing System (IMOS) – With the establishment of the IMOS network of National Reference Stations, coordinated ongoing monitoring of noise in the marine environment now occurs at several stations, predominantly in the southern half of Australia. Monitoring efforts are facilitating characterization and quantification of the marine soundscape, and the establishment of trends at the station sites. Analysis of acoustic data from the National Reference Station moored offshore from Perth has identified that soundscapes are dominated by physical and meteorological (wind, waves and rain), biological (marine animals such as whales and fish) and anthropogenic (predominantly marine vessel activity, which was present 25 per cent of the time) sound sources. However, the limited nature of monitoring of noise in the marine environment precludes an assessment of recent trends. Therefore, trends of anthropogenic noise remain unclear.
Brazil	• Environmental licensing for acquisition of seismic data – In 2004, the National Environment Council (CONAMA) approved Resolution 350/2004, establishing that acquisition of seismic data in the marine and transitional environment should be licensed by the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA), due to its environmental impact potential. This Resolution requires the entrepreneur to present environmental control plans, studies, and impact reports, among others. • Guide for monitoring marine biota in seismic data acquisition activities – Prepared by IBAMA, the Guide contains guidelines for the operation of airguns in a manner associated with the	• Research project on on-board observation tourism – The Baleia Franca Environmental Protection Area currently coordinates a research project to evaluate the effects of on-board observation tourism on the southern right whale (<i>Eubalaena australis</i>), especially the sound impacts, and to evaluate the possibility of authorization of the activity according criteria. • Review of National Action Plans – In 2018, the National Center for Research and Conservation of Aquatic Mammals (ICMBio / CMA) plans to evaluate and review the National Action Plans to optimize their implementation. The National Plan for Manatee has already been evaluated and reviewed by the National Center for Research and Conservation of Marine Biodiversity of the Brazilian Northeast and is in currently in the process of institutional approval and formalization.

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	performance of onboard observers, which aims to ensure that the prospected area is free of the presence of marine mammals and turtles during operations, reducing the impacts of seismic data acquisition on marine biota. • IBAMA Ordinance no. 117 of 1996 – establishes rules concerning the Prevention of Whale Cetaceans found in Brazilian areas and presents specific guidelines to reduce the impact of noise in aquatic mammals. • National Action Plans (NAPs) for the Conservation of Aquatic Mammals – have specific actions to increase scientific knowledge, and avoid or mitigate underwater noise. In particular: - The NAP for the Conservation of Small Cetaceans has a specific objective of assessment and reducing the impact of noise pollution on small cetaceans in Brazil in the next five years. As a follow-up, the Government planned to propose measures to prevent and mitigate noise pollution in the target species of the NAP. - The NAP for the Conservation of Large Cetaceans and Pinnipeds contains an action to investigate the impact of different sources of anthropogenic noise. - The NAP for the Conservation of the Franciscana dolphin includes an action to characterize the sound repertoire of the species and the effects of noise pollution.	• Admiral Paulo Moreira Sea Institute (IEAPM) – This laboratory will have hydrophones to conduct a study of the underwater soundscape and monitoring of marine mammals. • Monitoring programs required for the issuance of environmental licenses of ports and petroleum exploration and exploitation: - <i>Cetacean Monitoring program</i> – aims to monitor the occurrence and distribution of cetaceans in the area of influence of the enterprise, with a view to the identification and mitigation of possible impacts. In some cases, this program includes bioacoustics monitoring. - <i>Passive Acoustic Monitoring project</i> – aims to evaluate possible impacts of the activity on cetaceans, including among other measures, the procedures for gradual increase of airguns, the presence of onboard observers and the shutdown procedure of airguns when sighting mammal or marine chelonian within 500 meters of the seismic source. - <i>Underwater noise monitoring program</i> - <i>Beach monitoring program</i> – aims to evaluate possible impacts of oil projects on marine fauna from the monitoring of the occurrence of individuals stranded on the beaches to the execution of the necessary technical procedures for rehabilitation and veterinary treatment or for the accomplishment of microscopic exams for the determination of the cause of death.
Canada	• Incentivizing quiet vessel design – Vessels that call at the Vancouver Fraser Port Authority (VFPA) or the Port of Prince Rupert on Canada's	• Understanding Anthropogenic Underwater Noise – This report was prepared by Green Marine and highlights the sources of noise and its impact on marine life, regulations on

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	Pacific coast can be eligible for a discount on their harbour fees if they possess certain quieting technologies or hold a quiet certification from a classification society. • Voluntary measures – Voluntary speed reduction measures for maritime transportation vessels in the St. Lawrence River have been proposed by the Working Group on Marine Traffic and Protection of Marine Mammals in the Gulf of St. Lawrence (G2T3M), co-led by Parks Canada and the Department of Fisheries and Oceans Canada, and consisting of various stakeholders from the marine industry, research and conservation. These measures aim to reduce the risks of collision with whales but also to reduce the impact of noise on the belugas in the St. Lawrence River. The measures were published by the Canadian Coast Guard in the Notice to Mariners – East monthly Edition, from May to October 2013.	underwater noise in other jurisdictions, and lists areas for possible future research and development. • Activities on the southern resident killer whale (SRKW) – Canada supported a technical workshop on underwater noise to develop metrics on measuring noise impacts on SRKW. A multi-day symposium was also organized to discuss both immediate and long-term measures to mitigate underwater noise to further the recovery of SRKW. A Canadian Scientific Advisory Secretariat (CSAS) process (a national peer-review process organized by Fisheries and Oceans Canada) was held to assess the scientific effectiveness of specific mitigation measures on reducing underwater noise as received by the SRKW. • Computer modelling – Transport Canada has undertaken extensive computer modelling to determine the effectiveness of mitigation measures that can reduce noise from shipping and has planned work to develop a model that will predict the induced noise and vibration from a ship's propeller. • Underwater vessel noise – Canada presented a paper on underwater vessel noise (MEPC 71/16/5) at the IMO's Marine Environment Protection Committee (MEPC) in July 2017. The paper highlights current activities in Canada to address underwater noise from shipping and asks member states to work collaboratively in this regard by sharing information and coordinating future research. An informal contact group has been established to advance this collaboration. Canada also agreed at the Arctic Council's Protection of the Arctic Marine Environment Working Group (PAME) in September 2017 to co-lead a state of knowledge report on underwater noise in the Arctic.
Colombia		• Decreto 1076 de 2015 - This resolution notes studies on the environmental impact assessment required to obtain an environmental license for the marine seismic exploration projects at depths of less than 200m. Its objective is to define

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		rules that will be used for recovery, conservation, protection, ordinance, management and use of renewable natural resources and the marine environment of the country in order to ensure sustainable development. An EIA report is also required at the beginning of gas extractions in coastal areas so that a geophysical study, which does not require perforation, can be conducted in advance. • “Términos de referencia para la elaboración del estudio de impacto ambiental - eia en proyectos de exploración sísmica marina en profundidades menores a 200 m (TdR-10)” – This document presents the terms of reference for the preparation of the Environmental Impact Assessment for marine seismic exploration projects at depths of less than 200m in Colombian marine areas. The EIA is required for issuance of the environmental license in accordance with article 2.2.2.3.2.2. of Decree 1076 of 2015.
European Union	• Recital 12 of Directive 2014/52/EU – The Directive specifically mentions the marine environment and requires environmental impact assessment (EIA) and screening procedures for projects in the marine environment, with particular regard to technologies such as seismic surveys using active sonars. Considerations for marine environment are also mentioned in Annex III para 2 (ii) related to legal Article 4 (3), and noise and vibration are listed in Annex IV para. 1 (d) and 5 (c). • Habitats Directive and Birds Directive – Council Directive 92/43/EEC (Habitats Directive) and Council and European Parliament Directive 2009/147/EC (Birds Directive) require measures to avoid any significant disturbance of species in the Natura 2000 sites (Article 6 (2)). This provision also includes the obligation to assess human	• Technical Group on Underwater Noise (TG Noise) – advises EU Member States to deliver on the objectives of the Marine Strategy Framework Directive (MSFD). In particular, until 2015, its work has been focused on monitoring, with regard to setting up a register of loud impulsive noise and the development of a joint monitoring program for continuous noise. TG Noise focuses now on assessment of impacts of noise and development of thresholds in relation with the indicators developed in the MSFD.

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	activities that are likely to have a significant impact on the conservation objectives of the site. • Marine Strategy Framework Directive (MSFD) – Adopted in 2008, MSFD requires Member States to achieve or maintain good environmental status of EU marine waters by 2020. Of 11 qualitative descriptors of good environmental status, one descriptor states that “introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment”. Two types of criteria elements are also specified in Commission Decision 2017/848: a) anthropogenic impulsive sound in water and b) anthropogenic continuous low frequency sound in water.	
Norway	• Regulations for offshore petroleum activities – Regulations for seismic surveys are in place to avoid or minimise such negative impacts. Under the Petroleum Act and Petroleum Regulations, there are requirements for an impact assessment to be undertaken prior to the opening of new areas, which may include impacts related to underwater noise. This process involves stakeholder hearings both in the scoping phase and on the actual impact assessment report. Before start-up of seismic surveys the licensee shall submit details of the survey for feedback from relevant authorities. The Norwegian Marine Research Institute and the Directorate of Fisheries are responsible for notification of sensitive areas with respect to fish, marine mammals and fisheries. The Norwegian Petroleum Directorate will change the resource management regulation to include new provisions on "soft start" ("ramp-up") with weaker sound impulses at the start of a seismic survey. This is to	• Studies on the impact of underwater noise from seismic surveys on fish(eries) stocks – Several studies on the impact of underwater noise from seismic surveys on fish stocks in Norwegian waters have been carried out in recent years for several species of fish. • SONATE decision aid tool for planning of sonar operations in Norwegian waters – SONATE integrates current knowledge on sensitivity of species, distribution and abundance of species in time and space, fishery activity and other commercial activity. • Publication of reports on underwater noise impacts: - Engås, A., Løkkeborg, S., Ona, E. and Soldal, A.V. 1993. Effects of seismic shooting on catch and catch-availability of cod and haddock. Fiskeri og Havet nr. 9 - 1993, (ISSN 0071-5638). Bergen. 117 s. - Hassel, A., Knutsen, T., Dalen, J., Løkkeborg, S., Skaar, K., Østensen, Ø., Haugland, E.K., Fonn, M., Høines, Å. and Misund, O.A. 2003. Reaction of sandeel to seismic shooting: A field experiment and fishery statistics study. Fiskeri og Havet, nr. 4 - 2003. 63

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	allow fish and marine mammals to leave the area during seismic surveys. There are also time limitations for seismic surveys in certain protected areas in spawning periods. • Guidelines for Seismic Surveys – The Ministry of Fisheries and the Norwegian Ministry of Petroleum and Energy have published a common guideline for planning and conducting seismic surveys, "Implementation of seismic surveys on the Norwegian Continental Shelf." The Norwegian Oil and Gas Association have published further detailed guidelines for coexistence with the fishing sector when conducting seismic surveys. • Fisheries Liaison Officers on seismic vessels – Vessels carrying out seismic surveys must have a fisheries liaison officer (FLO) on board when it is necessary due to fishing operations in the area. • Sonar for naval operations – Generic EIAs for naval sonar operations have been conducted since 2003. The Navy Implemented Guidelines for use of active sonar in 2006, which were upgraded to Regulations in 2009 and to Military Instructions in 2015. The Sonar Instructions defines restriction zones in areas of high abundance of marine mammals and safety distances from fishing activity and marine mammals. Operational procedures such as marine mammals observers, ramp-up, speed limitations and restrictions during operations in restricted waters with limited escape options are also implemented. • Underwater explosions – Permission on terms could be given according to the Norwegian pollution control act. Terms could be mitigating measures like warning	- Dalen, J., Dragsund, E., Næss, A. and Sand, O. 2007. Effects of seismic surveys on fish, fish catches and sea mammals. Report for the Cooperation group – Fishery Industry and Petroleum Industry. Report no.: 2007-0512. Det Norske Veritas AS, 24.04.07. Høvik. 29 s. - Dalen, J. 2009. Scaring effects in fish by offshore seismic explorations. Contr. International workshop on "Methods and technologies for studies of fish behavior", OGP JIP E&P Sound and Marine Life. The International Association of Oil and Gas Producers, Stavanger 19-20.04.09. - Løkkeborg, S. 2009. Effects of seismic shooting on longline and gillnet fisheries. Contr. International workshop on "Methods and technologies for studies of fish behavior", OGP JIP E&P Sound and Marine Life. The International Association of Oil and Gas Producers, Stavanger 19-20.04.09. - Løkkeborg, S., Ona, E. & Salthaug, A. 2012. Sounds from seismic air guns: gear- and species-specific effects on catch rates and fish distribution. Can.J.Fish.Aquat.Sci. 69:1278-1291.

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	explosions with smaller power with the objective to scare away fish, sea mammals and other animals. • Piling – is not considered as an extensive activity in Norway at the moment. However, work is going on to include mitigating measures concerning underwater noise in guidance for handling of sediments.	
Oman	• Measures to minimize anthropogenic underwater noise: - Prohibiting seismic survey for oil discovery near sensitive sites and banning the activity during breeding season for particularly marine mammals and turtles; - Developing environmental requirements for projects to minimize the impacts of anthropogenic underwater noise on marine organisms, especially from oil extraction platforms; - Surveying marine mammals and turtles to observe any impacts caused by anthropogenic underwater noise; - Regularizing marine tourism activities and relevant business and issuing diving licenses in consideration of potential adverse impact of underwater noise on marine species.	
Peru		• Opinión técnica acerca del « Proyecto de Instalación de la Plataforma Marina CX-15 y Facilidades de Producción para la Exploración y Producción de 24 Pozos en el Yacimiento Corvina – Lote Z-1, Region Tumbes » – This technical report indicated that species such as plankton were especially affected in an irreversible way due to the underwater noise created by the installation project for the CX-15 marine

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		platform. It also noted that the operation would produce high level of underwater noise, and its potential consequence should be carefully considered in the decision-making.
Sweden	• EIA for permitting waterworks – An EIA must be prepared by the operator before submitting a permit application for waterworks and environmentally harmful operations. The potential environmental impacts of underwater noise should be included as well as mitigation measures. • Designation of a marine Natura 2000 area in the Baltic Proper for the harbour porpoise – This area is the largest marine area proposed by Sweden as a Natura 2000 site. The project aims to minimize noise disturbance from activities from pleasure boats as well as commercial boats and their use of underwater sounding devices like sonars. • Achieve Quieter Oceans by shipping noise footprint reduction (AQUO) - developed a guideline together with another EU project addressing the noise footprint from ships and methods to measure and mitigate the noise.	• Studies on free swimming cod in the Gullmarsfjord of the west coast of Sweden (Andersson et al., 2015) – This study investigated behaviour change when commercially important fish species, Atlantic cod, were subjected to ship noise. The study also noted that cod exposed to ship noise not always show a displacement from the area, which might lead to secondary effects. • Effects of motorboat noise on foraging behaviour in Eurasian perch and roach (Magnhagen, Johansson and Sigra, 2017) – This study, using authentic sound in a natural habitat, showed that noise exposure may affect the feeding behaviour of fish, that the response is species-specific, and that habituation and the presence of other species may modify the effects. • Offshore exposure experiments on cuttlefish (Cephalopoda) (Solé et al., 2017) – These are the first evidences of cephalopods sensitivity to anthropogenic noise sources in their natural habitat. From the measured received power spectrum of the sound sweep, it was indicated that received sound pressure and particle motion levels are associated with acoustic trauma (AQUO) in cephalopods. • Estimates of noise source spectra of ships from long term recordings in the Baltic Sea (Karasalo et al., 2017) – The procedure was applied to estimate the source strength of over 900 individual ships from more than 2,000 passages. Data was used to enhance the reliability of existing source strength models of ship noise. Considering that the awareness of the adverse effects, the behaviour and breeding patterns of fish and sea mammals have been found to be negatively affected by anthropogenic underwater radiated noise. The results could be used to more accurately direct mitigation measures.

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		• The development of a particle motion sensor (Sigray & Andersson, 2011) – This device measures the relevant component of sound wave, especially for fish that use particle motion for detection for frequencies lower than 300 Hz. • Results from a literature review and acoustic modelling exercise have recommended a framework for regulating underwater noise during pile driving activities (Andersson et al., 2016) – This work includes harmful sound pressure levels for fish and harbour porpoises, possible mitigation techniques and examples of sound propagation from a pile driving active in four different sea regions around the Swedish coast. • Vindval research programme – is a collaborative activity between the Swedish Energy Agency and the Swedish Environmental Protection Agency, which aims to develop and communicate science-based facts about the impacts of wind power on humans, nature and the environment. This has resulted in a guideline for regulating underwater noise during pile driving, which also works as guidance during the permitting process for offshore wind farms. • Management tools to predict adverse impacts – 1) a registry for impulsive noise events in the North Sea and the Baltic Sea. 2) A soundscape planning tool for continuous noise has been implemented and used for assessment and decision support for continuous low frequency noise in the Baltic Sea. This tool is a result of the project “Baltic Sea Information on the Acoustic Soundscape” (BIAS). • “Symphony” – is a cartographic tool that assesses cumulative effect of pressures on ecosystem components is nearing completion. It includes acoustic pressures and takes the temporal distribution of porpoises into account. • “Guideline level” – This concept was developed by the HELCOM Expert Network on Underwater Noise (EN-Noise)

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		and its principles have been used by the group for assessing the environmental status of some priority noise-sensitive species in the Baltic Sea. EU TG Noise has also discussed the possibility of using this to assess good environmental status according to MSFD.
Trinidad and Tobago (Environmental Management Authority)	• Certificate of Environmental Clearance (CEC) – In accordance with the CEC Order 2001, a CEC application for any activity involving the offshore surveys (geophysical, geotechnical, seismic and pipeline route) should be made under the designated exploration activity for crude oil or natural gas. The processing of the seismic survey applications has evolved to ensure that the most up-to-date best management practices are being utilized by Applicants to reduce the impact of acoustic disturbance from offshore seismic surveys on marine life. As such, sector-specific conditions have been developed based on the Joint Nature Conservation Committee (JNCC) Guidelines for seismic surveys.	
Venezuela	• Decreto No. 1.257 and Gaceta Oficial No. 35.946 – The Decree 1.257 sets standards for environmental assessment of activities that have potential to degrade the environment. The Official Gazette 35.946 requires submission of EIA report for activities that may cause damage to various components of the natural and social environment. This legal framework promotes preventing, mitigating and corrective measures that must be established for each program or project. The EIA must include all evidences that demonstrate the reversibility of the potential impact of underwater noise, validated with scientific studies.	

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	• Measures to mitigate impacts of underwater noise – Within the conditions established by the National Environmental Authority on authorization of projects that may generate underwater noise, it is required to adjust the activities to the seasonality of marine species (reproduction cycle, migration and etc.). This is in order to maintain impact observation and assessment during the operations that generate noise and avoid unnecessary impacts to fauna specimens present in the area of operation.	
Baltic Marine Environment Protection Commission, or the Helsinki Commission (HELCOM)	• 2013 HELCOM Ministerial Meeting – agreed that: - The level of ambient and the distribution of impulsive sounds in the Baltic Sea should not have negative impact on marine life; and - Human activities that are assessed to result in negative impacts on marine life should be carried out only if relevant mitigation measures are in place. Accordingly, the Ministerial Meeting agreed on specific actions which implementation is to be achieved guided by the ‘<i>Regional Baltic Underwater Noise Roadmap 2015-2017</i>’ adopted in 2016.	• Two indicators, one on continuous and one on impulsive sound, are under development to follow up anthropogenic sources of underwater noise. Current versions of the pre-core indicators are: “Continuous low frequency anthropogenic sound” and “Distribution in time and place of loud low and mid frequency anthropogenic impulsive sounds”. • There are proposals both for monitoring guidelines for continuous noise and for a regional monitoring programme of continuous noise. The programme proposal includes measurements and modelling, as well as data arrangements to compile and visualize regional monitoring data. • HELCOM is finalizing a report presenting the rationale for choosing Baltic species which have the potential to be impacted by noise together with a preliminary identification of biologically sensitive areas has been elaborated. The report has been approved by the Contracting Parties and will be published in 2017. • In 2015, a regional registry of licenced impulsive events such as pile driving, controlled explosions from naval operations and other activities that release energy was established by HELCOM and countries are reporting their national data. The registry enables the visualisation of the geographical distribution of the number of days with activities that create

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		impulsive sounds. • Soundscape maps showing the underwater noise generated by commercial vessels have been produced for the first time ever in the Baltic Sea, within the Life+ project Baltic Sea Information on the Acoustic Soundscape (BIAS project). Seasonal soundscape maps were produced for the demersal, pelagic and surface zones, and the information has been utilized in HELCOM for developing suitable indicators for underwater noise and developing a monitoring programme and guidelines (the latter ones in the approval process by the Contracting Parties). • An example of how spatial information of the noise distribution in the Baltic Sea can be overlaid with noise sensitive areas derived from biological data on noise sensitive species so far identified is included as part of the descriptive section on underwater noise included in the ‘State of the Baltic Sea report, June 2017’. There is on-going work to update this figure by June 2018. • A report compiling the internationally available reviews on underwater noise mitigation measures and country specific information has been prepared as background information (with support of the BalticBOOST project, theme 4 on underwater noise). • Effects of noise on the level of population are still very poorly understood, and good status for populations has therefore not yet been defined in relation to underwater noise. To guide further work, HELCOM is working on its input to the process of establishing environmental targets for underwater noise to serve as regional input to other fora, including other Regional Sea Conventions as well as European processes.
Convention on the Conservation of Migratory	• Resolution 12.14 on Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species – At COP-12 to CMS, this Resolution was adopted. It provides extensive	• “Technical support information to the CMS family guidelines on environmental impact assessment for marine noise-generating activities” (UNEP/CMS/COP12/Inf.11/Rev.1) – This has been developed

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Species of Wild Animals (CMS)	guidance on measures to be taken by Parties and industry, and endorses comprehensive Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities (UNEP/CMS/COP12/Inf.11/Rev.1). These Guidelines outline the information required in EIAs to allow regulatory decision-makers to assess the noise-related impacts proposed activities on CMS-listed species and their prey.	to present the Best Available Techniques (BAT) and Best Environmental Practice (BEP), and includes: - Characteristics of sound propagation and dispersal; - Information on each of the CMS species group, including species vulnerabilities, habitat considerations, impact of exposure levels and assessment criteria; - Information on decompression stress; - Summary of the current state of knowledge about general exposure levels; - Summary of marine noise-generating activities; - Related intergovernmental or regional economic organization decisions; - Principles of EIAs; and • List of CMS-listed species potentially impacted by anthropogenic marine noise.
International Whaling Commission (IWC)	• Report of the Standing Working Group (SWG) on Environmental Concerns (2016) – Item 11 on effects of anthropogenic sound was considered in a joint session with the Whale watching sub-committee. Under this item, the following was discussed: - 11.1 Review of the report from the Workshop on Acoustic Masking and Whale Population Dynamics: The Workshop agreed that there is now compelling evidence that chronic anthropogenic noise is having an effect on the marine acoustic environment in many regions and recognized emerging evidence that compromised acoustic habitat can affect some cetacean populations adversely. - 11.2 Progress on plans on workshop on stress. - 11.3 Review of ACCOBAMS and other regional, national or international work on ocean noise: An update was given on the	

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	activities by US NOAA to develop an Ocean Noise Strategy (ONS) which adopts an acoustic habitat approach to the management of underwater noise. ACCOBAMS has developed Guidelines on underwater noise with respect to best practises currently applied in Europe, including effective mitigation guidance for intense noise generating activities. - 11.4 Effectiveness of marine mammal observers as a mitigation measures: A recommendation was given that, whatever marine mammal observers (MMOs) are used as a measure for trying to mitigate risk of injury from noise sources, the expected risk reduction should be quantified. - 11.5 New sources of sound of concern for cetaceans: It was recommended that researchers should incorporate an impact aspect into any proposed unmanned aerial systems (UAS) study involving cetaceans. It was also recommended that countries without a research or commercial permitting system for UAS should develop a precautionary permitting system that considers the cumulative effects of UAS operations and other means of approach. - 11.6 Other noise concerns: It was strongly recommended that the Acoustic Masking Workshop recommendations (SC/66b/Rep10) be conveyed to the Western Gray Whale Advisory Panel (WGWAP) Noise Task Force to support a collaborative approach to noise management.	

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	• Report of the Standing Working Group (SWG) on Environmental Concerns (2017) – Item 9 considered issues related to noise: - 9.1 Update on national and international noise strategies: This section covered NOAA’s Ocean Noise Strategy Roadmap, and the development of two new acoustic standards via the Acoustical Society of America’s ANSI standards process. - 9.2 Update on intersessional cooperation with the IUCN WGWAP Noise Task Force and ocean noise recommendations. - 9.3 New international and national guidelines and advice (e.g. IMO).	
OceanCare		• A modelling comparison between received sound levels produced by a marine Vibroseis (MV) array and those from an airgun array for some typical seismic survey scenarios (Duncan, Weilgart, Leadper, Jasny, and Livermore) – This paper presents MV’s potential in providing an environmentally safer alternative to airguns without compromising effectiveness for seismic exploration. The paper recommends that MV should be field-tested for impacts on a wide range of sensitive marine taxa, something which should ideally happen in tandem with operationally testing various MV designs. As with other noise-reduction measures from seismic surveys, the development of MV could be greatly expedited with encouragement and pressure from regulatory governmental agencies.
University of Maryland		• Conference on The Effects of Noise on Aquatic Life –This Conference brings together scientists, regulators, environmentalists and industry representatives to learn about and discuss the potential effects of man-made noise on aquatic organisms. The fourth meeting in Dublin (2016) examined underwater noise from pile driving, seismic surveying, shipping and also non-anthropogenic sources such as wind. The next

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		conference is planned for July 2019 at Den Haag in Netherlands and will focus on recent research activities and their findings. • A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates (Hawkins and Popper) – This paper considers the problems of assessing the impact of noise upon fishes and invertebrates and the assessment procedures that need to be implemented to protect these animals and the marine ecosystems of which they form an integral part. The paper also suggests directions for future research and planning that, if implemented, will provide for a better scientific and regulatory basis for dealing with effects of noise on aquatic life. • Information gaps in understanding the effects of noise on fishes and invertebrates (Hawkins, Pembroke, and Popper) – This paper identifies critical information needs and data gaps on the effects of various sounds on fishes, fisheries, and invertebrates resulting from the use of sound-generating devices. It highlights the major issues and discusses the information currently available on each of the information needs and data gaps. The paper then identifies the critical questions concerning the effects of man-made sounds on aquatic life for which answers are not readily available and articulates the types of information needed to fulfill each of these drivers for information—the key information gaps.