



MSFD Advice Manual and Background document on  
Good environmental status - Descriptor 11:  
Underwater noise

A living document - Version 11 April 2011

### OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. The Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

### Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998.

Les Parties contractantes sont l'Allemagne, la Belgique, le Danemark, l'Espagne, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède, la Suisse et l'Union européenne.

Version of 15 April 2011

Prepared by the Inter correspondence Group on Marine Litter of the OSPAR Committee of the Environmental Impact of Human Activities (EIHA)

### Disclaimer

**This Advice Document is a living document and reflects the state of discussion at expert level at the time of its drafting. The document is of a non-binding nature and aims at facilitating coordination between EU Member States that are parties to the OSPAR Convention, with regard to developing indicators and targets for MSFD Descriptor 11. It does not prejudice the ongoing decision making process in Contracting Parties and their final conclusions in 2012.**

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## Advice Document on GES 11 – Underwater noise

**Descriptor 11: Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.**

Criteria and indicators from the commission decision:

### **11.1 Distribution in time and place of loud, low and mid frequency impulsive sounds**

- Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re 1µPa 2 .s) or as peak sound pressure level (in dB re 1µPa peak ) at one metre, measured over the frequency band 10 Hz to 10 kHz (11.1.1)

### **11.2 Continuous low frequency sound**

- Trends in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations and/or with the use of models if appropriate (11.2.1).

In the MSFD and in the commission decision also other forms of energy that have the potential to impact components of marine ecosystems are mentioned, such as thermal energy, electromagnetic fields and light. However, only indicators on noise have been specified. This advice will therefore concentrate on noise only.

## Common approach toward indicators and targets for GES 11

In order to assess the need for additional work on noise under OSPAR and as a first assessment of how each CP is proceeding in developing indicators, targets and a description of GES for descriptor 11 of the MSFD, a questionnaire was sent to EIHA-HODs in December 2010. The questionnaire was returned by 9 CPs (Be, De, Dk, Fr, Ire, NI, Se, Sp, Uk). No responses were received, so far, from Ice, No and Por.

It is clear from the responses to the questionnaire that different CPs are at different stages of considering this descriptor and that there are large differences between CPs. However, based on the responses a number of conclusions can be drawn.

### **Approach**

Development work on this descriptor is currently being undertaken within the EC Technical Subgroup on Noise (TSG-Noise). Initial discussions by the experts in this group indicate that a common approach to addressing this descriptor may be:

- For indicator 11.1.1: A register of information of anthropogenic activities that produce noise, using environmental impact assessment reports, permits and licenses, registers, etc.
- For indicator 11.2.1: Establishment of a network of ambient noise monitoring stations and use of appropriate modelling techniques.

### **Coordination of monitoring and measurement standards**

It will be vital to coordinate as much as possible the monitoring of ambient sound across EU member states and to adopt international measurement standards in order to ensure the comparability of data. Methodologies used to date differ vastly which results in issues in the interpretation of data and assessing GES across the OSPAR region. It is imperative to define methodologies for measuring ambient sound at the earliest opportunity and in a coordinated manner through the task groups and, if necessary, through OSPAR.

## OSPAR's task

OSPAR potentially has a role to play in addressing this descriptor, however, any work undertaken should be well coordinated with the TSG noise in order to address any gaps not currently being dealt with. The results of the questionnaire indicate that all CPs agree OSPAR should take up the following tasks:

- Facilitate the sharing of information and coordination of data and measures Address cumulative effects of different sources

## Advice on GES

The following table show the GES indicators and preliminary advice from EIHA on a preferred approach. A further advice will be elaborated at EIHA 2012.

Below the table experiences or considerations on target setting are given.

Criterion & Indicator	Parameter	Target	Monitoring	Advice/consideration
11.1.1– loud, low and mid frequency impulsive sound	Nr. of days	To be set by CPs – EC TSG will deliver a framework of options	Project - related	Advice will only be possible after the work of the EC TSG noise has been completed. This will be early 2012. EIHA 2012 will elaborate on a further advice.
11.2.1- continuous low frequency sound	Ambient noise level	(unknown)	Not yet – only in research projects	see above

## Experiences across CPs in setting targets for GES 11

There are no experiences yet in target setting for GES 11. However, there are existing targets within the IMO for noise reduction. OSPAR may look into adopting those targets.

## Detailed consideration of approaches for target setting

Target setting for this descriptor will be difficult for several reasons:

- There is no baseline
- Knowledge and understanding of the effects on the marine environment is limited, however progress is being made, e.g. thresholds have been established for various forms of damage caused by noise to marine mammals and fish. Those thresholds may be used to express risk arising from noise.

Pressure targets will be most suitable for this descriptor.

## Monitoring

For descriptor 11 the results of the EC TSG on noise will be awaited before any firm advice on monitoring can be agreed upon.

To date, monitoring in OSPAR CPs has been mainly undertaken on project to project basis. No CP has incorporated noise into any permanent monitoring programme. At a project specific level, noise is monitored in some locations in relation to:

- construction and operation of offshore wind farms
- seismic campaigns and drilling projects of the offshore industry
- construction of harbours, bridges and tunnels
- military activities
- dredging (sand/gravel dredges and dredging for navigational purposes)

The following table lists the extent to which noise monitoring activities are underway for each CP.

Indicator	Monitoring Type	Be	De	Dk	Fr	Ire	Ice	NI	No	Por	Se	Sp	UK
11.1.1	Data available in EIAs, reports, licences, registers, etc.*	X	X	X	X			X					X
11.1.2	Not available**		D		D	D					D		

\* this data is available but needs to be collected in some kind of register

\*\* only research projects or pilots

### Appropriate scales of assessment

The EC TSG noise will propose appropriate scales of assessment. The outcomes from the EC TSG on noise will be awaited before any advice on assessment scales can be made

### Research

Research programs have started in almost all CPs, addressing one or more sources and types of noise, as well as the effects of noise on the marine environment.

There should be a collation of information on the use or development of mitigation measures to reduce the 'potential harm' from noise sources introduced into the marine environment. An overview of research programmes in OSPAR CPS is provided in the background report to this document.

## Determining GES for MSFD descriptor 11 - underwater noise

Background document to the advice document on GES descriptor 11

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# 1. Background, process, aims

## 1.1 Background

According to the Marine Strategy Framework Directive (MSFD) EU Member States have to determine Good Environmental Status (GES) for their marine waters (Art. 9) and environmental targets need to be set in order to guide progress towards achieving GES (Article 10). GES has to be determined at the level of the region / sub-region (Article 3(5)).

The Marine Strategy Framework Directive also requires Member States sharing a marine region or sub-region to cooperate to ensure that the Directive's objectives are achieved and to coordinate their actions on each step of the marine strategies using the mechanisms and structures of the regional sea conventions.

Together with the review of the OSPAR Strategies, OSPAR 2010, meeting at ministerial level in Bergen, Norway, has established an efficient new working structure for the next 10 years that is fit for the purpose of facilitating the coordinated implementation of the Directive in the marine region of the North-East Atlantic and that is also ready to keep leading innovative approaches for tackling emerging issues in the marine environment.

### *EC Technical subgroup noise*

After the Decision on criteria and methodological standards on good environmental status of marine waters (2010/477EU) received the positive opinion of the Regulatory Committee in May 2010, the Marine Directors agreed to establish a technical subgroup under the Working Group on Good Environmental Status (WG GES) for further development of the descriptors noise and litter. Because of the different nature of these two issues, the technical subgroup will consist in practice of two parts – one for noise and one for litter.

The work of the technical subgroup on litter and noise will be reporting to the WG GES where all relevant actors (Member States, neighbouring countries, international organisations such as regional sea conventions and marine scientific organisations, stakeholder organisations) can provide structured feedback. This is the main forum where the outcomes of the subgroups' work are addressed for further approval in the working structure described above.

The Terms of Reference of the TSG Noise are:

1. Identify and review existing data and monitoring methods on underwater noise;
2. Develop proposals for methodological standards for registering loud impulsive sounds;
3. Develop proposals to monitor low frequency continuous sounds;
4. Assess the need to develop criteria and indicators for other forms of energy;
5. The technical subgroup provides a platform for sharing best practices on the development of what constitutes Good Environmental Status (characteristics of GES), environmental targets and associated indicators in relation to underwater;
6. Identify research needs and recommendation for future work.

The TSG Noise will provide the platform for sharing practices, but the coordination of development of what constitutes GES and targets will normally take place at the level of the WG GES and the MSCG and on OSPAR level in the ICG-MSFD.

The TSG Noise is chaired by the Netherlands and the UK. Representatives and experts from several OSPAR Contracting Parties will actively participate in this TSG.

### *OSPAR work on noise*

The OSPAR Biodiversity Committee and EIHA established in 2007-2009 an Intersessional Correspondence Group on Underwater Noise (ICG-Noise) for the preparation of the "Overview of the impacts of anthropogenic underwater sound in the marine environment" (OSPAR document 2009/441) and the "JAMP assessment of the environmental impact of underwater noise" (OSPAR document 2009/436) as feeder-reports and underlying assessments to the Quality Status Report 2010.

### *OSPAR Quality Status Report 2010*

The OSPAR Quality Status Report (QSR) 2010 recommended the following future actions (What to do next?):

- Facilitate the sharing of information and coordination of data and measures specific to the regions;
- Develop guidance on options for mitigation of noise and its effects.

Furthermore, the need was identified for:

- Further research on the propagation and effects of underwater sound on marine life, as well as behavioural and auditory studies, programmes to monitor the distribution of sound sources and the relevant marine species and anthropogenic sound budgets.
- Standardise methods for assessing the impacts of sound on marine species
- Address cumulative effects of different sources

### *Bergen statement and the revised OSPAR Biodiversity Strategy*

At the Ministerial meeting in Bergen 2010, OSPAR ministers have declared:

*“We will strengthen our efforts to combat adverse impacts on the marine environment that originate from various human activities, such as those resulting from the introduction of marine litter, non-indigenous species and of energy, including underwater noise.”*

In the revised Biodiversity strategy, one of the objectives is:

(1.2 e) endeavour to keep the introduction of energy, including underwater noise, at levels that do not adversely affect the marine environment in the OSPAR maritime area;

Furthermore, the strategy states that OSPAR will:

(4.2 I) consider, identify and implement appropriate measures for the reduction of the adverse effects of underwater noise on the marine environment.

### *How to proceed within OSPAR?*

Considering the recommendations from the QSR and political commitments in the Bergen statements and Biodiversity Strategy it appears that OSPAR should continue working on noise-related issues, however, avoid duplication of work that is already undertaken in the EC Technical Subgroup on noise.

In the Netherlands, UK and Germany research projects have been initiated (in 2009) for the development of standardised methods to characterize underwater sound. Within these research projects international coordination is planned but not yet formalised. OSPAR could assist in further adoption of these standards by OSPAR member states, in other regional conventions and outside the OSPAR area (e.g. US).

## **1.2 Process**

In order to assess the need for additional work on noise under OSPAR and as a first assessment of how each CP is proceeding in developing indicators, targets and a description of GES 11 for the MSFD, a questionnaire was sent to EIHA-HODs in December 2010.

Prior to the EIHA 2011 meeting, the questionnaire was returned by 6 Contracting Parties in time to have the results summarised before EIHA (Be, De, NI, Se, Sp, Uk). After EIHA 2011 the questionnaire was circulated again with a deadline of responding by end of March 2011. To this second round additional responses were received from Dk, Fr and Ire).

The results of this questionnaire have been be summarised in this document.

## 2. Commission Decision on criteria and methodological standards on good environmental status of marine waters

The text of the commission decision on GES descriptor 10 – Marine Litter is quoted in the box below. The commission defines four indicators that can be used to determine GES:

### **Descriptor 11: Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.**

Together with underwater noise, which is highlighted throughout Directive 2008/56/EC, other forms of energy input have the potential to impact on components of marine ecosystems, such as thermal energy, electromagnetic fields and light. Additional scientific and technical progress is still required to support the further development of criteria related to this descriptor, including in relation to impacts of introduction of energy on marine life, relevant noise and frequency levels (which may need to be adapted, where appropriate, subject to the requirement of regional cooperation). At the current stage, the main orientations for the measurement of underwater noise have been identified as a first priority in relation to assessment and monitoring, subject to further development, including in relation to mapping. Anthropogenic sounds may be of short duration (e.g. impulsive such as from seismic surveys and piling for wind farms and platforms, as well as explosions) or be long lasting (e.g. continuous such as dredging, shipping and energy installations) affecting organisms in different ways. Most commercial activities entailing high level noise levels affecting relatively broad areas are executed under regulated conditions subject to a license. This creates the opportunity for coordinating coherent requirements for measuring such loud impulsive sounds.

#### **11.1 Distribution in time and place of loud, low and mid frequency impulsive sounds**

Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re 1µPa 2 .s) or as peak sound pressure level (in dB re 1µPa peak) at one metre, measured over the frequency band 10 Hz to 10 kHz (11.1.1)

#### **11.2 Continuous low frequency sound**

Trends in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations and/or with the use of models if appropriate (11.2.1).

## 3. Process of determining GES in OSPAR Contracting Parties

The following countries responded to the questionnaire: Belgium, Denmark, France, Germany, Ireland, The Netherlands, Spain, Sweden and the UK. No responses were received, so far, from Iceland, Norway and Portugal.

### **3.1 Approach, GES and targets**

#### 1. How are you planning to address this descriptor?

**Belgium:** The information provided by various monitoring programmes is used to determine the ambient noise levels in our zone. The effect of various sound sources is still being assessed. The indicators for descriptor 11 will be used as reference values.

**Denmark:** DEPA in Denmark has planned to have meetings with the Danish operators in the autumn 2011 to collect the existing knowledge about descriptor 11 from the offshore industry

**Germany:** We plan:

- I) to monitor loud, low and mid frequency impulsive sound as well as continuous low frequency sound
- II) to undertake research to define the sound sources that exceed thresholds that are likely to entail significant impact on marine animals and to define this level in a precautionary way

- III) to measure sound levels of all kinds of anthropogenic underwater sound sources and to develop a model that allows predicting source and frequency specific sound levels and sound propagation.
- IV) to produce three-dimensional noise (propagation) maps showing the single and cumulative impact of different noise sources on a species by species basis.

At present, the data available on underwater sound are insufficient to address descriptor 11 properly. In Germany some research projects are dealing with standardisation of underwater sound measurements, development of noise propagation models, providing noise profiles of different sound sources, noise mapping and possible effects of noise on marine mammals and fish. Underwater sound measurements will be integrated in the monitoring programme of the German Federal Maritime and Hydrographic Agency (BSH) for the German EEZ and in the monitoring program of the Federal Agency for Nature Conservation for marine protected areas.

**France:** In France, descriptor 11 is split in two parts: 11a (acoustic perturbations) and 11b (other perturbations). On behalf of MEDDTL, SHOM (French Hydrographic and Oceanographic Office) is in charge of coordinating the work to define the good environmental status, conduct the initial evaluation of the anthropogenic noise pressure and to construct the first versions of the indicators (< 2012).

The scientific recommendations of the European expert working group will give the scientific background and support the definition of GES. This European expertise (aimed at specifying further the descriptor definition – which is still incomplete) will also be complemented with a national expertise group (rather aimed at the practical evaluation of the descriptor on the long term) to be set up in early 2011.

**Ireland:** By using a combination of data gathering from shipping activities, licensed activities of the oil and gas industry and other noise activities along with the development of specialised acoustic modelling tools and the deployment of a limited number of recording arrays to calibrate the modelling results.

**Iceland:** no response received

**The Netherlands:** With the relatively intense concentrations of human activities in the North Sea, and the probability that these will increase, it is important that the effects of increased levels of underwater sound are fully considered. Studies show that noise does affect marine organisms but so far there is a lack of knowledge on specific effects and possible cumulative effects which hampers understanding of dose-response relationships.

Research is needed on the propagation and effects of underwater sound on marine life, as well as behavioural and auditory studies, programmes to monitor the distribution of sound sources and the relevant marine species, and anthropogenic sound budgets. There is an urgent need to standardise methods for assessing the impacts of sound on marine species and to address the cumulative effects of different sources.

In 2009 an assessment was made of anthropogenic sound sources in the Dutch part of the North Sea, identifying the existing knowledge and revealing the gaps in knowledge (Ainslie, 2009<sup>1</sup>). In this study an inventory of all relevant natural and anthropogenic sources of sound in the water column was made. Also, in this assessment the most relevant activities were identified (see also item 4).

As a next step, research in order to assess the effects of these activities and the need for measures will continue for these activities.

**Norway:** no response received

**Portugal:** no response received

**Sweden:** Within HELCOM we are preparing a project that will use AIS data in combination with data on noise production by different type of vessels and spatial modelling to get an online, continuous assessment of sound levels. This will cover 11.2. For 11.1 A reporting system will be employed where noise levels from all relevant EIAs will be handled, according to 11.1.

<sup>1</sup> Ainslie MA, de Jong CAF, Dol HS, Blacqui re G & Marasini C, 2009. Assessment of Natural and Anthropogenic sound sources in the North Sea. Report TNO-DV 2009 C085, The Hague

**Spain:** Spain intends to address descriptor 11 through the implementation of the following activities:

- Collecting information about the current knowledge of the underwater acoustic environment in Spanish Waters (field data) with the aim of elaborating an initial assessment.
- Developing a feasibility study of the noise impact assessment proposed by descriptors.
- Determining the more potentially impacting activities and sensitive areas (where impacting activities and potentially affected populations are more likely to meet).

The Technical University of Catalonia has initiated a project to develop a Spanish acoustic map with shipping data ([www.lab.upc.es/mapa](http://www.lab.upc.es/mapa)) that could be useful for this purpose.

**The UK:** Based on the Commission Decision on GES the UK intends to consider the impacts of noise alone and not any other forms of energy on the marine environment.

The UK believes that the assessment and reporting required against this Descriptor will be most appropriate at a regional seas level (OSPAR), utilising information collected under the EIA and licensing processes (*low and mid-frequency impulsive sounds*) and through the establishment of a network of ambient noise monitoring stations and use of appropriate modelling techniques (*low frequency, continuous sounds*).

The current UK consents and licensing systems are considered to provide an appropriate framework within which many of the marine developments likely to introduce energy into the marine environment can be managed. These systems are not, however, able to manage noise inputs from shipping, one of the larger contributors to low frequency, continuous marine sound and so efforts will need to continue at an international level to address these impacts.

Continued efforts at an international level are essential and the establishment of ambient noise monitoring stations to monitor 'low frequency continuous sounds' are being looked at in order to start to address noise inputs from shipping. The UK will look to the Commission technical subgroup (TSG) on noise to provide further advice and facilitate the exchange of information with other Member States on how best to approach this Descriptor. Parallel discussions will be held within OSPAR's ICG-MSFD as appropriate.

The UK recognises that a considerable degree of uncertainty remains with respect to achieving GES for this Descriptor. There are significant gaps in our understanding of the current levels of noise in the marine environment, the actual impacts of marine noise on species and populations, and the thresholds at which noise is considered to be having a 'significant' impact on organisms. In conjunction with these evidence gaps, underwater noise is only monitored in specific cases in the UK and we do not have appropriate MSFD assessment criteria in place due to the number of uncertainties concerning how marine life perceives sound and which units of measurement are relevant.

A number of research projects have also been established within the UK that are designed to improve our understanding of noise impacts. These are described further under question 7.

## 2. Do you have a definition of Good Environmental Status in relation this this descriptor?

Most of the CPs that answered the questionnaire indicated that they do not have an (agreed) definition of GES for noise yet.

However, the Netherlands and UK provided the following preliminary definitions:

<i>GES for the introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment will be achieved when:</i>	
<b>NL:</b>	<ul style="list-style-type: none"> <li>- the occurrence (number of species, abundance and distribution) of cetaceans is not significantly limited by an increase of background noise introduced by human activities, in particular in habitats and seasons with specific functions for cetaceans (e.g. mating, nursing, foraging).</li> <li>- the migration of cetaceans and fish is not significantly disturbed by human activities, in particular activities that produce loud impulsive sounds (e.g. pile driving, seismic acquisition or use of explosives).'</li> </ul>
<b>UK:</b>	<ul style="list-style-type: none"> <li>- Continuous low frequency sound inputs are maintained at, or decreased to, levels which minimise adverse impacts on marine mammal and fish populations such as the masking of biologically significant sounds and behavioural reactions.</li> </ul> <p>Human activities potentially introducing harmful levels of noise into the marine environment are controlled to the extent that no significant harm is incurred by marine life such as marine mammal and fish populations.</p>

**Spain** further indicated that it would be desirable that this definition will be given by an international organization, such as ICES or OSPAR. This will guaranty a wide expert participation.

**Sweden** considers the suggested levels from the ICES/JRC expert group to be a good start. The levels as such are not critical but rather affecting the type of activities that needs to be reported. The frequencies are set to minimise naturally produced noise, which seems appropriate.

**Ireland** indicated that they plan to develop a definition from progress made through the Technical Sub Group Noise.

**Germany** answered that in order to define the Good Environmental Status we first have to define the thresholds beyond which sound is likely to entail significant impact on marine animals for low and mid frequency impulsive sound (indicator 11.1) as well as for continuous low frequency sound (indicator 11.2).

Germany has defined a threshold level for impulsive sound, which has to be met during construction work of offshore wind farms, which consists of dual criteria and is part of the license. A SEL of 160 dB (re 1 µPa) and a SPL of 190 dB (re 1 µPa) in 750 m distance to the sound source should not be exceeded.

The present status regarding underwater sound cannot be properly assessed, due to lack of standardised underwater measurements, validated propagation models, noise mapping and gaps in knowledge on possible effects of noise on marine life. At this point in time a definition would be mostly speculative.

### 3. How do you plan to address each indicator?

Indicator	Plan / Alternative
11.1.1	<p><b>Fr, Se, Sp, UK:</b> Collection of information of anthropogenic activities that produce noise and from research, using the following sources: environmental impact assessment reports, permits and licenses, data reports, registers, etc.</p> <p><b>Be:</b> The information provided will be used as reference values. The levels observed in our zone will be compared to the indicator. Monitoring reports will include these reference values</p> <p><b>Ir:</b> Inputs from the oil and gas industry will be compiled from seismic survey and drilling activities licensed by the Department of Communications, Energy and Natural Resources (DCENR). The size of the “areas” that is ultimately agreed on will determine the extent of data required. The combination of sound inputs and their levels (SEL and PSPL) within different “areas” or cells on any particular day in a year may be determined by modelling.</p>

	<p><b>Ni:</b> This will be based on the work of the TSG Noise. No concrete actions on monitoring have been taken at this stage.</p> <p><b>UK:</b> We recognise actual sound levels and durations above which significant impacts occur have yet to be established. Once these have been agreed, it should be possible to determine GES based on the plotting of activities at a regional level that generate noise over the agreed thresholds.</p>
11.2.1	<p><b>Be:</b> The information provided will be used as reference values. The levels observed in our zone will be compared to the indicator. Monitoring reports will include these reference values</p> <p><b>De:</b> There are no data available on continuous sound emissions and no thresholds set. Research and monitoring activities are planned, e.g. measurements of sound profiles of different vessel types in different operational status,</p> <p><b>Fr:</b> Due to the lack of data and methodological standards to measure ambient noise at mid and large scales, criterion 11.2 will be mainly addressed through ambient noise modelling based upon available data for merchant traffic. A reference level for recent years will be established. The trends will be qualitatively estimated from pressure indicators (as the evolution of the traffic at representative points (as traffic separation scheme, where the traffic is exhaustively monitored). The possibility of including field acoustical measurement by assimilation will be addressed in the future.</p> <p><b>Ir:</b> Inputs from shipping will be compiled from shipping density studies undertaken for Strategic Environmental Assessment Reports and from AIS data going forward. DCENR is currently funding a passive acoustic monitoring array in the Rockall Trough which will provide ambient noise levels for that area over a six-month timeframe. It is unclear at the moment how many observation stations will be needed to be representative but the use of acoustic modelling is seen to be critical.</p> <p><b>Ni:</b> This will be based on the work of the TSG Noise. No concrete actions on monitoring have been taken at this stage.</p> <p>The international adoption of measurement standards is one of the highest priority topics.</p> <p><b>Se:</b> By employing acoustic modelling supported by field data</p> <p><b>Sp:</b></p> <ul style="list-style-type: none"> <li>- "In situ" continuous measuring determined in the feasibility study mentioned in answer 1.</li> <li>- Elaboration of an ambient noise map mainly related to the maritime traffic.</li> </ul> <p><b>UK:</b> Meeting GES for the indicator 11.2.1 (<i>low frequency, continuous sound</i>) remains more uncertain since no robust baseline has been established above which negative effects will be seen. A scoping study is currently underway which will look at the feasibility of establishing an ambient noise monitoring network and begin to collect baseline ambient noise data. In addition to this a data mining project is underway which will determine whether historical noise recordings by parts of UK Government can be used to supplement existing data.</p> <p>Even with these activities in mind it is likely that closer engagement will be necessary by all Member States with efforts underway internationally (through the International Maritime Organisation) to tackle key noise inputs arising from shipping in order to set and consequently meet targets for this indicator.</p> <p>It will be vital to coordinate the monitoring of ambient sound across EU member states. The methodologies used so far differ vastly and this could lead to very different data / results being applied to assess GES. It is imperative to define methodologies for measuring ambient sound and this needs to be coordinated through the task groups and perhaps also OSPAR.</p>
Other forms of Energy	<p>No country has indicated to develop indicators for alternative forms of energy at this point.</p>

Alternative	<p><u>DE: Development of (further) indicator for the impacts of anthropogenic noise on biota:</u></p> <p>Current indicators 11.1 and 11.2 deal with source levels of anthropogenic noise. Establish the species-specific impact as a function of the distribution of noise over time and space. With the above mentioned steps I to IV it is possible to create a (threshold) factor which can be used as an indicator for the impact of noise. For species of concern, it is therefore necessary to develop a three-dimensional (propagation) model that takes account of the duration of noise events. The result of this modeling process would be a map with a grid of related impacts based on the Sound Exposure Level (SEL). It would be up to the member states to define which impact is acceptable. In a first approach, the suggested steps can be conducted as a computer based modeling. The benefit of this approach is the possibility of defining acceptable levels based on scientific estimates.</p>
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4. In your opinion, which human activities are the most relevant in relation to the GES for this descriptor?

**Belgium** indicated that for their zone of the North Sea pile driving related to the construction of offshore wind farms is the activity that was identified to produce the strongest underwater noise (Norro et al. 2010<sup>2</sup>).

A **Netherlands'** inventerisation concluded that shipping noise, seismic surveys, marine piling and explosive ordnance clearing contribute most in terms of free energy (Ainslie 20091).

Most mentioned sources are thus, for low and mid-frequency impulsive sounds:

- Pile driving
- Seismic surveys
- Explosive ordnance clearing

And for low frequency, continuous sounds:

- Shipping
- Operation of offshore windmill and other renewables

Other sources mentioned are:

- Sand and gravel extraction
- Military sonar
- Sonar and echo sounder of commercial shipping, fishing and of leisure boats
- Geophysical experimentations (for both scientific and industrial prospective) involving the use of very high-power airguns
- Dredging activities
- Acoustic harassment devices
- Harbour construction and operation
- Construction of bridges and tunnels
- Hydrocarbon extracting drilling

<sup>2</sup> Norro, A.; Haelters, J.; Rumes, B.; Degraer, S. (2010). Underwater noise produced by the piling activities during the construction of the Belwind offshore wind farm (Bligh Bank, Belgian marine waters), in: Degraer, S. et al. (Ed.) (2010). Offshore wind farms in the Belgian part of the North Sea: Early environmental impact assessment and spatio-temporal variability. pp. 37-52



### 3.2 Monitoring

#### 5. Is noise (or other forms of Energy) currently monitored?

##### a. Wind farms

In **Belgium, Denmark, Germany, the Netherlands and the UK** noise is measured during the planning phase, the construction phase and the operational phase of offshore wind farms. Background noise, construction noise and operation sound emissions are measured by the operating companies (licence condition) and in the framework of national ecological research projects.

##### b. Oil and Gas industry

In **Denmark and Germany** noise is registered during seismic campaigns as well as during drilling projects. A report has been produced by UK Department of Energy and Climate Change on the sound levels generated by various oil and gas exploration and production activities.

##### c. Defence

**Sweden** measures noise in harbours and in the archipelago, for defence reasons.

##### d. Studies

**Spain** has several research projects that monitor underwater noise:

- Ambient noise level (Listening to the Deep-Ocean Environment –LIDO): The Technical University of Catalonia (UPC) is coordinating an EU initiative to automatically measure noise at underwater observatories. In Vilanova i la Geltrú (Barcelona) a cabled observatory is monitoring noise in the full bandwidth.
- Ambient sound levels from low to ultrasonic frequencies, in deep and coastal waters, using drifting buoys and calibrated hydrophones: Cetacean research in the Canary Islands and Project LIFE-INDEMARES directed by Fundacion Biodiversidad
- Low frequency sound in the Mediterranean: Research project on Acoustic monitoring of fin whales in the Western Mediterranean Sea, Strait of Gibraltar and contiguous North Atlantic waters.

In the **UK** one study on low frequency continuous sounds, has been carried out around an offshore aggregate dredger

In **Ireland** a passive Beaked whale acoustic monitoring array in the Rockall Trough will provide ambient noise levels for that area over a six-month timeframe (noise and cetacean clicks).

##### e. Other

In **the Netherlands** background noise level and the noise level of dredging activities was measured in relation to the extension of the Rotterdam Harbour. In the project MV2 (extension of the Rotterdam harbour) one of the large-scale activities is dredging and discharging sand in order to reclaim land. Before action the background noise levels were measured, during action the noise levels during dredging, transit and discharge were measured in order to determine contribution of dredging to AN-levels.

In **Denmark** noise monitoring and assessments have been and are carried out in relation to bridges and tunnelling.

#### 6. Are there plans to extend your monitoring programme to include noise?

**The Netherlands** will base any extensions of their monitoring programme on the results of the TSG Noise.

**Germany** has planned the integration of underwater sound in the monitoring programme for the German EEZ, as part of the monitoring programmes by BSH and BfN. At present research is starting or ongoing on various underlying issues.

**Sweden** is working within HELCOM on a project that will use AIS data in combination with data on noise production by different type of vessels and spatial modelling to get an online, continuous assessment of sound levels.

In **Ireland** noise monitoring is proposed under the SMARTBAY programme

(<http://www.marine.ie/home/services/operational/SmartBay/>)

### 3.3 Research and methodological standards

#### 7. Do you have or are you developing methodological standards for noise?

**Belgium** uses standardised measuring and data treatment technique techniques, as provided by the scientific literature.

**Germany** has national guidelines on standards for construction and operation of offshore wind turbines. **Spain** has recently finished a national baseline document and has a project running on defining best practices for the management of underwater noise and standard measurements.

However, almost all believe standards for underwater sound measurements should be developed in European context.

Standards for underwater sound measurements are being developed in a joined European project by **Germany, the Netherlands and the UK** (TNO 2010). An international expert workshop on “Standards for Underwater Sound” to look at noise units, physical properties, units for standardisation, will be held in February 2011. This is a first step in looking at standardisation for European waters and should be beneficial for future monitoring. All respondents except Sweden and Spain indicated to be present at the workshop. First results of the standardisation are expected by the end of 2011.

The **UK** underwater sound forum have members working on and inputting to international panels on noise standards, such as the ISO BSI panel on the measurement of commercial ship noise.

#### 8. Are there initiatives for research projects on any of the proposed indicators?

Indicator	Description research
11.1.1	<p><b>De:</b></p> <p>There are research projects (including field studies) on:</p> <ul style="list-style-type: none"> <li>Several projects to map loud, low and mid frequency impulsive sounds. For the Hyprowind project, noise maps and propagation models concerning the construction noise of offshore wind turbines in the North Sea will be developed. For the noise maps and the monitoring programme, which is included in this project, indicators like 11.1 have to be defined. Cumulative effects and overlap of construction noise generated by more than one noise source will be considered for the noise maps.</li> <li>A project to map all relevant sound sources (11.1 and 11.2) in certain pilot areas both singular and cumulative. To do so, sound profiles need to be measured and software for three-dimensional mapping as well as for demonstrating species-related impacts on organisms will be developed.</li> </ul> <p><b>Fr:</b> There is one R&amp;T initiative to set up a man-made noise analysis and prediction model which can be useful for impact studies which will be necessary to determine the GES on the long term</p> <p><b>Ir:</b></p> <ol style="list-style-type: none"> <li>Data collection exercise on previously licensed activities that produced loud, low and mid frequency impulsive sounds in Irish EEZ waters. Data to be collected from reports produced (including but not exclusively EIAs, Construction Method Statements and Noise Records), licenses, leases and permissions issued (including Oil and Gas Exploration activity and Foreshore) and planning permissions granted post December 2000. Data to be expressed, where possible, in dB SEL and dB Peak, as per above Indicator 11.1.1.</li> <li>Creation of register to facilitate expressing future loud, low and mid frequency impulsive sounds (consideration to be given to expressing as number of ‘bang days’/annum which exceed 183 dB SEL or 224 dB Peak, in 30’N/S x 30’E/W grid cells within the EEZ).</li> <li>Modelling the degree to which loud, low and mid frequency impulsive sounds propagate at different frequency bands (from 10 Hz to 10 kHz); consideration to be given to the effect of the summer thermocline on such propagation; and the effects of any other local phenomena such as water column fronts, tidal mixing etc. on such</li> </ol>

	<p>propagation. Outputs to be expressed as sound exposure level and as peak sound pressure level.</p> <p><b>NL:</b> The majority of the research projects related to noise are aimed at assessing, mitigating and regulating the effects of the piling noise that is produced during construction of wind farms. A Masterplan Ecological Monitoring and Research was started in 2009. The masterplan is publicly available at <a href="http://www.noordzeeloket.nl">www.noordzeeloket.nl</a>. Research projects include above mentioned acoustic standards, characterization of sources, propagation, geographic distribution of sensitive species (marine mammals and fish larvae), and dose-response relations.</p> <p><b>Se:</b> Within HELCOM a reporting system will be employed where noise levels from all relevant EIAs will be handled, according to 11.1.</p> <p><b>SP:</b> Listen to the Deep-Ocean Environment, LIDO, European Sea-Floor Observatory Network of Excellence (ESONET), although this and any other proposal must still be subjected to a feasibility study.</p>
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11.2.1	<p><b>De:</b> At present there is starting or ongoing research work on the standardization of measurements, the development of validated propagation models, the development of species-specific noise maps to allow an assessment of the level of impact, the creation of a software to show single and cumulative noise levels in a three-dimensional way and the establishment of a long-time monitoring programme</p> <ul style="list-style-type: none"> <li>• Several projects to map continuous low frequency sound</li> <li>• A subproject on sourcing and reduction of cavitation-induced, low-frequent and broadband noise of ship propellers</li> </ul> <p><b>Ir:</b></p> <ol style="list-style-type: none"> <li>1. Feasibility study on establishing a number of ambient noise monitoring stations within Irish EEZ waters (possibly 2No. shipping channels and 1 reference station); data to be recorded within the 1/3 octave bands 63 and 125 Hz (centre frequency) as per above Indicator 11.2.1 and ideally over a 12 month period.</li> <li>2. Using known 12 month activity involving the various noise sources and the modelling results (from 11.1.1 (2) and (3) above), convolve these two and compare with measured ambient noise levels from 11.2.1 (1) above for the same time period. Consideration to be also given to shipping density studies from AIS data and propagation effects of this type of noise. Use the degree of fit between the modelled and measured noise levels to design an effective noise monitoring network of observation stations for Ireland's EEZ waters.</li> </ol> <p><b>Se:</b> Within HELCOM we are preparing a project that will use AIS data in combination with data on noise production by different type of vessels and spatial modelling to get an online, continuous assessment of sound levels.</p> <p><b>Sp:</b> Listen to the Deep-Ocean Environment, LIDO, European Sea-Floor Observatory Network of Excellence (ESONET), although this and any other proposal must still be subjected to a feasibility study.</p> <p><b>UK:</b> Defra funded project - ME5210 is being run by Cefas and is an ambient noise monitoring scoping study looking at potential sites for monitoring and developing a methodology for recording ambient sound from fixed moorings. It also includes 12 months of data collection at representative marine sites to help establish baseline conditions.</p> <p>The above research is also being mirrored in Northern Ireland (run by AFBI) on the Atlantic coast of Northern Ireland. Acoustic monitoring is being undertaken episodically on sites close to shipping lanes, renewable energy sites and where there are known cetacean occurrences. The aim of the project is to establish passive monitoring stations that will record ambient sound and allow cetacean occurrence to be assessed.</p>
Both indicators	<p><b>Fr:</b> There are initiatives for including acoustical measurements in observatories. The trend is to encourage multidisciplinary observatory initiatives to include acoustic equipment able to monitor ambient noise and more generally man-made noise.</p> <ul style="list-style-type: none"> <li>- Medon: On going project (INTERREG) - Technological demonstration of shore cable observatory in Very shallow water (Iroise sea) – continuous noise and sonar activities</li> <li>- MER CALME (Submitted ANR Partly supported by Brittany region and Defence Procurement Agency (DGA)): Research project - 6 months deployment / years with autonomous recorders - Ushant area – continuous noise and sonar activities</li> <li>- SNOCO (In Construction): National initiative for coastal operational oceanography. To examine the possibility of including noise measurements in the instrumentation panel – continuous noise</li> <li>- Project MER PROPRE (« <i>Prévention, Observation, Prévision, et Régulation de l'Environnement Sonore généré par les activités humaines en Mer</i> »)</li> </ul> <p>aiming to show the feasibility of operational noise analysis and prediction system labelled from Pole Mer Bretagne, in search for funding</p>

Other forms of Energy	<p><b>Se:</b> A substantial amount of research has been done on EM-fields in oceans.</p>
Noise and 'harm'	<p><b>Be:</b></p> <ul style="list-style-type: none"> <li>• Sensitivity of fish eggs, larvae and juveniles to underwater noise</li> <li>• (short- to medium-term) Disturbance of marine mammals by underwater noise</li> </ul> <p><b>De:</b> There are research projects (including field studies) on:</p> <ul style="list-style-type: none"> <li>• Cumulative effects of repeated impulsive underwater noise related to harbour porpoises</li> <li>• Audiograms of seals</li> <li>• The effect of sound on the behaviour of harbour porpoises and seals</li> <li>• The effect of sound on the vital rates of harbour porpoises and seals</li> </ul> <p><b>NL:</b> The Ministry of Defence funded research on the effects of sonar since the mid-90's; the research effort was intensified in 2003. Research projects include development of a risk assessment tool, distribution in time and space of marine mammals, behavioural response studies at sea, auditory studies in a controlled environment, detection, classification and localisation (DCL) of marine mammals, assessment of effectivity of mitigation (ramp-up and DCL).</p> <p><b>UK:</b> Defra funded project - ME5205 is looking specifically at elements of harm in order to help establish appropriate thresholds for impulsive sounds and is being run by a consortium consisting of Newcastle and Hull Universities, and the consultancy Subacoustech. It is a particularly novel research project which is attempting to detect biological responses to noise in species observed in wild conditions.</p> <p><b>UK:</b> Defra funded project - ME5207 is being run by Bristol University and is looking at elements of harm. It is solely a lab based study focussing on the impacts arising from noise generated by commercial shipping, wind turbines and pile-driving on the physiology, behaviour and development of individual fish and invertebrate species.</p> <p><b>UK:</b> DECC and partners (Collaborative Offshore Wind Research into the Environment, Scottish Government, Oil &amp; Gas UK) funded study on cetaceans (bottlenose dolphins in particular) in the Moray Firth has two broad aims:</p> <ul style="list-style-type: none"> <li>• to provide baseline data on the occurrence of bottlenose dolphins and other marine mammals in the central area of the inner Moray Firth, to determine whether the area was, important for bottlenose dolphins and to assess the use of the area by other cetaceans; and</li> <li>• providing the first year's data indicated that the central area was not particularly important for bottlenose dolphins, to monitor a commercial seismic survey in the area – subject to environmental impact assessment and appropriate mitigation measures – to better understand the impacts of seismic exploration on the distribution and behavioural responses of marine mammals</li> </ul> <p>DECC has contracted the University of Aberdeen to conduct the research in this area. Professor Paul Thompson, Director of the University of Aberdeen's Lighthouse Field Station, is leading the studies, which began with survey work to establish the occurrence of cetaceans in the central Moray Firth in May 2009.</p> <p>A combination of boat/aerial surveys and remote recording devices called C-PODs - which detect echolocation clicks to improve the understanding of the distribution of dolphins and porpoises are being used for the study.</p>

Other	<p><b>Sp:</b></p> <p>Point-measure calibrated full-band recordings of ambient noise in discrete locations of the Canary Islands and the Mediterranean (Project LIFE-INDEMARES and other projects by University of La Laguna and Alnitak)</p>
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### 3.3 OSPAR and noise

9. In your opinion, what role should OSPAR take, concerning noise:

And

10. In your opinion, what role should OSPAR **not** take up

**Denmark, UK** and **Spain** both mention that OSPAR should consult closely with the EC TSG Noise to decide which work could be managed by OSPAR and to avoid duplication. **Spain** also mentions that OSPAR could serve as a reference for other regions that have made less progress in this subject. Similarly, **Denmark** mentions that OSPAR could also play a role in facilitating the sharing of knowledge with other regional sea conventions.

	Be	De	Dk	Fr	lc	Ir	Nl	No	Po	Se	Sp	UK
a. Facilitate the sharing of information and coordination of data and measures specific to the regions		X	X	X		X	X			Too weak	X	X
b. Develop guidance on options for mitigation of noise and its effects	X	X	X	NOT		X	Under discussion			X	X	X*
c. Coordinating research on noise related issues	NOT	NOT	NOT	X		X	-			X	NOT	X*
d. Developing methodological standards for noise (and other forms of energy)	X	-	NOT	NOT		X	X			X (in close cooperation with HELCOM)	X	X*
e. Address cumulative effects of different sources	X	X	X	X		X	X			X	X	X*
f. None							NOT					
g. Other											**	

**UK (\*):**

- b) At present, there is no agreement on which sound sources/activities will require further mitigation (beyond the guidelines and work already in place). We recommend no further work on generic guidance until the work required to meet the needs of MSFD are agreed.
- c) Contracting Parties are already undertaking research, therefore OSPAR could provide a forum to facilitate the exchange of information on such activities and assist in joining up new research or leading on the establishment of joint calls if appropriate. AFBI and their partner institute (University of Western Australia) would be keen to interact within OSPAR to develop such a forum.
- d) OSPAR should be assisting contracting parties in working together to develop common or comparable methodological standards which can be applied across the OSPAR region as opposed to taking a prescriptive approach - NOTE THIS SHOULD ONLY BE BASED ON ANY NEEDS EMERGING FROM THE OUTCOMES OF THE TSG-NOISE.
- e) It is unclear how OSPAR would 'address' cumulative impacts at this stage. This will depend largely on the outcomes of associated research programmes and work carried out within the TSG-Noise.
- g) Contracting Parties would benefit from being able to establish comparable targets under Commission indicator 11.1 therefore OSPAR could facilitate these discussions, either through the existing ICG-MSFD or through the establishment of a new ICG-noise. Discussions could be held on Commission indicator 11.2 with the intention informing views at a broader international level e.g. for shipping noise. Again care will be needed to ensure duplication with the TSG-Noise does not occur.

**Sp: (\*\*)** Other more specific activities:

- Advise OSPAR parties to achieve minimum legal standards with respect to marine anthropogenic noise, e.g. regulating the need for environmental impact assessment of activities including sources of intense sound, such as underwater mining and hydrocarbon exploration, harbour construction, piling, underwater explosions and acoustic deterrents. Military activities could be encouraged to acquire environmental information prior to planning the location of naval manoeuvres using sonar or explosions.
- Develop an educational campaign to encourage best practices in OSPAR marine activities in relation to acoustic pollution, reaching the public and marine technology companies. E.g. marine technology developers should be informed of the benefits of reducing sound emissions for vessel propulsion efficiency and for the environment. Echosounders for small boats in shallow waters should emit high frequency pulses, out of the spectral hearing sensitivity of most marine fauna.
- Promote the inclusion of noise emissions reduction in quality and environmental industrial standards

11. In your opinion, what would be the most relevant way for OSPAR to address the tasks above (e.g. form an ICG Noise)?

**Be:** ICG Noise could be a good starting point, but perhaps more detailed discussion/working groups might be needed as more specialized questions are raised. Physical meetings are a good means for interaction, but the establishment and maintenance of a lively (www) discussion group might have a much higher accessibility and deserves our attention.

**De:** To offer a communication platform for authorities, researchers and industry on underwater sound mapping, mitigation measures and on cumulative effects. Provide guidance on any possible alternatives for activities and technique that generate less noise.

**Fr:** Task (a & c) can be easily done by maintaining an adhoc website for instance. Else, an interesting role for OSPAR could also be the support of GES related project either financial or political (maybe by creating an OSPAR label which would be recognized by participating countries. National and European institution could commit to support particularly OSPAR labelled project).

A useful action could be to recommend and coordinate the definition and use of common tools for ambient noise modelling, so that the future various national contributions are made rigorously comparable.

**Ir:** Possibly



**Se:** For 11.2 we would suggest the same approach as HELCOM (see above). For 11.1 we should stay close to the suggested methodology of the expert group.

Development of measures should be started soon(end of 2012), possibly by ICG – noise

**Sp:** Establishing an ICG-Noise is not necessary, because the Commission already has the Technical Subgroup on underwater noise and it would duplicate work.

**UK:** Given the uncertainty surrounding this Descriptor, the potential for joining up research and monitoring activities, and the need to coordinate the establishment of targets and indicators across the OSPAR region, the establishment of an ICG-Noise **may** be appropriate depending on its remit. However, its activities will need to be carefully aligned with those of the TSG-Noise recently established by the Commission in order to ensure there is no duplication of effort. It may be most appropriate to allow the EC WG on noise time to make some progress on the issue before deciding if any work is required separately.

**NL:** The international adoption of measurement standards is one of the highest priority topics. It is foreseen that a first proposal for acoustic standards available as product of the research project, mentioned above in para 7, of UK, Ger and NL will be in 2011. OSPAR could assist in further adoption of these standards by OSPAR member states, in other regional conventions and outside the OSPAR area (e.g. US).

## 12. Do you have any other remarks / questions / points of discussion on this descriptor?

**De:** The definition of the indicators 11.1 and 11.2 is ambiguous and should be reworked.

Concerning indicator 11.1:

In general, “the proportion of days and their distribution within a calendar year over areas of a determined surface” is not a dedicated parameter to quantify impulsive sounds. The SEL or SPL itself would be a better parameter.

If “the proportion of days” should be used, it should be defined which levels entail significant impact on marine animals. Additionally it should be defined what peak sound pressure level means (zero -> peak? peak -> peak?).

It is described that the measurements should be made at one metre. It is not possible to measure at one metre because of the near field effects. If it should be back calculated to a distance of 1 metre, it should be addressed in that way.

Concerning indicator 11.2 the definition of trend must be made more precise. To make measurements comparable it is essential to define at which depth (relatively to the sea bottom or surface) the hydro-phones should be installed.

The continuous sound should be also measured for mid frequency sound.

**Fr:** The level of achievement in the definition of this descriptor is not fully satisfactory yet, and its “blind” application is obviously premature. There is still work to refine and precise the indicators and the methodology to construct and follow them: spatial and time resolution, vertical integration of ambient noise measurement or model outputs, specify what are the “significant levels” and according to which criteria, etc.

**Se:** Leisure boating is likely to have major impacts on coastal ecosystems in some areas. It may seem to be a local national problem but economic/ legislative steering is likely to be needed on an EU- level to implement measures and therefore it should be addressed regionally/EU-level.

**UK:** Further consideration needs to be given to the actual operation of renewables since this presents a 24/7 sound source. Noise arising from the development phase can be managed through licensing and mitigation measures i.e. time restrictions on piling activities. However, the operation of marine renewables may cause future challenges which need to be considered in more detail at the earliest opportunity.

Also of use would be a consideration of how the establishment of different types and levels of noise would limit activities of great socio-economic and climate change benefit.

## 4. Conclusions

It becomes clear from the questionnaire that different CPs are in different phases of looking at this descriptor and that there are large differences between CPs. However, based on the questionnaire a few conclusions can be drawn.

### **Approach**

Though there are many different approaches to the subject a common approach may be,

For indicator 11.1.1: A register of information of anthropogenic activities that produce noise, using environmental impact assessment reports, permits and licenses, registers, etc.

For indicator 11.2.1: Establishment of a network of ambient noise monitoring stations and use of appropriate modelling techniques

Outcomes of the EC Technical Subgroup on Noise will be leading.

### **Current monitoring**

There are no monitoring programmes on noise only. All monitoring of noise occurs in relation to activities, such as the construction and operation of wind farms and offshore platforms, military sonar use, defence or harbour extensions, or in relation to studies.

It will be vital to coordinate the monitoring of ambient sound across EU member states and to adopt international measurement standards. The methodologies used so far differ vastly and this could lead to very different data / results being applied to assess GES. It is imperative to define methodologies for measuring ambient sound and this needs to be coordinated through the task groups and perhaps also OSPAR.

### **Research**

A lot of research is going on, on technical aspects as well as on the 'harm' noise inflicts on marine life.

### **OSPAR's task**

OSPAR has a role to play on this issue, however, this should be well coordinated with the TSG noise. All CPs agree that OSPAR should take up the following tasks:

- Facilitate the sharing of information and coordination of data and measures specific to the regions
- Address cumulative effects of different sources.



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