

**European Marine Strategy  
Framework Directive**

**Progress Report on Monitoring of  
Underwater Noise**

**TG Noise**

**MSFD Technical Group on Underwater Noise**

**November 2014**



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# 1. Executive summary

This document has been prepared by the Technical Group on Underwater Noise and other forms of Energy (TG Noise).

There have been a series of expert groups on Descriptor 11 of MSFD with overlapping membership. The current group (since start 2014) is the Technical Group on Underwater Noise (**TG Noise**). It reports directly to the EU's Marine Strategy Coordination Group. Its predecessor was the Technical Sub-group on Underwater Noise (**TSG Noise**) that reported to the EU's Working Group on Good Environmental Status (WG-GES) from 2010-2013. Prior to that a Technical Group on Descriptor 11 (**TG11**) met between 2008 and 2010 to help define the European Commission's decision on Descriptor 11.

In 2012, TSG Noise provided initial guidance that clarified the purpose, use and limitation of the indicators; and a description of methodology that was unambiguous, effective, and practicable. In 2013 TG Noise produced the Monitoring Guidance for Underwater Noise in European Seas, which was published via the JRC in 2014. This guidance provided EU Member States with the information needed to set up monitoring in their marine waters, as required in the MSFD.

In this progress report, information is provided on the progress of monitoring among Member States, in addition to the identification of the main issues that need to be solved to implement monitoring, and the suggested way forward with monitoring of underwater noise. Chapter 6 provides a list of recommendations related to the implementation of monitoring, standardization, review of the Commission Decision and on a possible roadmap towards describing GES. TG Noise asks that these recommendations be endorsed so that progress is made that would allow further consideration of target setting in the next MSFD cycle.

## **Disclaimer:**

*This document should be regarded as presenting an informal consensus position on best practice agreed by members of TG Noise. However, the document does not necessarily represent the official, formal position of any institute or organisation of the members. Hence, the views expressed in the document do not necessarily represent the views of the European Commission or of European Member States.*

## 2. Status of implementation of D11

### Background, main concerns and knowledge development

Since the end of the 20<sup>th</sup> century, concerns over the environmental effects of underwater noise have raised public and political awareness; this initial concern originated mainly from a number of military-sonar related strandings, and concerns that loud sounds would lead to physiological damage and would affect the hearing of marine animals. Underwater noise (and other inputs of energy) was included as D11 in the MSFD in 2008.

Knowledge of underwater sound<sup>1</sup> and the sources of underwater sound has evolved substantially over the last decades. The main concerns, described in 2010 TG11 report and repeated in the 2012 TSG Noise report, are around the impulsive noise from a number of loud sound sources such as marine piling (e.g. for the construction of offshore wind farms), seismic surveys (for the exploration of oil and gas resources), military sonar and underwater explosions; and the elevation of the background (or ambient) noise level, mainly by commercial shipping and impulsive sources at long ranges. A number of effects of underwater sound are known, ranging from physiological damage/death to subtle responses. Direct physiological damage and death are likely to be rare events and at present the more subtle responses (such as masking, behavioural change) are considered to be the most likely to have effects at the ecosystem/population scale; these effects may happen at low exposure level and consequently relatively large areas and therefore larger proportions of populations may be affected.

Although there are some properties of underwater sound that are unique in comparison to other pollutants, e.g. the rapid long range propagation in deep water (up to thousands of kilometres), underwater sound (or noise) can be viewed as a normal contaminant, but with many unknowns, making the assessment at this time (certainly at a large scale) difficult. In principle there is nothing exotic about underwater noise as a pollutant that would prevent a (mainly) quantitative approach to assessment.

Following the work of TG11, in the 2010 Commission Decision identified measurement of underwater noise as priority and defined two indicators, which address the two above-mentioned main concerns (masking and behavioural change):

- short duration: loud low and mid-frequency impulsive noise (as caused by seismic surveys, marine piling, sonars, explosions); and
- long lasting: low frequency continuous noise (mainly caused by commercial shipping and impulse sources at long range in some regions).

At the time of the Commission Decision, there was no existing noise monitoring in European waters (or elsewhere globally, e.g. the United States) and it was clear that further clarification and guidance was needed- to provide this guidance the expert group TSG Noise was formed by the MD (now TG Noise). In 2012, TG Noise provided initial guidance that clarified the purpose, use and limitation of the indicators; and gave a description of methodology that was unambiguous, effective, and practicable. In 2013 TG Noise produced the Monitoring Guidance for Underwater Noise in European Seas, which was published via the JRC in 2014. This guidance provided EU Member States with the information needed to establish monitoring schemes, co-operating with neighbouring Member States, in their marine waters, as required by MSFD.

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<sup>1</sup> The term “noise” is used to mean sound that has the potential to cause negative impacts on marine life; the term “sound” is used to refer to the acoustic energy, with no particular reference to function or potential effect. The term “noise” is only used where adverse effects are specifically described, or when referring to specific technical distinctions such as “masking noise” and “ambient noise.”

(See also the first report of TSG Noise, 2012)

Both indicators are pressure indicators; these may be used to describe “State” or “Status” if a clear understanding of the relationship between pressure, state and impact exists<sup>2</sup>. For impulsive noise, it is clear that there has been substantial development of knowledge of the effects. For some low and mid-frequency impulsive sounds, dose/response relations have been estimated, and therefore numbers of animals likely to be affected have been quantified to some extent; to quantify the consequences for populations is more difficult and to some extent unknown, but progress is made, based on ‘standard’ risk assessment-methods. For ambient noise, such quantitative dose/response relationships are generally not available. Establishing such relationships has also proved challenging and hence progress has been slow.

## Status of implementation of D11 results of the questionnaire

In cooperation with the European Commission, a questionnaire was developed to assess the usability of the TG Noise Monitoring Guidance for Member States and to identify common problems preventing effective monitoring of underwater noise. The results should help to identify whether the Commission and/or Marine Directors should initiate further actions to assist Member States with the development and implementation of underwater noise monitoring and registration. The questionnaire was sent to MS by the Commission, and TG Noise has analysed the results and responses received. This forms part of the advice provided by the TG Noise towards the implementation of monitoring.

The following status of monitoring implementation and TG Noise advice is based on the assessment of the answers provided by 15 Member States (MS).

### D11.1 - Impulsive Noise register

At present there are no operational noise registers either on a regional or sub-regional scale. However most MS have indicated that they are planning to implement such a register. Not all MS have interpreted the intention of the register for indicator 11.1 in the same way; and some MS are aiming to undertake measurements or collect new information.

At present, TG Noise does not foresee a need to undertake measurements of impulsive noise sources when fulfilling the need to establish a noise register under MSFD- the data to be incorporated into a Noise Register is expected to be available from regulatory bodies who regulate activities under existing National and European legislation.

In some MS the implementation of the noise register implies that an explicit obligation will need to be introduced for companies to make available the necessary data; sometimes concerns are raised that information cannot be provided because of commercial or security issues.

However, TG Noise is convinced that the level of information needed for an assessment whether GES is reached is not at the level that commercially sensitive or information needs to be made public.

For impulsive noise, the most relevant effects and knowledge needs have been identified, the knowledge base needed for management/policy is growing, and there may be sufficient progress for the new MSFD cycle. A regional assessment (2017) and further target setting (2018) in relation to amounts and distribution of underwater noise could be achievable in some regions, provided that noise registers (at a regional scale) are actually established and implemented.

TG Noise acknowledges that guidance on future use of the registers might be needed and will be available to provide additional support.

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<sup>2</sup> See e.g. the WG GES 2011 Common Understanding document.

## D11.2 – Ambient noise monitoring

Most MS have indicated the intention to set up monitoring; a few have started measurements, and some others have reported to have done pilot/experimental measurements; no MS has implemented full monitoring, including measurements and monitoring, as advised by TG Noise. Apart from the BIAS project (that has a limited duration), no regional measurements or monitoring has started, although there is an initiative (within OSPAR) to draft a proposal for a coordinated ambient noise monitoring programme for OSPAR regions, based on the advice of TG Noise, starting with a proposal for a coordinated ambient noise monitoring programme for the North Sea.

TG Noise membership includes several leading members of the BIAS project and it is intended that TG Noise will assess the results of MS/Regional initiatives that have actually started measurements with the aim of providing additional guidance to help MS overcome practical problems.

Although none of the MS reported a lack of funding, most MS have not decided on the actual funding scheme to use for the implementation of monitoring. Funding options explored are at both national and European level. The European Maritime and Fisheries Fund (EMFF) has been mentioned several times as a potential funding possibility. Interregional cooperation (e.g. INTERREG Europe) is also seen as a potential way forward to collaborate and work across regions and or within sub-regional sea.

There is almost no data available on baseline or historic ambient noise levels in EU waters. The monitoring schemes will in effect set the baseline, so this information is urgently needed. It will take many years to establish trends and TG Noise advises that for ambient noise, it will not be possible to make any quantitative contribution to the 2017 Intermediate Assessment with regard to trends.

TG Noise therefore recommends that priority must be given to starting monitoring of ambient noise. TG Noise is aware of potential cost of undertaking monitoring, particularly at the programme start up, in the very large marine areas of some Member States. TG Noise is available to provide support and facilitate access to relevant information (e.g. lessons learned from BIAS project; and the OSPAR ICG Noise, that will also specifically address the potential cost of monitoring).

## Proposed priorities

In the questionnaire, MS report that methodology proposed in the TG Noise Monitoring Guidance is adequate and that they all intend to set up registers, measurements and monitoring programmes using this guidance. Most MS report that they are active in setting up monitoring underwater noise, but at present there are no (regional/sub-regional) structured monitoring programmes.

Given this, and noting that the indicators described in the Commission Decision address the main identified concerns, TG Noise recommends that starting monitoring the existing indicators should be the highest priority for Member States. Consideration of introduction of additional indicators and associated monitoring requirements should not detract from effective assessment using the existing indicators.

Once monitoring has started, MS could start further development of possible future measures for the management of underwater noise. For this purpose, regulation frameworks need to be developed. This could possibly be done on a regional basis, possibly using Regional Action Plans.

### 3. Way ahead towards an international standard for monitoring underwater noise

#### Background

The TG Noise 2014 Monitoring Guidance identified the urgent need for an international underwater noise monitoring standard. This was further discussed in the October 2014 TG Noise meeting; TG Noise concluded that an underwater noise monitoring standard must comprise a measurement standard, a modelling standard and a procedure for combining these for noise monitoring.

TG Noise proposes that this objective should be pursued in the medium term by development of an international standard, and in the short term by development of interim guidance. These standards and guidance need to be based on an agreed terminology.

#### TG Noise recommendations on monitoring

##### Recommendation 1: Development of standards within ISO

TG Noise advises Member States (MS) to work together within the framework of the International Organization for Standardization (ISO) with the objective of developing an International Standard for underwater noise monitoring by 2021 at the latest.

TG Noise also notes that a harmonised international standard for sound metrics and terminology will be needed to complete this process, and that a harmonised approach between ISO and the International Electrotechnical Commission (IEC) is required. The development of an internationally agreed terminology for underwater acoustics is well underway. The working group Underwater Acoustical Terminology (TC 43/SC 3/WG 2, hereafter abbreviated 'WG2') of ISO was created in October 2012 with the purpose of developing an International Standard in three years. A Committee Draft (ISO/CD 18405) was approved by ISO ballot in January 2014. A Draft International Standard is planned for completion in October 2014, and is on target for the publication of a full International Standard in 2015 (ISO 18405). TG Noise recommends that ISO 18405 be used as a suitable starting point for this harmonised terminology.

TG Noise notes that the development of an international underwater noise monitoring standard within ISO is expected to take up to 6 years, assuming a starting point of October 2015.

##### Standardisation timeline within ISO for 2015-2021

- 2015: finalise ISO 18405:2015 Underwater Acoustics - Terminology
- 2015: start development of joint ISO/IEC terminology standard
- 2015: start development of measurement standard (best done jointly by ISO/IEC)
- 2016: start development of modelling standard (ISO)
- 2017: start development of monitoring standard (ISO)
- 2017: start review of ISO 18405
- 2018: publication of joint ISO/IEC terminology standard (in ISQ)
- 2019: finalise modelling standard (ISO)
- 2020: finalise measurement standard
- 2020: finalise ISO standard 18405:2020
- 2021: finalise monitoring standard (ISO)

TG Noise proposes that a New Work Item Proposal (NWIP) be prepared and submitted to ISO for establishing an ISO Working Group (WG) within ISO TC43 SC3 by October 2015. Members of TG Noise from Croatia, Germany, Netherlands, Sweden, and UK expressed an interest in participating in the development of an international underwater noise monitoring standard within ISO; but at this stage, there is no member of TG Noise that has indicated that he/she is able to convene the group.

TG Noise recognises that an NWIP requires a named individual as proposer of the work, and this individual will be expected to lead the work (and act as convenor of the WG). This is recognised by TG Noise as a critical step in the process. TG Noise proposes that MS consider whether they would be willing and able to nominate someone to lead the work as a matter of urgency.

#### Proposed timeline for establishment of Working Group in 2015

TG Noise proposes the following timeline towards the creation of an ISO Working Group within ISO TC43 SC3 by October 2015:

- March 2015: Decision on leader of NWIP (and likely Convenor of WG)
- April 2015: New Work Item Proposal to ISO (TC43 SC3)
- June 2015: Meeting of ISO TC43 SC3 (Seattle, US); confirmation of decision to establish a new Working Group (WG)
- October 2015: Creation of a Working Group within ISO.

## **Recommendation 2: Development of interim guidance procedures**

TG Noise notes that Member States (MS) are required to monitor underwater noise from 2014, and therefore an interim solution is needed until completion of the ISO work (2021). TG Noise advises MS to work with their neighbours to develop regional/sub-regional underwater noise monitoring procedures for this purpose.

TG Noise notes that the BIAS project (funded under LIFE+) has developed an underwater noise measurement procedure for the Baltic Sea [1], which is based on the TG Noise Monitoring Guidance. TG Noise recommends MS:

- to adopt this BIAS procedure as a starting point for the development of regional procedures;
- to adopt the terminology of ISO 18405 for the procedures.

The German representative in the October 2014 TG meeting announced the intention to organise an international workshop about standardisation, to be held in Germany. The timing of the meeting is under discussion, a two-day period in April 2015 now seems the most likely. TG Noise proposes that this activity should be part of their work programme in 2015.

#### References

- [1] “BIAS standards for noise measurements”, Verfuß, U.K., Andersson, M., Folegot, T., Laanearu, J., Matuschek, R., Pajala, J., Sigra, P., Tegowski, J., Tougaard, J. LIFE-project BIAS LIFE/ENV/SE/841, 2014.

## **4. Review of the Commission Decision**

### **General approach**

As part of the 6-year cycle of the implementation of MSFD, the European Commission reviews the GES Decision 2010/477/EU and MSFD Annex III. TG Noise was asked, working under the aegis of ICES, to provide a draft technical review of the decision in relation to Descriptor 11. A template was provided by contractors working for the European Commission. A first draft revision was drawn up using the template and the results of earlier work by TG Noise (and its predecessors). TG Noise had identified a number of technical (wording) issues with the relevant part of Decision 2010/477/EU (and its translations into other EU languages). The first draft revision was passed to all members of TG Noise for comment. As far as possible these comments were responded to and a second version was subsequently issued. Once this version had been checked, it was passed to ICES for onwards transmission to WG-GES. TG Noise stands ready to respond to comments from WG-GES and others.

### **Assessment of the need for additional indicators**

One issue that was addressed was the need for indicators of further pressures from the introduction of energy into the marine environment. Further indicators (electromagnetic fields, heat release, light from offshore structures and high frequency impulsive noise) had been considered by the original Task Group (TG11) that supplied guidance ahead of Decision 2010/477/EU, and, with exception of high frequency impulsive noise, these were rejected. In order to codify the decisions of that original Task Group and to aid consideration of other possible criteria and indicators a document was drafted that provided reasoning as to whether or not an issue was of sufficient relevance and importance to suggest that a further pressure indicator was needed. This document was agreed by TG Noise, but it needs further consideration before being used as there may be implications for other aspects of the implementation of MSFD. For this purpose, this document was presented to the Working Group on Good Environmental Status (WG GES). TG Noise received some comments on the document and has produced an improved version, which, together with an example of its possible application, is provided as annex 2 of this report.

TG Noise recommends that this document is discussed at the 'Cross cutting issues' meeting that is planned for January 2015, in Copenhagen, to ensure consistency with the approach of the expert groups that provide advice on the other indicators.

## 5. Review of ENV.D.2/FRA/2012/0025: Impacts of noise and use of propagation models to predict the recipient side of noise

### Description of the work

The European Commission, DG Environment, commissioned a contract to CEFAS, NPL and TNO to further provide necessary information on future knowledge needs to implement monitoring and setting targets for underwater noise. This project, ENV.D.2/FRA/2012/0025: 'Impacts of noise and use of propagation models to predict the recipient side of noise', started in 2013 and was finished in October 2014.

The main contents of this project were:

1. To compile existing information on impacts on individuals, populations and ecosystems (literature & legislation)
2. To organize a workshop to: *Propose methodologies and guidelines on how to evaluate impacts of noise on marine biota*
3. To propose a roadmap towards defining sound limits for GES
4. To compile existing information on underwater sound propagation models
5. To review the usability of sound maps for monitoring GES
6. To share the results of the final report

### TG Noise assessment/recommendations

TG Noise, as described in their work programme for 2014, has worked with the consortium (e.g. TG Noise members participated in the April 2014 workshop in Brussels). The reports of the consortium have been made available to TG Noise and the TG Noise makes the following main recommendations based on the proposed roadmap and other reports:

#### **ROADMAP:**

Proposed action 1: Define terminology/metrics/measures/basic intermediate time analysis to measure ambient sound (2015-2016).

TG Noise confirms that this is a priority issue, and has provided further recommendations in this report. TG Noise recommends that EU MS and EC further support this work.

Proposed action 2: Design scientific studies to address knowledge gaps and research priorities on crustaceans, fish and marine mammals (2015-2018)

TG Noise confirms that this is a priority issue and that this overview of knowledge gaps can be used to plan further knowledge development. TG Noise recommends that information is shared with other initiatives, so that maximum use is made of existing structures- e.g. the OSPAR Science Needs Agenda, that could be further updated with this information, noting that the OSPAR Science Needs Agenda also provides a rationale for prioritization; and the JPI Oceans Secretariat, to investigate whether a pilot action under JPI Oceans is an option. TG Noise recommends that EU MS and EC further support knowledge development, noting that cooperation with specific other parties outside the EU would add value. These include the US government (NOAA and ONR) and the International Association of Oil & Gas producers (OGP).

Proposed action 3. Develop suitable common sensor technology to monitor ambient sound at the relevant frequencies for deployment across member states (2015-2018)

TG Noise has discussed this, and confirms that development of cost-effective MSFD targeted sensors is still at an early stage, and that it is not likely that these systems will become commercially available at the short term. TG Noise recommends that further development of

sensors/methodology is supported, noting that this may be partially addressed in the recent Horizon 2020 Call for Proposals (H2020-BG-2014-2/BG9- Acoustic and imaging technologies).

Proposed action 4. Develop a method to address the problem of defining GES for underwater sound, including setting thresholds, targets and refining descriptors (2017-2018)

TG Noise has discussed this, and suggests that for this topic it should be possible to go into more depth about possible assessment frameworks and/or management frameworks. TG Noise has included this in its draft work programme for 2015, noting that it is not a task that TG Noise can carry out on its own and this can only be done in cooperation with or supported by other initiatives.

**REPORTS:**

NPL/OASIS/TNO: Review of underwater acoustic propagation models:

TNO/OASIS/NPL: Use of Sound Maps for monitoring GES: Examples and way ahead

TG Noise confirms that these both are clear and informative reports that are written in such a way that they provide added value to those that are responsible for e.g. underwater sound monitoring, but who are not qualified acousticians. These reports help understand the essence of acoustic modelling including sound maps, and gives relevant insight in restrictions and suitability.

TG Noise recommends that both reports should be made freely available as soon as possible, so that these can be used by MS and other initiatives that are active at this moment, e.g. the OSPAR ICG Noise.

## 6. Overview of TG Noise Recommendations

Here we provide an overview of all recommendations, per subject:

### Recommendations on implementation of monitoring

MS have reported that methodology proposed in the TG Noise Monitoring Guidance is adequate and that they all intend to set up registers, measurements and monitoring programmes using this guidance. Most MS report that they are active in setting up monitoring underwater noise, but at present there are no (regional/sub-regional) structured monitoring programmes.

Given this, and noting that the indicators described in the Commission Decision address the main identified concerns, TG Noise recommends that starting monitoring the existing indicators should be the highest priority for Member States. Consideration of introduction of additional indicators and associated monitoring requirements should not detract from effective assessment using the existing indicators.

Once monitoring has started, MS could start further development of possible future measures for the management of underwater noise. For this purpose, regulation frameworks need to be developed. This could be done on a regional basis, possibly using Regional Action Plans.

### Recommendations on standardization

#### Recommendation 1: Development of standards within ISO

TG Noise advises Member States (MS) to work together within the framework of the International Organization for Standardization (ISO) with the objective of developing an International Standard for underwater noise monitoring by 2021 at the latest. Members of TG Noise from Croatia, Germany, Netherlands, Sweden, and UK expressed an interest in participating in the development of an international underwater noise monitoring standard within ISO; but at this stage, there is no member of TG Noise that has indicated that he/she is able to convene the group.

TG Noise recognises that an NWIP requires a named individual as proposer of the work, and this individual will be expected to lead the work (and act as convenor of the WG). This is recognised by TG Noise as a critical step in the process. TG Noise proposes that MS consider whether they would be willing and able to nominate someone to lead the work as a matter of urgency.

#### Recommendation 2: Development of interim guidance procedures

TG Noise notes that the development of an international underwater noise monitoring standard within ISO is expected to take up to 6 years, assuming a starting point of October 2015.

Interim standards are needed, therefore TG Noise recommends that Member States (MS) adopt the underwater noise measurement procedure developed by the BIAS project for the Baltic Sea, based on the TG Noise Monitoring Guidance, as a starting point for the development of regional monitoring programmes.

A Draft International Standard is planned for completion in October 2014, and is on target for the publication of a full International Standard in 2015 (ISO 18405).

TG Noise recommends that Member States adopt the terminology of ISO 18405 for the current development of regional monitoring programmes.

Germany is planning an international workshop on standardisation, to be held in April 2015 in Germany. TG Noise proposes that this activity should be part of their work programme in 2015.

## Recommendations on review of the Commission Decision

### Assessment of the need for additional indicators

TG Noise has provided a document that provided reasoning as to whether or not an issue was of sufficient relevance and importance to suggest that a further pressure indicator was needed. This document was presented to the Working Group on Good Environmental Status (WG GES). TG Noise received some comments on the document and has produced an improved version, which, together with an example of its possible application, is provided as annex 2 of this report.

TG Noise recommends that this document is discussed at the 'Cross cutting issues' meeting that is planned for January 2015, in Copenhagen, to ensure consistency with the approach of the expert groups that provide advice on the other indicators.

## Recommendations on the roadmap towards GES and noise mapping

### **ROADMAP:**

Proposed action 1: Define terminology/metrics/measures/basic intermediate time analysis to measure ambient sound (2015-2016).

TG Noise confirms that this is a priority issue, and has provided further recommendations in this report. TG Noise recommends that EU MS and EC further support this work.

Proposed action 2: Design scientific studies to address knowledge gaps and research priorities on crustaceans, fish and marine mammals (2015-2018)

TG Noise confirms that this is a priority issue and that this overview of knowledge gaps can be used to plan further knowledge development. TG Noise recommends that information is also shared with other relevant initiatives.

Proposed action 3. Develop suitable common sensor technology to monitor ambient sound at the relevant frequencies for deployment across member states (2015-2018)

TG Noise recommends that further development of sensors/methodology is supported, noting that this may be partially addressed in the recent Horizon 2020 Call for Proposals (H2020-BG-2014-2/BG9- Acoustic and imaging technologies).

Proposed action 4. Develop a method to address the problem of defining GES for underwater sound, including setting thresholds, targets and refining descriptors (2017-2018)

TG Noise has included this in its draft work programme for 2015, noting that it is not a task that TG Noise can carry out on its own and this can only be done in cooperation with or supported by other initiatives.

### **REPORTS:**

NPL/OASIS/TNO: Review of underwater acoustic propagation models:

TNO/OASIS/NPL: Use of Sound Maps for monitoring GES: Examples and way ahead

TG Noise recommends that both reports should be made freely available as soon as possible, so that these can be used by MS and other initiatives that are active at this moment, e.g. the OSPAR ICG Noise.

## ANNEXES

# Annex 1 ISO New Work Item Proposal



<b>6.1.1.1 NEW WORK ITEM PROPOSAL</b>	
Date of presentation	Reference number (to be given by the Secretariat)
Proposer	<b>ISO/TC 43 / SC 3 N</b>
Secretariat	

A proposal for a new work item within the scope of an existing committee shall be submitted to the secretariat of that committee with a copy to the Central Secretariat and, in the case of a subcommittee, a copy to the secretariat of the parent technical committee. Proposals not within the scope of an existing committee shall be submitted to the secretariat of the ISO Technical Management Board.

The proposer of a new work item may be a member body of ISO, the secretariat itself, another technical committee or subcommittee, or organization in liaison, the Technical Management Board or one of the advisory groups, or the Secretary-General.

The proposal will be circulated to the P-members of the technical committee or subcommittee for voting, and to the O-members for information.

See overleaf for guidance on when to use this form.

**IMPORTANT NOTE: Proposals without adequate justification risk rejection or referral to originator.** Guidelines for proposing and justifying a new work item are given overleaf.

**Proposal** (to be completed by the proposer)

<p><b>Title of proposal</b> (in the case of an amendment, revision or a new part of an existing document, show the reference number and current title)</p> <p>English title      Underwater acoustics - monitoring of underwater noise</p> <p>French title (if available)</p>
<p><b>Scope of proposed project</b></p> <p>Standardize modelling and measurement of underwater sound for purpose of noise monitoring</p>
<p><b>Concerns known patented items</b> (see ISO/IEC Directives Part 1 for important guidance)</p> <p><input type="checkbox"/> Yes      <input checked="" type="checkbox"/> No      If "Yes", provide full information as annex</p>
<p><b>Envisaged publication type</b> (indicate one of the following, if possible)</p> <p><input checked="" type="checkbox"/> International Standard    <input type="checkbox"/> Technical Specification    <input type="checkbox"/> Publicly Available Specification    <input type="checkbox"/> Technical Report</p>

**Purpose and justification** (attach a separate page as annex, if necessary)

Worldwide there is an increasing awareness and concern for possible effects of underwater sound on marine life. This concern is sometimes reflected by the use of the term "noise" to describe the sound.

In the EU, the Marine Strategy Framework Directive requires Member States to achieve or maintain Good Environmental Status (GES) by the year 2020. GES has 11 Descriptors, of which one, Descriptor 11, (Introduction of energy (including underwater noise) does not adversely affect the ecosystem) relates to underwater noise. As a result of a European Commission Decision in 2010, MS must monitor trends in 'Continuous low frequency sound' and they must do so at a regional level, requiring international collaboration and standardisation of monitoring methods.

The U.S. National Oceanic and Atmospheric Administration (NOAA) has begun developing a forward looking Ocean Noise Strategy to provide long term direction to NOAA's management of Ocean Noise. A framework for ocean noise monitoring is being developed in U.S. waters in which methods and techniques will be outlined for characterizing and monitoring marine soundscapes. Developing international standards for the measurement of underwater ambient noise would be of mutual benefit for both EU Member States and NOAA.

Australia has developed an Integrated Marine Observing System (IMOS), with three moored acoustic observatories. These observatories can be moved, and are currently placed on the east coast, north of Sydney, on the south coast, near Victoria, and on the south west coast, close to Perth. IMOS is funded via the Australian federal government. Its purpose is to understand background noise (noise in absence of identifiable sources) and then deal with identifiable sources separately. The observatories are calibrated and programmed to operate in such a manner to make the output from any one of the three observatories comparable that of the other two. The Australian monitoring requirement is for a movable system because the area to be covered is large. If a requirement arises for long term monitoring, this would be probably still be moored and left for however long was considered necessary.

A standard for monitoring underwater noise is envisaged to comprise three parts as follows.

**Part 1. Measurement of underwater sound for noise monitoring**

Monitoring requires some measurements of underwater sound. Two purposes are envisaged for measurements: to provide ground truth acoustical measurements for model validation or calibration; and to provide supporting data such as source level and environment characterisation.

Considerations will be made on spatial, temporal and spectral sampling protocol, equipment calibration and data processing.

**Part 2. Modelling of underwater sound for noise monitoring**

A fine spatial grid is prohibitively expensive if attempted by measurement alone. Interpolation between a coarse grid of measurements can be achieved using computer models of sound propagation. Modelling is therefore seen as an integral part of any monitoring standard, in a manner akin to a weather "nowcast". Modelling can also be used for extrapolation in both space and time (forecast or hindcast).

Considerations will be made on choice of sound sources (natural as well as anthropogenic), characterisation of those sources, selection of sound propagation model, choice of temporal, spatial and spectral averaging protocol.

**Part 3. Monitoring of underwater noise by combining model predictions with measurements**

Given measured and modelled data after application of Parts 1 and 2, there remains the question of how to combine these data into a single coherent whole. see Leiden workshop report (Anon. 2014).

A note on terminology: The terminology that will be needed for all three parts is partly addressed by ISO 18405 (under development by ISO/TC43/SC3/WG2, presently at CD stage and on track for publication in 2015). In any new standard, some new terminology will also be needed, and this can be developed as the need arises. One concern that cannot be addressed by developing new terminology is the reliance for any measurement standard on new or existing calibration standards developed by IEC. Basic terms like "sound pressure" and "sound pressure level" have a different meaning in IEC terminology than they do in ISO terminology, creating potential for confusion. To avoid this confusion, there is an urgent need for harmonisation of IEC and ISO terminologies.

**Target date for availability** (date by which publication is considered to be necessary) **target date: 2020**

**Proposed development track**  1 (24 months)  2 (36 months - default)  3 (48 months)

<p><b>Relevant documents to be considered</b></p> <p>Dekeling, R.P.A., Tasker, M.L., Van der Graaf, A.J., Ainslie, M.A., Andersson, M.H., André, M., Borsani, J.F., Brensing, K., Castellote, M., Cronin, D., Dalen, J., Folegot, T., Leaper, R., Pajala, J., Redman, P., Robinson, S.P., Sigray, P., Sutton, G., Thomsen, F., Werner, S., Wittekind, D., Young, J.V., Monitoring Guidance for Underwater Noise in European Seas, Part I: Executive Summary, JRC Scientific and Policy Report EUR 26557 EN, Publications Office of the European Union, Luxembourg, 2014, doi: 10.2788/29293</p> <p>van der Schaar, M., Ainslie, M. A., Robinson, S. P., Prior, M. K., &amp; André, M. (2014). Changes in 63Hz third-octave band sound levels over 42months recorded at four deep-ocean observatories. <i>Journal of Marine Systems</i>, 130, 4-11.</p> <p>Hawkins, R. S., Miksis-Olds, J. L., &amp; Smith, C. M. (2014). Variation in low-frequency estimates of sound levels based on different units of analysis. <i>The Journal of the Acoustical Society of America</i>, 135(2), 705-711.</p> <p>Merchant, N. D., Blondel, P., Dakin, D. T., &amp; Dorocicz, J. (2012). Averaging underwater noise levels for environmental assessment of shipping. <i>The Journal of the Acoustical Society of America</i>, 132(4), EL343-EL349.</p> <p>Leiden workshop report (Anon., 2014)</p> <p><a href="http://www.st.nmfs.noaa.gov/marine-mammals-turtles/acoustics/index">http://www.st.nmfs.noaa.gov/marine-mammals-turtles/acoustics/index</a></p> <p>Robinson et al (2014) [NPL GPG 133 2014] Good Practice Guide for Underwater Noise Measurement, National Measurement Office, Marine Scotland, The Crown Estate, Robinson, S.P., Lepper, P. A. and Hazelwood, R.A., NPL Good Practice Guide No. 133, ISSN: 1368-6550, 2014.</p>	
<p><b>Relationship of project to activities of other international bodies</b> to be completed</p>	
<p><b>Liaison organizations</b> IEC, ...</p>	<p><b>Need for coordination with:</b>  <input checked="" type="checkbox"/> IEC      <input type="checkbox"/> CEN      <input type="checkbox"/> Other (please specify)</p>
<p><b>Preparatory work</b> (at a minimum an outline should be included with the proposal)</p> <p><input type="checkbox"/> A draft is attached      <input checked="" type="checkbox"/> An outline is attached. It is possible to supply a draft by</p> <p>The proposer or the proposer's organization is prepared to undertake the preparatory work required    <input checked="" type="checkbox"/> Yes    <input type="checkbox"/> No</p>	
<p><b>Proposed Project Leader</b> (name and address) TBD</p>	<p><b>Name and signature of the Proposer</b> (include contact information)</p>

**Comments of the TC or SC Secretariat****Supplementary information relating to the proposal**

- This proposal relates to a new ISO document;
- This proposal relates to the amendment/revision of an existing ISO document;
- This proposal relates to the adoption as an active project of an item currently registered as a Preliminary Work Item;
- This proposal relates to the re-establishment of a cancelled project as an active project.

Other:

**Voting information**

The ballot associated with this proposal comprises a vote on:

- Adoption of the proposal as a new project
- Adoption of the associated draft as a committee draft (CD)
- Adoption of the associated draft for submission for the enquiry vote (DIS or equivalent)

Other:

**Annex(es) are included with this proposal** (give details) **proposed contents list**

Date of circulation	Closing date for voting	Signature of the TC or SC Secretary

*Use this form to propose:*

- a) a new ISO document (including a new part to an existing document), or the amendment/revision of an existing ISO document;
- b) the establishment as an active project of a preliminary work item, or the re-establishment of a cancelled project;
- c) the change in the type of an existing document, e.g. conversion of a Technical Specification into an International Standard. This form is not intended for use to propose an action following a systematic review - use ISO Form 21 for that purpose.
- Proposals for correction (i.e. proposals for a Technical Corrigendum) should be submitted in writing directly to the secretariat concerned.

**Guidelines on the completion of a proposal for a new work item**  
(see also the ISO/IEC Directives Part 1)

- a) **Title:** Indicate the subject of the proposed new work item.
- b) **Scope:** Give a clear indication of the coverage of the proposed new work item. Indicate, for example, if this is a proposal for a new document, or a proposed change (amendment/revision). It is often helpful to indicate what is not covered (exclusions).
- c) **Envisaged publication type:** Details of the types of ISO deliverable available are given in the ISO/IEC Directives, Part 1 and/or the associated ISO Supplement.
- d) **Purpose and justification:** Give details based on a critical study of the following elements wherever practicable. *Wherever possible reference should be made to information contained in the related TC Business Plan.*
- 1) The specific aims and reason for the standardization activity, with particular emphasis on the aspects of standardization to be covered, the problems it is expected to solve or the difficulties it is intended to overcome.
  - 2) The main interests that might benefit from or be affected by the activity, such as industry, consumers, trade, governments, distributors.
  - 3) Feasibility of the activity: Are there factors that could hinder the successful establishment or global application of the standard?
  - 4) Timeliness of the standard to be produced: Is the technology reasonably stabilized? If not, how much time is likely to be available before advances in technology may render the proposed standard outdated? Is the proposed standard required as a basis for the future development of the technology in question?
  - 5) Urgency of the activity, considering the needs of other fields or organizations. Indicate target date and, when a series of standards is proposed, suggest priorities.
  - 6) The benefits to be gained by the implementation of the proposed standard; alternatively, the loss or disadvantage(s) if no standard is established within a reasonable time. Data such as product volume or value of trade should be included and quantified.
  - 7) If the standardization activity is, or is likely to be, the subject of regulations or to require the harmonization of existing regulations, this should be indicated.

If a series of new work items is proposed having a common purpose and justification, a common proposal may be drafted including all elements to be clarified and enumerating the titles and scopes of each individual item.

- e) **Relevant documents and their effects on global relevancy:** List any known relevant documents (such as standards and regulations), regardless of their source. When the proposer considers that an existing well-established document may be acceptable as a standard (with or without amendment), indicate this with appropriate justification and attach a copy to the proposal.
- f) **Cooperation and liaison:** List relevant organizations or bodies with which cooperation and liaison should exist.

## Annex 2 Criteria for the selection of new GES indicators

### Purpose

The Terms of Reference require TG Noise to provide advice about potential additional indicators for a new Commission Decision on criteria and methodological standards on Good Environmental Status of marine waters, which should be published in 2015 or 2016.

TG Noise decided that it would be useful to first develop a rationale proposing new indicators, based on possible impacts on the marine ecosystem, and abundance and extent of the pressure. This will enable TG Noise to assess the need and a justification for addressing these other sources in additional indicators. This document describes that rationale ('criteria for criteria') and TG Noise would like to get feedback from WG GES on this approach.

### Background

In the earlier Commission Decision (2010) two criteria have been selected for Qualitative Descriptor 11 from the MSFD, Annex 1: Introduction of Energy, including underwater noise.

These are:

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

#### 11.2 Continuous low frequency sound

The first criterion (and its indicator) focuses on loud impulsive sounds that are known to cause behavioural change in marine species (leading to displacement from habitats). The second criterion (and its indicator) addresses pervasive sounds from shipping and other sources in the ocean that are believed to reduce the ability of marine species to use sound for communication and other purposes (masking). See the TSG Noise 2012 report and the TG Noise 2014 Monitoring Guidance for further explanation.

The Commission Decision (CD) focussed on underwater noise, as a first priority in relation to assessment and monitoring. However, the CD notes:

*"Together with underwater noise 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)."*

And, thus, for the next phases of the MSFD, inclusion of other sources of introduced energy should be considered. TG Noise decided that the best way forward was first identify criteria for the selection of potential additional GES indicators and verify whether these criteria could be endorsed by the WG GES. In this document, criteria are given for the selection of new GES indicators, either being other sources of energy or other forms of underwater noise. These criteria are based on our understanding of the purpose of the Marine Strategy Framework Directive, and on discussions/debates by WG GES and other Groups at the time of the first Commission Decision.

### Selection criteria for new sources of energy or other forms of underwater noise to be included as indicators for GES:

TG noise suggests the following selection criteria.

- 1. Scale: Activities introducing energy into the marine environment cause or may cause an impact at a large scale<sup>3</sup> rather than at a local scale or there is a concern that such activities will cause an impact at large scale in the near future.**
- 2. Evidence of impact: There should be evidence (or a reasonable level of suspicion in the scientific community) of a (long-term) negative impact on the marine ecosystem, on**

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<sup>3</sup> Large scale: larger scale than singular projects that normally are regulated by the standing licensing regime, environmental impact assessments or other standing national or EU regulations.

populations or on habitats or ecosystem services, or indication of potential long term impact or irreparable damage at these scales.

- 3. Added value: The impact related to the introduction of the energy in the environment by human activities and the cumulative effect of these impacts should not be already fully regulated under other EU-regulations, *or* monitoring and assessment should deliver added value because e.g. it enables assessment of potential cumulative impact caused by different activities (not necessarily restricted to noise/energy).**

TG Noise concluded that all 3 criteria need to be met: impacts that only occur at a local scale are typically not addressed by the MSFD – these scales are addressed under other Eu legislation, the aim of the MSFD is to address the ecosystem (or population) level. TG Noise recommends avoiding unnecessary regulation - so if an activity is sufficiently regulated (including cumulative effects) additional action is not necessary, even if it could happen at large scale and there would be sufficient evidence. TG Noise concluded that at least some form of evidence (or indication) needs to be available, but noting the precautionary principle, this threshold should be lower for impacts that might have a long term impact.

If a source of introduced energy meets all 3 criteria, it could be proposed to be taken up in the revision of the Commission Decision for the next implementation round of the MSFD (e.g. 2018-2026).

## Defining associated indicators

Once the European Commission and Member States have decided that additional GES indicators would be needed, a concrete/explicit indicator or a set of indicators should be proposed to assist in monitoring and assessment programmes and to help ensure coherence at a Regional Sea level.

There is further guidance available that includes a number of criteria that may be considered when determining the utility and applicability of an indicator (Table 1 from OSPAR's MSFD Advice Manual on Biodiversity).

Establishing indicators that comply with all these specifications is a complicated task that should be done by a group that includes experts on the subject. The Indicator selection criteria in the table below should be taken into account, as well as a cost-benefit analysis of applying such an indicator.

**Table 1: State Indicator selection criteria (adapted from ICES and UK scientific indicator evaluation)**

Criterion	Specification
Sensitivity	Does the indicator allow detection of any type of change against background variation or noise?
Accuracy	Is the indicator measured with a low error rate?
Specificity	Does the indicator respond primarily to a particular human pressure, with low responsiveness to other causes of change?
Simplicity	Is the indicator easily measured?
Responsiveness	Is the indicator able to act as an early warning signal?
Spatial applicability	Is the indicator measurable over a large proportion of the geographical to which it is to apply e.g. if the indicator is used at a UK level, is it possible to measure the required parameter(s) across this entire range or is it localised to one small scale area?
Management link	Is the indicator tightly linked to an activity which can be managed to reduce its negative effects on the indicator i.e. are the quantitative trends in cause and effect of change well known?
Validity	Is the indicator based on an existing body or time series of data (either continuous or interrupted) to allow a realistic setting of objectives?
Communication	Is the indicator relatively easy to understand by non-scientists and those who will decide on their use?

## Applying the selection criteria<sup>4</sup>

In table 2 present indicators and a number of indicators that may be considered when determining the utility and applicability. The present indicators would score high when these criteria are applied. These potential new indicators were also described in the 2010 TG11 advice; the scoring provided here should only be seen as a rough indication, this will be further elaborated in the next TG Noise report.

**Table 2**

Energy source	1. Scale	2. Evidence	3. Not yet regulated/ other added value	End score
Loud, low and mid frequency impulsive sounds <sup>5</sup>	+	+	± <sup>6</sup>	+
Continuous low frequency sound <sup>7</sup>	+	+	+	+
High frequency impulsive sounds <sup>8</sup>	± <sup>9</sup>	-	+	TG Noise advice on review of CD (spring 2015)
Electromagnetic fields (from submarine cables)	TBD	TBD	TBD	MaRVEN project results (expected mid-2015) <sup>10</sup>
Heat release	-	+ <sup>11</sup>	-	TG Noise advice on review of CD (spring 2015)
Light (by offshore structures)	±	± <sup>12</sup>	+	TG Noise advice on review of CD (spring 2015)

<sup>4</sup> Most information is taken from the TG11 report (Tasker *et al* 2010)

<sup>5</sup> From Commission Decision 2010

<sup>6</sup> Individual activities are usually regulated or licensed, however, the cumulative effects are not addressed anywhere

<sup>7</sup> From Commission Decision 2010

<sup>8</sup> Proposed in TG11 report (2010) but not taken over in the Commission Decision 2010

<sup>9</sup> Wide-spread only in coastal areas

<sup>10</sup> Some information is available but not conclusive of significant impact (see Gill, A.B., Bartlett, M., Thomsen, F. (2012). Potential interactions between diadromous fishes of U.K. conservation importance and the electromagnetic fields and subsea noise from marine renewable energy developments. *Journal of Fish Biology* 81, 664–695).

Regarding the scale and evidence of impact of EMF, the EC has funded a project to study the environmental impacts of noise, vibrations and electromagnetic emissions from marine renewable energy devices, the MaRVEN project (Marine Renewables, Vibrations, Electromagnetics and Noise). One goal of the project is to make an in-depth analysis of the current norms and standards and environmental impacts related to EMF for marine renewable energy systems as well as performing relevant on-site measurements of EMF from cables. The project will report their findings by June 2015. ([www.marven.dhigroup.com](http://www.marven.dhigroup.com))

TS Noise recommends that the outcome from the MaRVEN project will be starting point for future discussion on the use of an indicator for EMF.

<sup>11</sup> At a local scale, i.e. an order of magnitude of 10 km<sup>2</sup>, there is evidence available of increase of sea surface temperature or reduced sea-ice. See e.g. Fennovoima Oy, Environmental Impact Assessment Report for a Nuclear Power Plant, 2008, available at [www.fennovoima.fi](http://www.fennovoima.fi).

<sup>12</sup> However, impact is usually not on marine species, but on migratory land-birds

## Annex 3 D11 questionnaire: Summary analysis of responses and TG Noise advice

### UNDERWATER NOISE (D 11) QUESTIONNAIRE

#### Summary of responses and TG NOISE Advice – November-2014

The present document provides an analysis of the responses received to the Underwater Noise (D11) questionnaire circulated to MS in July 2014. Furthermore, and as result of the discussions during the 7<sup>th</sup> Meeting of TG Noise in Ljubljana, Slovenia (23-24 Oct. 2014), a summary assessment and the advice of TG Noise is provided (in boxes).

Please take note that the summary below reflects the view of 16 Member States (UK, SL, IT, MT, HR, PL, IE, NL, ES, DE, FIN, BE, FR, EE, RO, BG) out of the 23 coastal MS who responded to the request to fill in this questionnaire.

#### 1. Have you established a noise register as recommended for Indicator 11.1?

2 Member States (DE and PL) established a noise register for indicator 11.1. DE expects this to be operational August 2015. 1 MS (UK) has partially established a noise register. 10 Member States (FIN, BE, MT, FR, HR, EE, IT, NL, RO, BG) plan to do so. FIN plans an evaluative registry. BE seeks guidance. MT and ES included this in the MSFD Monitoring programme. In MT it is considered that the format of the database needs to be agreed within at a regional scale. In Spain the monitoring programme is now in public consultation. FR expects to be operational in 2015-2016 if funding is available. NL intends to co-operate in setting up an international register for the OSPAR region. 2 Member States (SL, IE) started with other related projects. SL started with short-term measurements of underwater noise. IE has undertaken research projects into Noise through the Environmental Protection Agency.

#### **Status summary and TG Noise advice:**

There are no regional/sub-regional scale operational noise registers. Most member states have indicated that they are planning to do so.

Not all Member States have interpreted the intention of the register for indicator 11.1 the same way; some MS are aiming to undertake measurements or collect new information.

The core of the information of the register, that is a catalogue of all data, is expected to be available within regulatory bodies already, since the activities that are addressed here normally are regulated to some extent.

In some MS implementation of this register implies that a concrete obligation will need to be designed for companies to make available the necessary data.

TG Noise is of the opinion that the level of information needed for an assessment whether GES is reached is not at the level that commercial sensitive information needs to be made public.

TG Noise acknowledges that guidance on future use of the registry might be needed.

#### 2. Have you had any significant difficulties setting up this register process so far, and were you able to solve these?

DE expects a result considering national security concerns. Only then shall they know which data are actually allowed to be registered. DE mentions a problem with the interpretation of the term “measured at 1 m” and the new proposal “change of wording”, “monopol source level”. An international standardization (MS) of the approach for measurements and predictions (see, for example, the project BIAS) should be elaborated.

UK mentions technical difficulties in collating information of different types and from different sources into a standard database.

SL did not succeed to obtain necessary data for sonars on recreational boats and merchant ships.

PL finds it hard to reach to the main entities which are responsible for carrying out activities which contribute to the increase of impulsive underwater noise production.

FR notifies that making a register operational encompasses to define processes and rules to make data available and exploitable from a huge diversity of sea users.

IE foresees difficulties related to governance and quality assurance of the data to be collected.

ES expects some difficulties may arise with the public consultation. The procedure is as follows: the proposal has been presented to the Ministry of Industry (Sub-General Directorate for Hydrocarbons, as seismic campaigns carried out by this sector is the main activity to be register), including a proposal for a procedure to obtain the information for the register. Firstly the developer will include the data for the register in the Impact Assessment Study and after, the Ministry of Industry will notify the monitoring agency about the authorisations and the real date of start and end of the activity.

BG expects to find some difficulties that may arise from the scope of a project planned in 2015, during which the establishment of a noise register will be developed.

**Status summary and TG Noise advice:**

There is a limited number of MS that have attempted to actually collect the data. Those have run into some practical problems that delay the process; no MS reported fundamental issues inhibiting them (in the future) to collect the data. National security issues (related to military sonar) may limit data collection to some extent.

Extract from Monitoring Guidance 2014 on military activities:

*The main aim of the registry is to provide an overview of all loud sounds. If certain sound sources are left out, the aim of addressing the cumulative effects of impulsive noise would not be fully met, and therefore it is recommended that information on all sources should be included [see Van der Graaf et al., 2012]. TSG Noise suggest that data on explosives and military activities (of which the sole purpose is defence or national security) should also be included in the register, but notes that this should be on a voluntary basis as this is a national policy issue. ....*

*It is possible that many operators (e.g. navies using sonar) may have concerns about releasing sensitive information.*

*Where detailed information of source properties is requested it is proposed that certain operators be given the option to report source level in bins (for example, in intervals of 10 dB) rather than giving a precise figure.*

Some MS have confirmed that they will include information on military activities.

TG Noise is available to provide advice and the chairs of TG Noise will contact Member States that have reported that there are specific issues that are unclear and where possible provide the additional information.

If an issue is identified that is relevant to all MS additional guidance will be made available.

**3. Do you think the approach for a register proposed by TG Noise is adequate or do you think an alternative approach is needed?**

7 Member States (UK, FIN, SL, MT, FR, EE, IE) see the approach for a register as adequate.

UK looks forward to contributing to an OSPAR register. FIN adds that the registry could be coordinated internationally, i.e. within the sea regions. In SL opinion it is mainly adequate, but there can be some important noise sources, not included yet in this register; for instance throbbing noise of some recreational boats as an impulsive noise source, as described in 10.

PL asks for additionally, if possible: source spectra; duty cycle; duration of transmissions (and actual time/time period); directivity source depth; platform speed. PL adapted the block areas to the dimensions for the so-called Baltic squares, which have been used in our monitoring studies for a lot of years. The blocks chosen don't exactly match in dimensions with those proposed by TG.

NL mentions that a register is an essential part of the monitoring for Indicator 11.1. Further development is needed to process the data in the register to obtain a map of this indicator. Some choices to do that have to be made (e.g. what is the impact area of impulsive noise sources).

ES acknowledges the importance of the register although considers not enough to be able to define any threshold regarding the indicator.

**Status summary and TG Noise advice:**

The proposed approach is considered to be adequate. A number of MS have asked for detailed additional information.

TG Noise is available to provide additional information, and the chairs of TG Noise will contact Member States that have reported that there are specific issues that are unclear and where possible provide the additional information.

**4. Do you monitor underwater ambient noise at the frequencies specified in Indicator 11.2 already or do you plan to monitor it under your new MSFD monitoring programme in the future?**

**Yes** – 5 Member States (DE, FIN, BE, FR, EE) monitor underwater ambient noise. FIN is monitoring the Ind. 11.2. 1/3 octave bands with middle frequencies of 63 and 125 Hz. BE measures underwater ambient noise, at distinct times linked to the available monitoring programmes. FR targets a dozen of fixed stations completed by a database of opportunity data. EE has 4 stations in the Estonian waters (BIAS project).

**Not yet** – 11 Member States (UK, SL, IT, MT, HR, PL, IE, NL, ES, RO, BG) are planning to monitor underwater ambient noise. UK, has no ambient noise monitoring yet, but pilot testing has occurred. SL is in the process of setting up stationary measurements on a buoy in 2014. SL is using any opportunity for performing measurements from different underwater impulsive noise sources, as soon as they appear in their sea. In IT research on underwater noise is ongoing, but not on a structured way. There is no monitoring programme yet, but IT has involved the underwater noise in the future monitoring programmes under MSFD at the frequencies specified in Indicators 11.2.

MT has no current monitoring regime for ambient underwater noise, but intends to monitor ambient underwater noise as part of the MSFD monitoring programme, subject to further regional discussions on the matter. HR reports there is no systematic monitoring of underwater ambient noise at the frequencies specified in Indicator 11.2 until now for the Croatian part of Adriatic Sea. In our Monitoring and Observation System for Ongoing assessment that is to be adopted in September 2014, at latest, accordingly MSFD, the monitoring of underwater ambient noise will be performed. PL is gathering funds for buying equipment (hydrophones) for monitoring. IE reports that ambient noise monitoring from MSFD is likely to be undertaken as part of the calibration of noise modelling projects. ES included the plans in their monitoring programme monitoring and expect to implement it in a mixed way, using modelling and in-situ monitoring in selected stations.

NL is making a proposal for a monitoring strategy for ambient noise in the North Sea OSPAR region. The strategy is mainly based on a combination of registering noise producing activities, modelling and measurements for source levels and model validation. No dedicated ambient noise measurements are being performed in NL at this moment, but in specific monitoring of pile driving ambient noise is addressed and data are collected.

**Status summary and TG Noise advice:**

Most MS have indicated the intention to set up monitoring. A few have started measurements, and others have done pilot/experimental measurements.

The MS/Regional initiatives (e.g. BIAS) that have actually started measurements are invited to share the information (and the solutions they found for practical problems) with TG Noise, that can assess this information and provide additional guidance to help MS overcome practical problems.

In the OSPAR and HELCOM region some MS work together on a sub-regional design of a monitoring programme.

## **5. Do you already monitor underwater ambient noise? If not, continue with Q9**

4 Member States (DE, FIN, HR, EE) monitor underwater ambient noise. HR reports their monitoring was limited in time and spatial scale.

8 Member States (UK, MT, FR, IE, NL, ES, RO, BG) do not monitor (yet) underwater ambient noise. Monitoring is underway in several member states. Funding is a critical factor.

### **Status summary and TG Noise advice:**

A limited number of MS report that they monitor Ambient Noise.

TG Noise advices that priority must be given to initiate ambient noise monitoring.

## **6. How is the underwater ambient noise monitoring funded**

According to the responses most activities are funded by governmental institutions, at national or European level. In DE until now monitoring is funded by government and industry (mostly in order to meet the scope of licensing procedures for offshore wind farms and to work towards management plans for the Natura2000-sites). Also in BE monitoring was funded through an impact assessment of environmental stressors e.g. the construction and operation of Offshore wind farms. In the UK a pilot project was funded with direct Government funds. NL activities are also funded by government funds, scientific funding bodies and European projects.

In FIN and EE funding is received through the BIAS project funded by the EU Life +, and national Ministries and a university. In HR monitoring has been funded by the World Bank.

### **Status summary:**

According to the responses most activities are funded by governmental institutions, at national or European level. No MS has reported that there is no funding.

## **7. Have you had any significant difficulties during the monitoring process so far, and were you able to solve these**

There are several questions regarding significant difficulties to the monitoring process (DE) related to: (1) requirements demanded for measurements in order to be able to validate predictions; (2) appropriate prediction tools for trend analyses; (3) the description of the noise situation.

The loss of monitoring gear presumably towed away (and not returned) by fishermen is reported as a difficulty during the monitoring process so far, (UK). Monitoring under adverse meteorological conditions is reported (BE), though this is solved through mooring autonomous hydrophones with recorders.

The 2013 monitoring was carried out with available resources (equipment and infrastructure) which do not fully comply with the recommendations of Monitoring Guidance for underwater noise in European Seas (HR). According to NL a major difficulty is a lack of knowledge on source levels of shipping, certainly to the extent that allows noise mapping with enough accuracy. The expertise available is not sufficient to make ambient noise monitoring effective at the short term.

### **Status summary and TG Noise advice:**

The MS that have actually started measurement report practical problems that are encountered, e.g. loss of gear. Available expertise is partially limiting the speed of advance.

## **8. Which of these difficulties in relation to monitoring do you think are important to address in the short term? And in the long term?**

For both short- and long term the loss of gear is a major issue and probably needs greater engagement of the fishing industries of all countries using an area. The availability of resources (human and financial) is

another major difficulty to be addressed in both the short and long term. Costs of measuring at sea are very high and limiting the progress.

**Status summary and TG Noise advice:**

Reported difficulties in relation to monitoring important to address **in the short term** are:

- (1) Creation of a profile with specifications on the requirements for the measurements and analyses to support the predictions;
- (2) Measuring instruments, anchorage of that and signal processing;
- (3) Measurements are being executed on sound sources, but more are needed;
- (4) The acquisition of the equipment required.

Reported difficulties in relation to monitoring important to address **in the long term** are:

- (1) Standardization of the measurements and predictions for the application with monitoring (interim standard BIAS);
- (2) Development of a much more integrated and handy monitoring instrument is recommended;
- (3) Lack of knowledge on the effects of increased ambient noise is being addressed, but needs much effort, the present progress in this field is low (compared to progress being made with regard to effects of impulsive noise). This is needed to derive Impact indicators from the Pressure indicators.

TG Noise is available to provide additional information and clarifications that may help to address reported difficulties.

**9. Please ignore the following questions if you already have a fully functioning monitoring scheme) Do you intend to set up underwater ambient noise monitoring based on the guidance provided by TG Noise?**

Most Member States (DE, UK, SL, BE, PL, MT, FR, HR, EE, IT, IE, NL, ES, RO, BG) intend to set up underwater ambient noise monitoring based on the guidance provided by TG Noise. UK prefers a collaborative scheme that includes all relevant coastal member states around a sub-regional sea. Both BE and IE intend to do so, provided matching funds will be available. MT adds that successful monitoring depends on various aspects including: (1) availability of expertise on underwater noise; (2) the acquisition of the necessary software for noise modelling purposes; (3) access to or appropriate analysis of AIS data and (4) Agreement on Category A and/or Category B monitoring stations at regional level. FR suggests that some adaptation may be required to account for local specificities. ES used it to describe a sub-programme on ambient noise for all marine subdivisions in Spanish waters (Noratlántica, Sudatlántica, Estrecho y Alborán, Levantino-Balear y Canaria)

**Status summary and TG Noise advice:**

Most Member States have indicated the intention to set up underwater ambient noise monitoring based on the guidance provided by TG Noise.

Some MS have indicated that they prefer to do so in a sub-region scale. In the OSPAR and HELCOM area there is collaboration at the sub-regional scale.

TG Noise encourages and supports cooperation between MS and in sub-regional scale.

**10. Do you think the methodology proposed by TG Noise is adequate or do you think alternative methodology is needed?**

According to almost all Member States (DE, UK, SL, BE, PL, MT, FR, HR, EE, IT, IE, NL, ES) the methodology proposed by TG Noise is or seems to be adequate. SL points out some definitions, terms and their applications for which we refer to the original Questionnaire of SL. Both IE and BE refer to funds and flexibility needed for both equipment and data processing. MT refers to the fact that implementation of the monitoring programme depends on various aspects (see question 9). ES considers that although is adequate is not enough to be able to define any threshold for this indicator. RO has no sufficient knowledge about the proposed methodology. BG has not yet started monitoring but will use the methodology proposed by TG Noise.

FIN responds they need to wait the results achieved and experiences gathered in the BIAS project. The relationship between measurements and modelling is one of the major questions that also requires a regional approach.

**Status summary and TG Noise advice:**

Almost all Member States report that they consider the methodology proposed by TG Noise to be adequate; some MS have indicated that they would like some further clarifications.

TG Noise is available to provide additional information.

## 11. How do you intend to fund future monitoring of underwater ambient noise?

Funding is still unclear and under discussion (DE, FR, IT, IE, BE) for some Member States. Funding options explored are at both national and European level. The European Maritime and Fisheries Fund (EMFF) has been mentioned several times as a potential funding possibility.

EE responds that most probably the future monitoring of underwater ambient noise will be funded by the Ministry of Environment as part of the national environmental monitoring programme. UK is willing to consider funding its share of a joint monitoring programme; European funds may be needed to facilitate the establishment of such joint monitoring. SL reports that monitoring will probably be funded from public funds, a part which gets funding from concessions. PL applied for a subsidy which might afford the purchase of the equipment. Then the maintenance, servicing, data analysis and so on will be funded by the National Monitoring Programme. MT seeks the possibility to make use of funds under the European Maritime and Fisheries Fund for the purposes of implementing parts of the MSFD monitoring programme. However, project proposals in this regard still need to be developed and details are not yet available. HR reports that in case that we fail in accomplishment of preconditions to make prerequisites for withdrawals from EU structural funds (to include ambient noise in Operational plans for ERDF or EMFF for the period 2014-2020) financing of the whole Monitoring and Observation System for the Adriatic Sea (including ambient noise) will be from state budget. ES expects to ask for European funds for the implementation of this sub programme, plus to national funds. In NL Further development of a monitoring strategy (from 2015) and setting up of monitoring will be funded from the EMFF. These special funds are needed for further research and development. Once a regular monitoring is operational this should be funded from the national monitoring budget.

BG informs that in 2015 they are planning to carry out a project including also underwater ambient noise funded by the Norwegian Programme of European Economic Area Financial Mechanism (EEA FM) 2009-2014. Further and according to the Water Act activities for monitoring of marine waters are funded annually by the national budget of Bulgarian Ministry of Environment and Waters.

**Status summary and TG Noise advice:**

Most MS have not decided on the actual funding scheme for. Funding options explored are at both national and European level. The European Maritime and Fisheries Fund (EMFF) has been mentioned several times as a potential funding possibility.

## 12. What are the most important problems/data gaps in the short term, and in the long term preventing or delaying the (design of) a monitoring programme?

Most important problems/data gaps in the **short term**, preventing or delaying the (design of) a monitoring programme reported are: (1) there is a lot of work to do within 11.1 – prepare the inquiries and methodology to reach to the target entities, so they could start already the activities recording and register from the beginning of the next year (PL); (2) The availability of resources (human and financial) for the implementation of MSFD D11 Noise requirements (IE); (3) Another short term problem is the lack of expertise on underwater noise in some member states, and lack of experts, especially within the governmental organisation. These experts are needed to translate national and European policies on underwater noise into operational monitoring programmes.

Most important problems/data gaps in the **long term**, preventing or delaying the (design of) a monitoring programme reported are: (1) the maintenance of observatories for long term, which is costly and time

consuming in particular on open sea (FR); (2) The challenge will be ensuring a coordinated regional and sub-regional approach to developments on D11 Noise (IE, MT); decisions where and how to install hydrophones in existing oceanographic platforms/buoys, and face the technical issues to implement it, also the budgetary issue is determinant (ES).

More **general** – One of the most important short and long term problems will be the funding. Measurements at sea are expensive; there is a need for more cost effective technology to measure noise, collect, store and transfer data to shore and analyse the data (NL). Several member states indicate difficulties on where to measure (location and depth) by help of what kind of instrument. There is a lack of instrumentation adapted to all of the variable Mediterranean marine environments.

There is a lack of baseline data reported (IT, EE, RO). Another problem mentioned are the data gaps of ambient noise. It is mentioned not to be possible to fill those gaps in the short-term, but only in the mid-long term.

Currently the problem is timing, since work progress is slow; additional problem is a lack of regional cooperation in practice. We think that the best would be to set up the monitoring program in the framework of a common regional or sub regional project, with the help of more experienced experts from other EU countries (SL). However there is lack of capacity to get a joint monitoring programme agreed and put in place (UK).

In modelling the amount of input data (hydrography, weather, shipping, boating etc.) is enormous. Questions are posed related to the kind of model to be used and how much input data is really needed to satisfy the request of MSFD D11 Ind. 11.2 in a most effectively way?

Many aspects of this work must be complied with different services, where a lot of bureaucratic procedures are involved, demanding an additional time, which often causes unexpected delays.

**Status summary and TG Noise advice:**

Lack of available expertise is reported as short term problem, especially within governmental organisations. Not in all regions there is actual cooperation, some MS have reported that setting up regional cooperation is difficult.

Further difficulties are dealing with funding and timing due to slow progress so far. There is a need to help MS implementing their monitoring programmes.

TG Noise is available to provide support and facilitate access to relevant information (e.g. lessons learned from BIAS project).

## Annex 4 List of participants in 7<sup>th</sup> Meeting TG Noise, October 2014

### 7<sup>th</sup> Meeting TG Noise 23-24<sup>th</sup> October 2014, Ljubljana, Slovenia

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**The participants of 7th TG Noise meeting in Ljubljana (23-24 October 2014):**

(left to right) Maria Ferreira, Tetrienne Box, Ferdinand Dezelak, Nikolina Rako Gospić, Antonio Codarin, Marta Picciulin, John Dalen, Thomas Folegot, René Dekeling, Predrag Vukadin, Monika Peterlin, Andreas Müller, Mark Tasker, Frank Thomsen, Stephen Robinson, Nina Uratarič, John Young, Dónal Cronin, Jukka Pajala, Michel André, Fabrizio Borsani, Lydia Martin-Roumegas, Michael Ainslie, Mathias Andersson.  
Picture taken by Luka Curovic.

## Annex 5 Terms of Reference TG Noise for 2015

### Mandate of Technical Group on Underwater Noise (TG Noise) and Terms of Reference 2015, including work programme

#### 1. MAIN ISSUES - SCOPE OF WORK

In 2011, a technical group on underwater noise was set up according to a mandate by the Marine Directors of 2.12.2010. TSG (Underwater) Noise (now called TG Noise) in 2012 provided a report clarifying the purpose, use and limitation of the indicators and described methodology that would be unambiguous, effective and practicable.

The TG Noise has identified potential priority work items for support to the operational implementation of Descriptor 11. In 2013, the main focus of TG Noise was on developing a practical guidance for monitoring and noise registration for member states. This guidance provided EU Member States with the information needed to set up monitoring in their marine waters, as required in the MSFD. In 2014, TG Noise provided further advice on the actual progress of monitoring and a list of recommendations has been provided, related to the implementation of monitoring, standardization, and review of the Commission Decision and on a possible roadmap towards describing GES.

#### 2. ORGANISATION

The TG Noise will be chaired by UK and the Netherlands. The work of the technical group on underwater noise will be reported to the Marine Strategy Coordination Group where relevant actors (Member States, neighbouring countries, international organisations such as regional sea conventions and marine scientific organisations, stakeholder organisations) are represented.

##### Membership

The technical group consists of persons who have:

- a. Demonstrated expertise applicable to the task,
- b. Demonstrated experience in providing practical scientific advice,
- c. Ensuring the range of expertise necessary for the tasks of monitoring underwater noise and assessing the noise impacts on marine environments.

In principle the same group of people will continue. From 2014, a wider range of Member States representatives takes part in the group, including people involved in monitoring, as well as a representation of the regional sea conventions. Additionally, for some meetings additional experts on a certain topic (for example electromagnetic fields) may be invited.

Establishment and implementation of monitoring by Member States should be coordinated within the regional sea context (as required by MSFD art. 11), but it is useful to share knowledge and experience in a wider European context.

Most of the work of the technical group will be done by correspondence. The technical group will have a maximum of two physical meetings per year, to ensure work is planned and coordinated efficiently. Intermediate progress reports will be used to inform the MSCG.

Since February 2013, The Coastal & Marine Union (EUCC) and Arcadis have been contracted to support administrative, organisational and logistic support to the TGs on Marine Litter and Underwater Noise (2013-2014).

#### 3. TIMELINES AND DELIVERABLES

TG Noise was tasked to deliver guidance so that European Member States could initiate programmes for underwater noise monitoring. In 2013, TG Noise delivered a Monitoring Guidance for Underwater Noise, which is available via the JRC<sup>13</sup> (Executive Summary, Monitoring Guidance Specifications and Background

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<sup>13</sup> Link to the official EU Underwater Noise (3 parts) guidance document:

information). Responding to a questionnaire from EC DG Environment, MS have reported that methodology proposed in the TG Noise Monitoring Guidance is adequate and that they all intend to set up registers, measurements and monitoring programmes using this guidance.

Based on the existing Terms of Reference, the TG Underwater Noise will address the following items in the year 2015:

#### **1. Assistance to MS/RSC's on implementation of operational monitoring programmes**

Monitoring and assessing underwater noise is a complex issue which requires dedicated expertise. This expertise is organized, for Europe, in the Technical Group. The TG Noise will provide assistance to (groups of) Member States on a number of issues related to the monitoring and assessment such as:

- Setting up the monitoring of ambient noise in a (sub)region;
- Setting up and interpretation of the noise register
- Via the MCC4GES, provide advice for the review of the 2010 Commission Decision with regard to descriptor 11, following advice of EC DG ENV and WG GES;
- Review outcomes of projects relevant to monitoring and/or assessment of the effects of underwater noise

#### **2. Consider the design of assessment frameworks for underwater noise**

MS will need to eventually use their monitoring [and mapping] of underwater noise to assess its effects and whether the achievement of GES is being inhibited. For this, some sort of common assessment framework is required. The design of any assessment framework needs to be informed by how, if required, underwater noise might be regulated, noting that some sounds are required for a purpose, while other is incidental and not required. Both assessment and regulation may need to be considered on a regional basis, possibly using Regional Action Plans. TG Noise will provide assistance to (groups of) Member States issues related to these issues such as:

- Enable coherent interpretation of results of monitoring, both within and between Regional Sea Conventions, enabling future assessment of Good Environmental Status
- Consider options for management frameworks and, if required, help in their development

#### **3. Support the process of standardization, including participation in technical workshop (Germany)**

The TG Noise 2014 Monitoring Guidance identified the urgent need for an international underwater noise monitoring standard. This was further discussed in the October 2014 TG Noise meeting; TG Noise concluded that an underwater noise monitoring standard must comprise a measurement standard, a modelling standard and a procedure for combining these for noise monitoring.

TG Noise will further support development of an international standard in the medium term, and in the short term development of interim guidance. TG Noise will participate in a technical workshop in 2015, hosted by TG Noise members in Germany.

#### **4. Links to other activities**

##### *Liaison with RSCs*

The work in the Technical Group is related to activities undertaken in regional seas conventions with regard to especially setting up a register of loud impulsive noise and the development of a joint monitoring programme for ambient noise. TG Noise provides link between existing regional initiatives (OSPAR ICG Noise), BIAS (HELCOM) and other (Med) MS.

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Monitoring Guidance for Underwater Noise in European Seas - Part I: Executive Summary

<http://publications.jrc.ec.europa.eu/repository/handle/11111111/30979>

Monitoring Guidance for Underwater Noise in European Seas - Part II: Monitoring Guidance Specifications

<http://publications.jrc.ec.europa.eu/repository/handle/11111111/30973>

Monitoring Guidance for Underwater Noise in European Seas - Part III: Background Information and Annexes

<http://publications.jrc.ec.europa.eu/repository/handle/11111111/30980>

#### *Liaison with the US Government*

In the United States, the National Oceanographic and Atmospheric Administration (NOAA) is developing the NOAA Ocean Noise Strategy; for this purpose NOAA (a.o.) has convened the Cetaceans and Sound (CetSound) project in which it is developing mapping tools to produce underwater sound-field maps, along with cetacean density and distribution maps. Cooperation between the US and EU in the field of monitoring and assessment of underwater noise will advance the understanding and management of the effects of underwater noise. As an example, in a meeting organised by NOAA, the International Whaling Commission and the NL Ministry of Infrastructure and the Environment in Leiden in April 2014, experts from governments and science discussed the use of soundscape modelling to inform management underwater noise; one of the results of the workshop was an agreement on noise bands that need to be monitored, which should result in similar methods of noise assessment both in the US as in the EU. To enable smooth cooperation, NOAA had nominated a representative for membership in TG Noise.

#### *Liaison with ongoing project initiatives*

The TG will support learning from project initiatives and knowledge and information collected, such as in the BIAS project (<http://biasproject.wordpress.com/>), SONIC ([www.sonic-project.eu](http://www.sonic-project.eu)) and AQUO (<http://www.aquo.eu/>) and at other regional, national and international level. TG Noise concluded to support MS to work with their neighbours to develop regional/sub-regional underwater noise monitoring procedures for this purpose.