

Minutes

Report of	EC Technical Subgroup Noise
Meeting date	6 & 7 October 2011
Participants	René Dekeling, Mark Tasker (chairs) Leo de Vrees (EC-DG-Environment) Michael Ainslie, Mathias Andersson, Michel André, John Dalen, Thomas Folegot, Russell Leaper, Mary Meacle, Jukka Pajala, Stephen Robinson, Peter Sigray, Frank Thomsen, Sandra van der Graaf, Stefanie Werner, John Young (participants)
Copy to	Arjen Boon, Karsten Brensing, Ian Boyd, Robin Fitch, Cédric Gervaise, Santiago Lens Lourido, Alexander Liebschner, Bill Nicholls, Marije Siemensma, Jan Stenløkk, Albert Willemsen, EEA

EC Technical SubGroup (TSG) Noise -6 & 7 October 2011

The second meeting of the TSG Noise took place on 6 and 7 October 2011 at the National Physical Laboratory in Teddington, UK, on the kind invitation of Stephen Robinson.

Opening

The representative of the EC (Leo de Vrees) described where we stand in the process. Originally the Terms of Reference for the TSG were written based on the expectation that relevant work on energy issues would be finished at the end of 2011. There may, however, be further work that might be needed that cannot be finished this year and therefore he asked the TSG Noise to consider if there are issues that might need to be addressed during next year and if so, to indicate these to the Marine Directors in time for their meeting on 7-9 December 2011. The WG GES meeting in September asked TSG Noise to provide a short report with consideration on how GES could be determined and how targets can be set. This is an addition to Terms of Reference and the work programme. The WG GES further complimented both TSG's and believed that more progress was made on these descriptors as compared to some other descriptors.

He also pointed out that two calls for research related to noise have been or will be going out soon. The first one is on the noise of ships and impacts on marine environment¹, the second on noise impacts, vibrations and electromagnetic emissions from renewable energies². Additionally next year there will be a joint call on dealing with offshore monitoring.

1a. Presentation and discussion on product 2.1 – A glossary of indicator terminology – John Dalen

Work on this product was based on the proposed interpretation of indicator 11.1.1 presented by Michael Ainslie at the previous meeting.

Some points that were discussed:

- Monopole source levels
- Leo de Vrees (EC) explained that the glossary should be seen as a communication tool, it is not legally binding, so not everything has to be described in detail. The meeting agreed that a list of sources or activities that should be included in this indicator could usefully be provided to Member States. This list has already been developed for product 2.3.
- Statistical interpretation of trends

Leo de Vrees (EC) pointed out that two other projects have also attempted to make a glossary of MSFD terminology. They are now combined as an annex to the Common Understanding Paper on art 8, 9 and 10 of WG GES and he suggested the authors of product 2.1 also to refer to this.

¹ *SST.2012.1.1-1. Assessment and mitigation of noise impacts of the maritime transport on the marine environment (coordinated topic within the framework of the 'Ocean of Tomorrow') Level 2 - CP-FP - Call: FP7-SST-2012-RTD-1*

² *Energy 2012.10.2.1 Study of the environmental impacts of noise, vibrations and electromagnetic emissions from marine renewables.*

1b. What is “Impulsive Sound” – Michael Ainslie

A questionnaire was sent out earlier to the group asking whether there was a need to define ‘impulsive sound’ and, if so, whether a quantitative or a qualitative definition was needed (or both).

Everybody agreed that there is need for a qualitative definition, some thought in addition that also a quantitative definition was needed. Southall et al. (2007) define a pulse in both ways. An alternative would just be a list of sources that are included under indicator 11.1.1. Danger of having both is that they may partially contradict each other.

The group agreed that the way ahead would be to list the sources of concern and suggest a definition of a “pulse” inspired by Southall et al. (2007).

2. Product 2.2: Methodological standards - Michael Ainslie

A separate project has been running on defining methodological standards on noise. The TNO report has been published this week and is available through the following link: (http://www.informatiehuismarien.nl/ihm/themas/Shortlist_Ecologische_Monitoring_Wind_op_Zee/Geluidsonderzoek/, “Standard for measurement and monitoring of underwater noise, Part I: physical quantities and their units”)

The TSG agreed to distribute this report and to recommend the standard terminology used in this report.

3. Product 2.3: Framework of options - René Dekeling

Product 2.3 gives a framework of options on scale, sound sources and number of days. Furthermore it explains the reasoning behind the indicator.

Purpose of indicator 11.1.1

First of all the question was asked to the TSG whether everybody agrees that indicator 11.1.1 addresses displacement. The reason for this is in the document 2.3, i.e. that displacement affects a part of the population and is a measurable reaction.

The TSG agreed that indicator 11.1.1 addresses displacement.

The TSG agreed that this does not imply that other effects are not relevant or that other effects should not be addressed in future. It was agreed that injury and TTS, caused by specific projects, should be addressed in Environmental Impact Assessments (EIAs). The MSFD-indicator addresses regional and cumulative effects, rather than local (though possibly serious) effects caused by individual projects. Each MS should already have sufficient legislation in place to deal with this.

Further the TSG concluded that it addresses “considerable displacement”, this means displacement for a significant time period or spatial scale. In the words of Southall et al., it does not address evasion (low level severity response), but rather the long distance and longer duration displacement or habitat loss.

The initial use of this indicator will be to get an indication of the pressure, i.e. an overview of all impulsive sound sources, through the year and through areas. A possible follow-up in future would be to set a target and potentially adopt specific measures to meet the target. It was pointed out that indicator 11.1.1 is a pressure-indicator, and a possible future target would thus be in the form of a threshold on the proportion of days and their distribution. Some members of the TSG saw this indicator as a tool for Marine Spatial Planning.

Framework of options

Product 2.3 discusses three options for addressing indicator 11.1.1.

Option 1 is the approach suggested by the TG 11, a single threshold value.

All members of TSG agreed that the approach was valid but some felt that the justification of the current values was flawed. They considered that it might be better to say that the levels chosen were arbitrary, instead of trying to justify them. All agreed that the values should be adjusted in the future in the light of further research.

Option 2 is based on a risk assessment framework.

All members of TSG agreed that this approach was also valid, but the main problem with this option is lack of data. At this time most TSG-members agreed that for their region there is simply not enough quantitative data available to apply this even to the best-studied species. However, this option is the preferred option of many members of the TSG, because it takes biological effects best into account and has the best scientific background. Some members even claim that there is already enough data available for harbour porpoise to use this option. For other areas and other species of concern this option should be further developed, incorporating new information, to become common practice within the next six years.

Option 3 is an inventory of sources.

This option allows a more qualitative description. The main difference compared with Option 1 is that it is made more flexible by taking into account characteristics of the source other than source level. The inventory of sources would be a mix of expert opinion and supported by reasoning. In the inventory different levels for each activity would be included. This will work better than single threshold for all sources. This option was seen as very practical.

The TSG agreed that option 3 is the most pragmatic and practical at present for most areas and most species. However, in the next 6 years options 1 and 2 could be further developed, if further information became available from research. Where it is already possible to use option 2 instead of option 3 this is the preferred method.

A proposal for an inventory of sources and levels was presented. It was agreed that this would be further worked on in the coming weeks. TSG members are invited to consider what other activities should be in and which threshold levels, in order to exclude non-relevant sources. The list should become a practical tool for MS to use.

The following points were brought up that should further be addressed when making up the inventory of sources:

- refer to the list of sources and their levels in the TG 11 report, in Southall et al. and in the DECC report distributed at the first meeting of TSG Noise;
- whether or not to include a threshold for the type of seismic survey;
- whether or not explosions should be part of the indicator (because mostly they are single events);
- whether or not military sonar can and should be included.

Furthermore it was noted that although some sounds in the broad spectrum emitted by shipping have a impulse-like character, the indicator excludes shipping noise.

4. Product 2.4: Proposal for the establishment of a sound register - Mark Tasker

Mark Tasker presented the UK example of a noise registry. The UK has chosen to use oil & gas licensing blocks (10 min lat and 12 min long), because those blocks are already used in registering seismic surveys, the most common source of loud impulsive low and mid frequency sound in UK waters. All data were converted to shot points and then converted to area. The exercise revealed some limitations in the notification and reporting process for seismic surveys; these are being addressed by the UK authorities.

For the entire UK area the average proportion of days was 0.7%. However, distribution of sound sources is very heterogeneous; a large part of the area has no or very few activities while other parts have much more activity.

The TSG considered this a good start and very practical for managers to work with. The TSG agreed there is a need for guidance on a sound register. It was suggested that the UK would come up with a paper on how this exercise was done as guidance for other MS, this should include a manual to collect data on pile-driving and seismic surveys. The UK urged other MS also to send in their register of sound sources, in order to test the system for other MS and to come up with a register that can be used by all.

It was agreed that, after a draft of the document on the framework of options (product 2.3) has been prepared, a request for data will be sent out to MS by the EC

Some members of the TSG still had some concerns on the exact use of this indicator. They were afraid that setting a target on the number of days will imply that on other days one can make as

much sound as possible. It was pointed out again, that individual activities also have to be licensed through an EIA or similar procedures.

Some members also suggested that sounds might be further categorised in the register, for example 'loud' and 'very loud' sound sources. This might help in distinguishing trends in various sound types and might enable the loudest (most disturbing) sounds to be addressed first.

5. Product 3.1: Interpretation of indicator 11.2.1 - Frank Thomsen

Product 3.1 is a short document interpreting indicator 11.2.1, it focuses on three parts of this indicator: 1) trends, 2) average noise level, 3) the use of models.

The discussion focussed on whether this interpretation allowed for both measurements and models. Some interpret the way the indicator is phrased now in that you always have to measure, this would be too restrictive. The TSG was divided over the question whether having only measuring at representative sites or modelling (based on data) was to best approach to address this indicator.

After a short presentation by Thomas Folegot on QONOPS, the TSG agreed that in addition to the necessary measurements, additional modelling is feasible. Models will also be improved in the future years, so the TSG should not exclude this option. Furthermore, modelling can be a cost-effective way to get data. It was also noted that in order to get a trend you do not need many measurement points, as long as the ones that are picked out are representative. Modelling can be used in addition to monitoring to iron out changes caused by things you are not interested in (for example the change of location of a shipping route).

It was concluded that the document could be accepted by the TSG with a slight change of wording making it clear that the trend in ambient noise can also be identified by modelling.

6. Products 3.2/3.3: Monitoring scheme for low frequency continuous sounds and technical specifications - Frank Thomsen & Michel André

The report on product 3.2 and 3.3 will be a summary report. The outline report lists ambient sound monitoring known to its authors. TSG Noise members were invited to add any further initiatives to the list of projects.

There was a short discussion on baseline data. Germany indicated that they had measurements from 30 years back from a silent area, which could be used as a baseline for that area and similar ones. The UK has found that past data could often not be used due to methodological issues.

The TSG decided that a draft report would be ready by the end of October. Comments can be send up to mid-November and the final product will be ready end of November.

The following contributions are expected:

- Info on Irish project (Mary Meacle)
- Info from Slovenia & Croatia (Leo de Vrees)
- Info from Sweden (Peter Sigray and Mathias Andersson)
- Text from Stephen Robinson on technical specifications

TSG Noise recommends that MS store all measured data, not only the data in the required frequency range.

7. Product 4.1: Other forms of energy

A first draft of this product was produced, based on the TG11 report. The product includes both other noise sources and other forms of energy.

The TSG concluded that the document should advise on the way forward. It should do that by prioritising indicators that could be developed practically in the near future, rather than just give an overview of all possibilities.

The TSG decided that the following sources of energy should be given priority for the development of indicators:

- 1) High frequency impulsive sounds: TG 11 suggested an indicator for this sound source. However, possibly because the indicator was phrased as a target rather than as an

indicator and because of lack of evidence of impact, the Commission decided not to use this indicator in the initial list of indicators of GES. Research on the use of these sources and their effect on the marine environment is required. Raising the awareness of producers, users and industries might help stimulate research and mitigation measures.

- 2) Electromagnetic fields: there is some evidence that these affect some marine species. Electromagnetic field may increase significantly in the near future due to an increase in the number of wind parks and associated cables. The TSG thought it worthwhile to review this issue at a future meeting and to invite experts in the topic to contribute. It was also noted that even though this may be a future problem, EIA also applies to the activity and that there may be mitigation possibilities.

It was recognised that high frequency impulsive sounds has the higher urgency, since there are probably other ways to regulate electromagnetic fields. For both indicators further evidence as well as a proposal for an indicator might be considered at the next meeting of the TSG Noise. High frequency impulsive sounds could be split into horizontal sonars and downward-pointing sonars.

Other possible sources of energy were considered, but not recommended for further development as indicators at present:

- heat release at large scales is only coastal and is covered in the WFD;
- light at sea is an issue that is currently being addressed by OSPAR and the outcome of this process should be awaited before starting to develop anything;
- the use of ADD and ADHs ('pingers') was not considered further, as a problem could not be demonstrated;
- particle motion and sound induced effects expressed in terms of perceived levels. Technically these are not other sources of energy, but sources described in a different way. However, these may be further explored if there is evidence of serious impacts of these sources.

The TSG will combine this product with product 6.1 (research needs).

8. Product 5.1 Considerations on GES and target setting

The WG GES meeting in September, in addition to the outlined work package asked the TSG Noise to provide a short report with consideration on how GES could be determined and how targets could be set, soon after the meeting, in order to be sent to MSCG (14 November) and Marine Directors (7-9 December).

The representative from the EC indicated that the discussions from the past few days can be turned into considerations. The chairs agreed to construct this document and circulate it within the TSG for comments soon after the meeting (see Annex 1).

Furthermore the TSG urged the EC to convey to the marine directors the need to supply further information on the occurrence of loud impulsive, low and mid-frequency sounds in order to develop a proposal for a sound register based on more than one MS's information.

9. Product 6.1 Recommendations for further research - Michel André

A list of possible future research was presented. The list was based on recommendations from Southall et al. (2007) and the report of the US Marine Mammal Commission of 2007.

The TSG agreed that this should not be the final product of the TSG as it lacks focus. The TSG should focus on the need of MS for implementing the MSFD. It was suggested that the product should address the following categories:

- 1) Understanding the impacts of noise and how Good Environmental Status can be described. At the moment it is impossible to define levels of elevated ambient noise and cumulative levels of loud low and mid frequency impulsive sounds from man-made sources that would affect the marine environment to the extent that it would not be considered to be at GES. This is due to insufficient knowledge on the impacts of these noises on the marine environment. Further knowledge is needed to enable MS to set meaningful targets, possibly this will not be done in time for the 2012 reporting, but more information should be available by the next reporting round in 2018.
- 2) Research on issues that have not been addressed yet, for example high-frequency masking, effects of light, electromagnetic fields, etc

3) Things that help technical development, for example development of models

The TSG decided that the product should be further discussed by mail within the focus group and finalised before the end of November.

10. Follow-up and future work

All products should be finalised before the end of the year. In the list with product, deadlines for versions of each product and for comments are given. These will be strictly kept.

There was consensus on continuation of the TSG. In future TSG Noise could, if asked, address the following issues:

- Making the present indicators mentioned in the Commission Decision of 2010 operational
- Development of monitoring systems/register and acoustic standards
- Interpretation of the results
- Assist in future target setting
- Develop, if necessary, additional indicators on noise or other forms of energy based on new evidence
- Assist in defining priority research needs

In the future, it is advised that a wider range of MS will be represented, as well as a representation of the regional sea conventions. Additionally, for some meetings additional experts on a specific topics (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.

A proposal for a new work package and a Terms of Reference will be written by the chairs and the EC, including the issues above. If the Marine Directors meeting in December decides to ask the TSG to continue, the next meeting might be in March or April 2012. This meeting could possibly be held in Barcelona, Spain.

Annex 1 Documents on Considerations (Chairs paper for the MSCG 14 November 2011)

Annex 2: Updated work programme

ANNEX 1

Considerations on how to describe GES and set targets for indicators of underwater noise

– submitted to the MSCG 14 November 2011

Please note that this is a paper of the chairs of the Technical sub-group on underwater noise (part of the TSG covering litter and noise) (TSG noise), summarizing the work of the group. However, work of the TSG noise is still in progress, so the final conclusions of the sub-group may differ slightly.

1. Summary

Prior to the inclusion of underwater energy in the Marine Strategy Framework Directive (MSFD), underwater noise had not been explicitly addressed in European legislation. At present there is insufficient knowledge of the impact of anthropogenic sound on biota to be able to advise on its significance to populations. In the case of some aspects of anthropogenic sound, little is known of the geographic or temporal distribution of its production or of any trends in these parameters. In 2012, it will therefore only be possible for most MS to describe GES and set targets in qualitative terms. However, TSG Noise recommends MS to start registering the distribution of loud, impulsive, low and midfrequency sounds, and monitoring sound levels of low frequency ambient sound, as soon as possible but at the latest by 2014, in accordance with MSFD art 5 a (iv). TSG Noise also recommends further research into the effects of underwater sound at the population level. Successful implementation of these activities should provide a good base of knowledge and enable more quantitative targets to be established by the review in 2018.

2. Impulsive Sound

2.1 Interpretation of the indicator on Impulsive Sound

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

Definition of impulsive sound

TSG Noise discussed several options for a definition for impulsive sound. TSG Noise will specify those further and will conclude in their final document.

TSG Noise stresses that measuring the sound pressure in relation to Sound Exposure Level should not take place at 1 metre from the source, as the original text of Indicator 11.1.1 expresses. Based on this point, TSG noise suggests the following clarification / interpretation of indicator 11.1.1:

*Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re $1\mu\text{Pa}^2\cdot\text{s}$) or as peak sound pressure level (in dB re $1\mu\text{Pa}_{\text{peak}}$) **referred (back-calculated) to one metre, measured over the frequency band 10 Hz to 10 kHz.***

Table 1 provides an indicative list of activities likely to generate impulsive sounds between 10 Hz and 10kHz that may cause significant impact on marine animals.

Aim of the indicator

TSG Noise agreed that the impact that is addressed by this indicator is “considerable” displacement. This means displacement of a significant proportion of individuals for a significant time period and spatial scale.

Information that should enable this impact to be assessed and addressed would come from an inventory of "pulse-block-days" registered over the EUs regional seas.

The indicator is addressing the cumulative impact of activities and possible associated displacement, rather than that of individual projects. Environmental Impact Assessments (EIA) can be used to limit the environmental impacts of individual projects. TSG noise noted also requirements of other European legislation that restricts the effects that underwater sound may have on certain marine animals. Options for mitigation are also included as part of EIA procedures.

2.2 GES and Targets on Impulsive Sound

At the moment it is difficult to give a more specific description of GES beyond the text of the Directive: *Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment*. This is due to insufficient knowledge on the cumulative impacts of impulsive sound on the marine environment.

The initial purpose of this indicator will be to assess the pressure, i.e. an overview of all loud impulsive low and mid-frequency sound sources, through the year and through areas. This will enable MS to get an overview of the overall pressure from these sources, which has not been achieved previously. A necessary follow-up in future years would be to evaluate effects on biota and set targets and potentially take measures. Indicator 11.1.1 is a pressure-indicator, and a possible future target would thus be in the form of a threshold of, or a trend in, the proportion of days when these sounds occur and in their spatial distribution.

2.3 Register of Impulsive Sound

A first step is to establish the current level and trend in these impulsive sounds. This should be done by setting up a register of the occurrence of these impulsive sounds. TSG Noise recommends that MS work together to set up such a register, both at the regional level and the EU level.

Setting up a register

The design (and possibly implementation) of a register will be one of the most important tasks for MS in the next year.

The TSG urges MS to submit any registered data on impulsive sounds that they have in order to assess the formats in which information is currently held and to allow a proposal to be made to establish a common register. This exercise would give a first overview of the current level of sound and the distribution of sound sources.

Sound Sources

The TSG considered several approaches for addressing this indicator. The approaches were based on i) single thresholds, ii) a risk assessment framework or iii) an inventory of sources. Most TSG members agreed that the third option would be the most pragmatic and practical for the moment and that in the next 6 years the option based on the risk assessment framework (second option) should be further developed particularly following information that further research should gather. However, some TSG-members believed that enough knowledge is available for the harbour porpoise to start applying the second option and they favour that approach.

The inventory of sources is derived from expert opinion, supported by reasoning.

The TSG Noise proposal will probably include the following sound sources to be taken up in the register. Suggestions for MS to adopt as the level(s) and threshold(s) for significant impact are still under discussion in TSG noise.

Table 1. Indicative list of activities and sources likely to generate impulsive sounds between 10 Hz and 10 kHz that may cause significant impact on marine animals.

activity	type of source	parameter chosen to characterise source
seismic survey	air gun array	source strength in main beam (assumed vertical)
sonar search	low or mid-frequency search sonar	(energy) source level in main beams (assumed horizontal)
offshore construction	pile driving	hammer/vibrator energy
use or disposal of explosives	explosion	equivalent mass TNT charge

Spatial scale

Ideally grid size should be in the same approximate spatial scale as the impacts of the source, however, this varies per species and source. TG11 suggested units of ¼ ICES statistical rectangle (15 NM N/S x 30 min E/W). This was a precautionary choice as the empirical evidence for one species (harbour porpoise) indicates average effects of marine piling at ranges beyond 20 km. Other grid units might be the block system used to license oil and gas activities (most NW European MS have such a system).

In order that TSG Noise might best advise on possible format(s) of the register, MS are asked to submit data on the scale at which they are available. The actual choice of grid definition, and the size of the grid cells, is a choice made by MS and often will be based on practical considerations, e.g. in the UK data is registered in standard hydrocarbon licensing blocks of 12 minutes latitude by 15 minutes longitude. However, this does not pose a problem: if the grid size is not in the same spatial scale as the impacts of the source, a correction factor can easily be applied when comparing results of different MS or for definitions of targets. This correction factor would in principle be the ratio impact size/registry grid size.

Temporal scale

Ideally one would want to define an appropriate time scale on an ecologically relevant level, however, this varies between species. Since no ecological data or studies are available to determine an appropriate time scale, TSG noise proposes to use days. This is only for ease of use and is not scientifically founded.

Proportionality

The indicator as described in the Commission Decision does not provide explicitly for proportionality. This could however be addressed to some extent by making a provision for a register that classified sound sources into more than one category (e.g. 'loud' and 'very loud').

2.4 Knowledge gaps

The TSG focussed on helping MS to implement MSFD. Advice will therefore fall into the following categories:

- 1) Understanding the impacts of noise on biota, what does GES mean? This will help MS to determine what is GES is and what not by 2018.
- 2) Research on issues that have not been addressed yet, for example high-frequency masking, effects of light, electromagnetic fields, etc
- 3) Technical development, for example of models

3. Ambient noise

3.1 Interpretation of the indicator on Ambient Noise

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

There has been some variation in the understanding of the proposal in the TG11 report, probably due to variation in understanding of the terminology surrounding the complex issue of underwater sound and its (possible) effects. The TSG therefore developed proposals for definitions of the terms used in Indicator 11.2.1 indicated in bold and any related issues.

- **Trends** TSG noise refers to the explanation of the Oxford Dictionary, which defines 'trend' as 'general direction in which something is developing or changing'. Following this, 'trend' refers to year-to-year (or longer) changes in ambient noise levels.
- During the meeting in February, TSG noise discussed what kind of **average noise level** would be appropriate. Details of this await further consultation. As a first approach TSG noise suggests using the mean square pressure. Unlike other types of averaging, it is expected to be robust to changes or differences in the duration of individual time samples.
- With regards to the **use of models**, the purpose of the change is to clarify that the measurements are considered essential, whereas the use of modelling would strengthen the analysis by addressing bias introduced by the variability of the spatial distribution of human pressure, and by the natural variability of the environment, and to extend the monitoring to poorly or un-covered areas.

Based on these points, TSG noise suggests the following clarification / interpretation of indicator 11.2.1:

Trends in the annual average of the mean square sound pressure associated with ambient noise in each of two third octave bands, one centred at 63 Hz and the other at 125 Hz, expressed as a level in decibels, in units of dB re 1 µPa, either measured directly at observation stations, or inferred from a model used to interpolate between or extrapolate from measurements at observation stations.

3.2 GES and Targets on Ambient Noise

At the moment it is impossible to define those elevations of ambient noise from anthropogenic sources that would cause the marine environment to not be at GES. This is due to a lack of knowledge on the impacts of elevated ambient noise on the marine environment.

The TSG cannot therefore advise on a level of ambient noise that could be set as a target for this indicator. However, since shipping is probably the largest contributor to low frequency ambient noise, the International Maritime Organisation (IMO) will be involved in potential future measures. Recently, the IMO has made general recommendations on technical possibilities to reduce shipping noise and agreed that uncertainty should not preclude working on the issue of quieting technologies for commercial ships. Under IMO, there is an active correspondence group that has recently published a recommendation paper with non-mandatory technical guidelines towards reducing ship noise.

There are other fora working on this issue, for example the Scientific Committee of the IWC (the International Whaling Commission) that has endorsed targets to reduce shipping noise

3.3 Monitoring of Ambient Noise

A first step is to establish the current level and any trend in ambient noise. This should be measured directly at observation stations, or inferred from a model used to interpolate between or extrapolate from measurements at observation stations..

The TSG Noise recommends that MS start a measurement programme as soon as possible in order to be able to define the current levels and trends in ambient noise (from shipping) by 2018

3.4 Knowledge gaps

In addition to ambient noise monitoring, the main knowledge gap for this indicator is the impact of ambient noise on the marine environment. TSG noise advises further research into this subject. The TSG notes that the EC has just issued calls for research proposals on this issue.

ANNEX 2: Updated work programme TSG Noise

Products	Lead and group members
Product 1.1: Summary of experiences within Member States <ul style="list-style-type: none"> <i>Is something is received we will incorporate</i> 	Lead: Sandra van der Graaf
Product 1.2: Review of existing knowledge on noise monitoring methods and other noise issues <ul style="list-style-type: none"> <i>Comments next 2 weeks – 21 october</i> <i>Final product 1 november</i> 	Lead: Michel André Group: Thomas Folegot, Cedric Gervaise
Product 2.1: Glossary of indicator terminology (under water noise terminology) <ul style="list-style-type: none"> <i>Comments next 2 weeks (21 October) on everything except impulsive sound, John deals with feedback</i> <i>Impulsive sound Michael Ainslie will send something on impulsive sound 1 November ready</i> <i>1 November both parts ready</i> 	Lead: John Dalen & Michael Ainslie Group: Michael Ainslie, Stephen Robinson, Cédric Gervaise
Product 2.2: Methodological standards for describing source levels of low- and mid-frequency impulsive sounds <ul style="list-style-type: none"> <i>Write paragraph referring to the other initiatives, before 1 November</i> 	Stephen Robinson
Product 2.3: A framework of options for Member State decisions on levels of anthropogenic sound sources that exceed levels that are likely to entail significant impact on marine animals <ul style="list-style-type: none"> <i>René and Sandra will finish document</i> <i>For list of sources: look at it and come up with concrete suggestions to fill in the table (threshold, duration, additional sources if needed; and what is it based on) – before 21 October</i> <i>Next version document 1 November</i> 	Lead: René Dekeling Group: Michael Ainslie, Arjen Boon, Alexander Liebschner, Karsten Brensing, Frank Thomsen, Stefanie Werner, John Young, Michel André, Mark Tasker, Jukka Pajala, Russell Leaper
Product 2.4: Proposal for the establishment of a register of loud impulsive low-and mid- frequency sound sources <ul style="list-style-type: none"> <i>UK experience as an example, plus general description – draft by 1 November</i> <i>NL will send an unlocked pdf to Mark next week</i> 	Lead: Mark Tasker Group: Frank Thomsen, René Dekeling, Stefanie Werner, Karsten Brensing, John Young, Alexander Liebschner

<p>Product 3.1: Interpretation of indicator 11.2.1</p> <ul style="list-style-type: none"> • <i>Change of wording – Final draft by 1 November</i> 	<p>Leads: Michael Ainslie and Frank Thomsen Group: Stephen Robinson, Alexander Liebschner, Mathias Andersson, Cédric Gervaise, Karsten Brensing, Stefanie Werner, Russell Leaper</p>
<p>Product 3.2: Proposal for a monitoring scheme for low frequency continuous sounds & Product 3.3: Technical specification of monitoring equipment</p> <ul style="list-style-type: none"> • <i>Next draft by 1 November</i> • <i>Comments to mid-November</i> • <i>1 December Final Version</i> 	<p>Lead: Frank Thomsen (3.2) + Stephen Robinson (3.3) Group: Cédric Gervaise, Mathias Andersson, Thomas Folegot, Stephen Robinson, Karsten Brensing, Jukka Pajala, Russell Leaper</p>
<p>Product 4.1: Assessment of the need to develop criteria and indicators for other forms of energy & Product 6.1 Recommendations for further research</p> <ul style="list-style-type: none"> • <i>Comments up to 21 October</i> • <i>Proposal for structure by 21 October</i> • <i>Draft version 15 November</i> • <i>Short comment round- 1 week</i> • <i>Final version 1 December</i> 	<p>Lead: Karsten Brensing & Stefanie Werner & Michel André Group: Arjen Boon, Stephen Robinson, Stefanie Werner, Alexander Liebschner, Cédric Gervaise</p>
<p>Product 5.1: Considerations that may be taken into account when defining Good Environmental Status</p> <ul style="list-style-type: none"> • <i>Draft by 1 November</i> • <i>Comments up to 4th of November</i> • <i>Ultimate deadline for final product: 7 November</i> 	<p>Lead: Sandra van der Graaf & Chairs</p>
<p>Product 7.1: Interim reports for the WG GES</p> <ul style="list-style-type: none"> • <i>15 March 2011 (3 weeks before 5 April 2011)</i> • <i>6 September 2011 (3 weeks before 27 September 2011)</i> 	<p>Lead: Sandra van der Graaf & Chairs Support and review: all</p>
<p>Product 7.2: Final report</p> <ul style="list-style-type: none"> • <i>31 December 2011</i> • <i>Support from a contractor through Leo</i> 	<p>Lead: Sandra van der Graaf & Chairs Support and review: all</p>