



# OSPAR Joint Ambient Noise Monitoring Programme for the Greater North Sea (OSPAR Region II)

(OSPAR Agreement 2022-06)

## **OSPAR joint monitoring programme for the Greater North Sea (Region II)**

The Agreement applies only to the Greater North Sea, defined as OSPAR Region II.

### **1. Background: From an Interreg NSR project towards operational monitoring**

In the Interreg North Sea Region JOMOPANS project, seven countries around the North Sea have worked together on the monitoring of ambient noise. Various elements of operational monitoring have been developed and used in JOMOPANS. These elements form the foundation to develop an OSPAR joint monitoring programme for the Greater North Sea. The elements must, therefore, be transferred from a typical project environment to an environment of operational monitoring under the auspices of OSPAR. This requires a different type of organisation that is compatible with the existing national monitoring activities of the North Sea countries. The monitoring programme should also relate to the agreements within OSPAR and fulfil the requirements by the EU Marine Strategy Framework Directive (MSFD) as stated in “Assessment Framework for EU Threshold Values for continuous underwater sound” (published 2021) and a report on threshold values (to be published in 2022) .

### **2. Aim of the OSPAR Joint Monitoring Programme for Ambient Noise in the North Sea**

The aim of the OSPAR Joint Monitoring Programme in the North Sea is to produce one set of maps of ambient noise for the North Sea, as needed to supply the key information to the OSPAR and MSFD assessments. These maps should give a seamless picture of the noise distribution on the North Sea and should show no discontinuities along national boundaries. Measurements at stations across the North Sea and the validation of the modelling with measurements will remain a national responsibility, but the geographical distribution of measurement stations provides a coordinated coverage for the North Sea.

Since sound and sound sources (ships) propagate across borders, another aim of the programme is to coordinate and seek synergies or harmonise with regions bordering the North Sea. These regions include the Arctic Waters (OSPAR region I), the Celtic Seas (OSPAR region III) and the Baltic Sea (HELCOM).

### **3. Spatial and temporal scope**

This Agreement is to implement a Joint Monitoring Programme in the North Sea which forms an integral part of the OSPAR Monitoring Strategy for Ambient Underwater Noise ([Agreement 2015-05](#)).

The Agreement applies only to the Greater North Sea, defined as OSPAR Region II. It has a run time of 6 years corresponding to the regular reporting cycles to inform the OSPAR and MSFD assessments. On completion of the 6 year cycle the agreement will be reviewed and can be renewed. The next OSPAR assessment will be the Quality Status Report in 2023. The OSPAR reporting cycle is designed to align with the MSFD cycle, such that the OSPAR assessments can be used for the MSFD as well. The next reporting year for the MSFD is 2024. For this it is necessary that the assessment is compatible with the Guidance from TG Noise.

#### **4. Programme elements**

The implementation of the OSPAR Joint Monitoring Programme in the North Sea requires the following elements:

- a. a coordination subgroup under Intersessional Correspondence Group on Underwater Noise (ICG Noise) (or ICG Noise itself) that facilitates the cooperation of participating institutions within the Greater North Sea Joint Monitoring Programme as well as between OSPAR regions and with HELCOM;
- b. Revision as required to take account of Guidance given by TG-Noise, in the Documents DL3 (already agreed and published by EU) and DL4 (coming soon in 2022)
- c. ambient noise measurements at several stations across the North Sea, carried out under the responsibility of the national authorities and using the OSPAR's Coordinated Environmental Monitoring Programme (CEMP) guidance. Each year a basic measurement effort will be performed, and every 6 years an extended measurement effort with stations covering the whole of the North Sea;
- d. technical work for the OSPAR Joint Monitoring Programme, split over the following shared tasks:
  - i. yearly review of AIS/VMS intensity to inform the modelling effort;
  - ii. yearly modelling of sound propagation to produce the soundscape maps;
  - iii. yearly validation of the soundscape maps with all the measurement data;
  - iv. intermediate assessments of ambient noise when needed (to be decided by ICG Noise/EIHA).
- e. coordination of the validation of modelling with measurements by independent expert institutions (including national institutions);
- f. technical support to the OSPAR Joint Monitoring Programme, which includes support for the GES Tool, the database of measurements and noise maps by expert providers and support for the standardisation process for underwater noise;
- g. an annual progress report to EIHA from ICG Noise , supported by the OSPAR Secretariat.

#### **5. Financial burden sharing**

The Contracting Parties will be working separately on some tasks of the OSPAR Joint Monitoring Programme (such as measurement, data quality management), but there will be a distribution of other tasks to make use of one another's expertise. Each party will perform one or more tasks, such that the burden of the programme is spread evenly among the North Sea countries. Annex 1 of this document describes the financial burden sharing mechanism that participating Contracting Parties will endeavour to fulfil. Budget estimates for the different tasks are used as the distribution key in this regard. Because these estimates may differ from practice, the actual burden per country will be evaluated, compared and discussed during a Midterm Review (see below). This way of burden sharing makes it possible to

implement the Joint Monitoring Programme in the most cost-effective manner but without budgets being transferred between countries.

## **6. Management and reporting**

The OSPAR Joint Monitoring Programme will be co-ordinated by a subgroup of the ICG-Noise. The subgroup will report every year to ICG-Noise about the progress of the programme, who in turn report to EIHA. The EIHA Committee will act as the main decision-making body of the OSPAR Joint Monitoring Programme.

## **7. Review**

The OSPAR Joint Monitoring Programme for the Greater North Sea (region II) will undergo a Mid-term Review after 3 years. The main purpose of this review will be to evaluate whether the programme has succeeded to supply the key information to the OSPAR and MSFD assessments and to propose necessary adaptations for the next implementation cycle. It will provide an opportunity to make modifications where the progress in relation to the cycles of OSPAR and the MSFD might not be on track. Another purpose of the Mid-term Review will be to help identify budget overruns, which may cause a country to have a particularly high share in the burden. The findings and any recommendations from the Mid-term Review will be submitted to EIHA for its consideration.

The Programme will also be reviewed after each OSPAR Quality Status Report or Intermediate Assessment beyond 2023. Any changes to the Programme will be reflected in an updated Agreement.

## Annex 1: Financial burden sharing scheme for the ambient noise monitoring in the North Sea

Annex 1 is provided to EIHA 2022 for information only.

This part describes the principle of the financial burden sharing in the monitoring programme and outlines the budget estimates that act as a sharing mechanism as regulated by article 5 of the Agreement. The precise task allocation is not yet completed and therefore table 2 is still empty.

The budgets mentioned in this part are estimated based on experience. It should be noted that the estimates for measurements are the least reliable and are highly dependent on national choices for the programme and the national organisation.

Table 1: Work break down of joint monitoring programme for the North Sea.

| Activity / task       | Y1                        | Y2               | Y3               | Y4                 | Y5               | Y6               | Total              |
|-----------------------|---------------------------|------------------|------------------|--------------------|------------------|------------------|--------------------|
| Programme management  | € 50 000                  | € 50 000         | € 50 000         | € 50 000           | € 50 000         | € 50 000         | € 300 000          |
| Technical support     | € 25 000                  | € 25 000         | € 25 000         | € 25 000           | € 25 000         | € 25 000         | € 150 000          |
| Collect information   | € 40 000                  | € 40 000         | € 40 000         | € 40 000           | € 40 000         | € 40 000         | € 240 000          |
| Modelling             | € 50 000                  | € 50 000         | € 50 000         | € 50 000           | € 50 000         | € 50 000         | € 300 000          |
| Measurements          | € 408 400                 | € 408 400        | € 408 400        | € 1 425 400        | € 408 400        | € 408 400        | € 3 467 400        |
| Evaluation            |                           |                  | € 65 000         |                    |                  | € 65 000         | € 130 000          |
| Technology management | € 50 000                  | € 50 000         | € 50 000         | € 50 000           | € 50 000         | € 50 000         | € 300 000          |
| <b>Totals</b>         | <b>€ 623 400</b>          | <b>€ 623 400</b> | <b>€ 688 400</b> | <b>€ 1 640 400</b> | <b>€ 623 400</b> | <b>€ 688 400</b> | <b>€ 4 887 400</b> |
| <b>Average</b>        | <b>€ 814 600 per year</b> |                  |                  |                    |                  |                  |                    |

Table 2: Tasks volunteered by Contracting Parties

| Work parcel              | Netherlands | Belgium | UK | Norway | Sweden | Danmark | Germany |
|--------------------------|-------------|---------|----|--------|--------|---------|---------|
| Coordination             |             |         |    |        |        |         |         |
| Technial support         |             |         |    |        |        |         |         |
| Collect information      |             |         |    |        |        |         |         |
| Modelling                |             |         |    |        |        |         |         |
| Cabled near              |             |         |    |        |        |         |         |
| Cabled near              |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone near          |             |         |    |        |        |         |         |
| Standalone far           |             |         |    |        |        |         |         |
| Standalone far           |             |         |    |        |        |         |         |
| Standalone far           |             |         |    |        |        |         |         |
| Standalone very far      |             |         |    |        |        |         |         |
| Evaluation               |             |         |    |        |        |         |         |
| Assessment and reporting |             |         |    |        |        |         |         |

### Programme management

The programme will be executed as part of the work of ICG Noise (delegated to a dedicated subgroup) and falls under an EIHA agreement to be discussed at EIHA2022(1).

A central programme management should facilitate the cooperation of the people and institutes that comprise the programme. Key for this management is the definition of all tasks and the planning of the activities in time and cost. A multi-year monitoring plan will be made with a yearly update to be agreed by EIHA.

A second objective is the execution of central tasks for the monitoring programme. These are:

- EIHA  
Reporting to EIHA and presentation of status.
- Communication and harmonisation  
Communication to stakeholders.  
Collaboration with other activities (other Regional Sea Conventions, Arctic programme, NOAA, Transport Canada)
- Quality assurance  
At a central level the quality of the total monitoring programme and the process to generate the output should be assessed. A plan needs to be made on how to achieve this.

The following activities are identified:

- Programme management
  - Regular meetings of team
  - Yearly update of monitoring plan if needed
  - Yearly report of the programme to EIHA via ICG Noise
  - Financial report of the programme
  - Participate in OSPAR and EU bodies
- Communication
  - Website
  - Newsletters
  - Press contacts
  - Articles
  - Contacts with other projects and programmes
- Quality assurance
  - Quality plan

The effort of a programme manager is estimated to about 2 days per week for a manager at academic level. Also additional communication and administrative support needs to be included. The budget for coordination can therefore be summarised to:

| Activity / task        | Required budget (per year) |
|------------------------|----------------------------|
| Programme manager      | € 30 000                   |
| Communication          | € 10 000                   |
| Administrative support | € 10 000                   |
| <b>Total</b>           | <b>€ 50 000</b>            |

Note: costs for team members to participate in the ICG Noise subgroup and Programme meetings is not included.

### **Technical support for the programme**

The monitoring programme needs technical support for data and tools:

- Support and hosting of GES Tool
- Data management and storage
- Data dissemination
- Standardisation

The GES Tool is proposed to be implemented by OSPAR Data and Information System (ODIMS). During the development of the tool it will be embedded into ODIMS. Governance on ODIMS will be done by the OSPAR ICG Data working group.

Biological data on species distributions, habitats and sensitivities included in the GES tool must be evaluated and updated through input from relevant fora (such as OSPAR and ICES expert groups).

At the initiative of HELCOM ICES has built a database for ambient sound measurement data. It is advised this database will be used to store the measurements data at an aggregation level that is allowed by the countries (considering national security regulations). Governance of the database is done by EN Noise (HELCOM) and ICG Noise (OSPAR).

Standardisation is important in any international co-operation and Jomopans has contributed various proposal to ISO. Future developments should be followed and supported, including other regional monitoring within the OPAR region.

Costs for new developments and extensions of the GES Tool are not included. About the same amount is budgeted for the ICES data base for measurement data.

An amount of € 5 000 is reserved for supporting the standardisation process. The budget for technical support can therefore be summarised to:

| Activity / task             | Required budget (per year) |
|-----------------------------|----------------------------|
| GES Tool                    | € 10 000                   |
| Database ICES (fixed costs) | € 10 000                   |
| Standardisation             | € 5 000                    |
| <b>Total</b>                | <b>€ 25 000</b>            |

### Collect information

Various input data need to be collected annually, to inform the sound propagation modelling. These data involve the actual human activities that produce continuous sound, and environmental data.

Collect all information in order to be able to do the modelling.

Data on human activities:

- Shipping (AIS and VMS)
- Operational windfarms
- Offshore installations
- Other sources

Environmental data:

- Bathymetry
- Bottom composition
- Wind
- Waves

The major costs for collecting data comes from the purchase of AIS data. AIS is at this moment no open data and has to be purchased. It has been found that these data need an extensive quality control to be useable for sound modelling.

| Activity / task        | Required budget (per year) |
|------------------------|----------------------------|
| AIS purchase           | € 25 000                   |
| AIS quality control    | € 15 000                   |
| Bathymetry and geology | € 0                        |
| Meteorological data    | € 0                        |
| <b>Total</b>           | <b>€ 40 000</b>            |

### Modelling

Tasks for modelling are described in the Jomopans “Guidelines for modelling ocean ambient noise”.

Modelling is a highly specialist activity. A few institutes have numerical models available that are capable and validated to do this type of modelling. Also, the modelling itself requires a lot of attention from specialists.

It is presumed that the modelling will be done by one contacting party for the North Sea region that produce annual sound maps for the complete North Sea region.

The budget for the production of soundscape maps can be summarised to:

| Activity / task  | Required budget (per year) |
|------------------|----------------------------|
| Data preparation | € 5 000                    |
| Modelling        | € 40 000                   |
| Map production   | € 5 000                    |
| <b>Total</b>     | <b>€ 50 000</b>            |

This budget estimation is based on the assumption that the Jomopans modelling approach is repeated annually. It does not include model maintenance, improvement or further development (such as including other sound sources than ships and wind). See 8. Technology Management.

### Sound measurements

Measurements of the local underwater sound are a national responsibility and also the choice of measurement setup. The costs can vary depending on this choice. In this report we give some estimates of these cost based on the Jomopans experience to help the national authorities to make choices and to prepare budget estimates.

Measurement tasks are:

- Jomopans used a mix of recording systems in the stations. We use difference hydrophones, cabled and autonomous stand-alone (battery powered). By coordinating the locations for measurements on a North Sea scale the highest costs reduction can be reached.
- Quality assurance / Quality control (also according to standards)
- Auxiliary data gathering
- Bench mark processing and calibration
- Processing of measurements
  - Unified processed data (1s average, unless national legal restriction apply)
  - Unified/Agreed data format (e.g. HDF5)
- Data hosting and sharing platform
- Data archiving

It is best to organise the measurement on a national level. Equipment, ship resources and local conditions are important and could be handled on a national basis. However, coordination at a regional level are important so a regional coverage of monitoring stations is reach.

Hydrophones and additional equipment need to be deployed on often remote locations, involving equipment costs and logistical costs (ship time). There is a risk of the equipment getting lost during the operation. In most cases the loss of data is considered to be more severe than loss of equipment and it is recommended to have a backup available for the measurement equipment. This is also useful to make the deployment operation more efficient. The existing station can be replaced by a similar station and the data retrieval and battery recharging can be done on land.

It should be noted that no two stations are the same (different equipment, different locations, stand-alone or autonomous). Large differences can be found and the costs will also vary.

### Equipment

Equipment is an investment with a depreciation time of 3 year.

Autonomous standalone systems are listed from € 14,000 to € 25,000. Backup equipment and calibration of this are required.

Extra costs for a cabled station are estimated to be an extra € 25,000 on equipment, especially the cost



of the cable itself. The initial costs for a cabled station are higher, while operational costs can be comparable to autonomous standalone stations.

|             |                               |
|-------------|-------------------------------|
| Equipment   | € 25,000 per station          |
| Extra costs | € 25,000 per cabled station   |
| Calibration | € 10,000 per station per year |

Therefore an autonomous standalone station (and backup) will cost € 26 700 per year on average. For a cabled station (and backup) this is € 35 000 per year on average.

Standalone station=

station+ backup in 3 years=€ 50,000/3= € 16,700 per station per year  
calibration € 10,000 per year=  
€ 26 700 per year.

Cabled station=

station+ backup in 3 years=€ 50,000/3= € 16,700 per station per year  
Cabling etc=€ 25,000 every 3 years  
calibration € 10,000 per year=  
€ 35 000 per year.

#### **Mobilisation/demobilisation and/or service**

Mobilisation costs were listed from € 6,000 per recovery (near shore) to € 35,000 per recovery (far), but also € 40,000 to € 50,000 per year. For some countries a combination with other survey trips can be made, thus reducing the costs considerably. For a very far station at the centre of the North Sea these costs are even higher.

|              |  |
|--------------|--|
| Mobilisation | € 25,000 per year for a near station     |
| Mobilisation | € 50,000 per year for a far station      |
| Mobilisation | € 75,000 per year for a very far station |

#### **Personnel/management**

It is not very clear what costs were included in the management of measurements. The costs range from € 5,000 to € 25,000 per year. In the used numbers processing is excluded.

|           |                               |
|-----------|-------------------------------|
| Personnel | € 20,000 per year per station |
|-----------|-------------------------------|

#### **Processing**

The data from all station have to be processed and stored in the database. The costs for this is:

|            |                               |
|------------|-------------------------------|
| Processing | € 20,000 per year per station |
|------------|-------------------------------|

#### **Summarising the different stations:**

|                               |                    |
|-------------------------------|--------------------|
| Near shore standalone station | € 91 700 per year  |
| Far standalone station        | € 116 700 per year |
| Very Far standalone station   | € 141 700 per year |
| Near cabled station           | € 100 000 per year |

A scenario has been chosen to come to a final budget estimate. We make a distinction between a base year and an intensive year.

In a base year in total 4 measurement station are operational (2 cabled near shore station, 1 stand-alone near shore station, 1 stand-alone far station).

In an intensive year in total 14 stations are operational (2 cabled near shore station, 8 stand-alone near shore station, 3 stand-alone far station, 1 stand-alone very far station).

| Activity / task          | Required budget (base year) | Required budget (intense year) |
|--------------------------|-----------------------------|--------------------------------|
| Station costs, equipment | € 123 400                   | € 390 400                      |
| Mobilization             | € 125 000                   | € 475 000                      |
| Personnel                | € 80 000                    | € 280 000                      |
| Processing               | € 80 000                    | € 280 000                      |
| <b>Total</b>             | <b>€ 408 400</b>            | <b>€ 1 425 400</b>             |

### Evaluation maps

Using the soundscape maps and the measurements, a validation is performed and confidence maps will be calculated.

- Use measurements at different locations (with different sediment type, water depth, temperature and ocean condition).
- Comparison of measurements with models must be executed using statistical techniques (to be determined).
- Identify environmental parameters which are more important than others. For example: sediment grain size.
- Make an estimate for the uncertainties there are, based on measurements we have. Prediction at site level. Do we have enough data points to do the statistics? This can be figured out when doing it.
- Evaluate the soundscape maps
- produce confidence maps
- Compute exposure/risk maps

The validation and production of confidence maps is also a highly specialist activity. The production of risk maps and risk curves is closely related to the assessment and is considered to be done by the countries (7) themselves and the assessments are not included in the estimates.

The budget for evaluation can therefore be summarised to:

| Activity / task           | Required budget (per year) |
|---------------------------|----------------------------|
| Analysis                  | € 30 000                   |
| Risk maps and risk curves | € 35 000                   |
| <b>Total</b>              | <b>€ 65 000</b>            |

### Assessment and reporting

The assessment based on the results from the monitoring programme should be reported to OSPAR (via ICG Noise) and the EU (MSFD reporting cycle). Because of the different requirements for different OSPAR Contracting Parties I propose to leave these costs outside the programme.

### Technology management

The programme will use the most advanced technologies and needs regular improvements in technology. It should be discussed whether 'technology management' is a separate task in the programme or a common task for all participating Contracting Parties.

- New functionality on tools (GES Tool)
- New measurement techniques

- New modelling functionality
- Knowledge management

This knowledge should be monitored and the programme can also contribute.

- A specific type of knowledge is a contribution to standardisation activities in ISO working groups.

| Activity / task       | Required budget (per year) |
|-----------------------|----------------------------|
| Technology management | € 50 000                   |
| <b>Total</b>          | <b>€ 50 000</b>            |