

Managing the impacts of underwater sound

Strengthen your EIA, for easier project approval and a small environmental footprint



Water is an ideal medium for sound

Human activities in the marine environment generate underwater noise. Such activities include offshore construction – e.g. for wind farms or oil and gas exploration and production -, seismic surveys, ship traffic and fisheries, but also the operation of offshore wind farms, which produces a low intensity but almost continuous noise. The effects of underwater sound on marine life can range from very subtle behavioural impacts to physical damage, e.g. of the animal's hearing system or swim bladder, and even death at very high levels.

In Europe, the EU Marine Strategy Framework Directive addresses noise impacts. Outside Europe, developers and planners have to consider and manage sound related impacts with increasing importance as well.



Sound behaves differently in water than it does in air – it travels more than four times faster and significantly further underwater. Consequently, man-made sound can affect marine life over very large distances. This is especially true as marine animals may rely heavily on sound to communicate, to exploit and investigate the environment, to find prey and to avoid obstacles.

Tailor-made, project specific solutions

There is no one-off solution for the management of underwater sound impacts. Whether you are intending to build a bridge, a tunnel or an offshore wind farm, the sound that your project will emit will vary greatly. We can give you detailed information on the characteristics of that sound.

The impacts also very much depend on local conditions, such as water depth and sea bottom

SUMMARY

Clients

Offshore Developers, Fish Farm Operators, Planners, Policy Makers

Challenge

- Estimating source level characteristics
- Calculating sound ranges
- Assessing noise related impacts
- Developing feasible mitigation measures

Solution

Integration of our modelling capabilities with our acoustic and biological expertise allows us to make realistic impact scenarios and forecasts, thereby providing developers with maximum security concerning the reliability of the assessment and ultimately securing the realisation of the project. Early consultation in design and construction will facilitate mitigation.

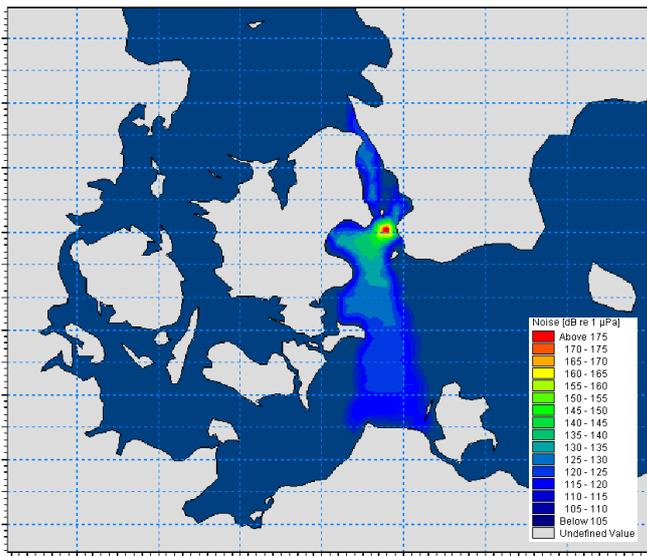
Value

- Effective management of the environmental impacts of underwater sound
- Swifter and smoother project approval, commencement, progress and operation
- Security in planning and investment for marine users
- Reduced environmental footprint

structure and composition. Moreover, it is crucial to investigate into the distribution and abundance of sensitive marine life to assess its exposure.

DHI experts provide you with a treasure trove of experience and state-of-the-art knowledge in all of these fields, ranging from field surveys to the modelling of emitted sound fields and sound propagation paths to a detailed risk assessment of sound effects.

To make sure your project proceeds smoothly, our staff has acquired in-depth expertise on noise related environmental impact assessments (EIAs) in Europe



This sound map shows a hypothetical calculation of the potential range and levels of noise produced by underwater pile driving - e.g. for the construction of an offshore wind farm - in the Inner Danish Waters. Such maps are usually used in sound impact assessments together with data on the distribution and abundance of marine animals.

and beyond, we have studied the acoustics of marine life to a great extent and investigate sound related impacts both experimentally and through field observations. We are also able to advise you on possible measures to manage and mitigate sound related impacts.

Furthermore, we offer our services and advice to policy makers both on a national level in a variety of EU countries, as well as internationally in bodies such as ICES, OSPAR and the EU. Thus, we are at the cutting edge of sound related impact studies.

Combining scientific expertise with state-of-the-art modelling to provide realistic impact forecasts

A unique selling point is the integration of DHI's underwater sound expertise with our top level modelling capabilities, enabling us to provide you with a realistic impact forecast. Based on our calculations of local sound propagation conditions and data on the characteristics of the sound source, we create sound maps showing the distribution of the sound field in the study area. Sound maps are used together with data on the distribution and abundance of fish and marine mammals to provide an estimate of the number of individuals affected. The impact is then extrapolated using empirical data on hearing sensitivities and demonstrated effects. Such reliable forecasts form the base of a successful and sustainable sound management of your project.

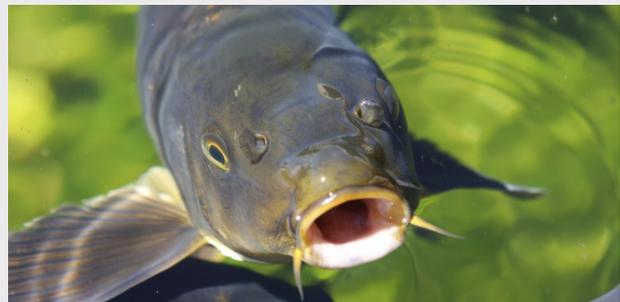
Green design

Sound related impacts on the marine environment can be further reduced by an optimised design of marine structures. Therefore, considering these impacts in the design stage of marine construction projects will

Aquaculture and noise

Underwater noise is also an issue in aquaculture: Fish in aquaculture facilities can be exposed to noise from nearby ships and construction activities. Moreover, the facility itself creates noise, e.g. through aerators, air and water pumps, harvesters, blowers, filtration systems and maintenance machinery. This noise can have a variety of effects, such as impairment of the auditory system and increased stress, which results in reduced growth rates.

DHI offers fish farm operators a complete noise risk assessment based on the sensitivity of the species kept, the surrounding soundscape and the likely effects. This assessment can help to identify feasible mitigation measures and ultimately result in a better product for the market.



significantly increase our client's chances to get their projects approved and commence swiftly. In addition, such green design will minimise their environmental footprint and therefore benefit the marine inhabitants.



Pile driving during offshore wind farm construction can have an impact on marine animals, sometimes being audible for up to 80km by certain species. Tailor made mitigation measures can lead to a significant reduction in the environmental footprint of offshore wind farm construction.