



KONGSBERG

Underwater Acoustic Modelling Services

With the on-going expansion in the marine environment coupled with the increasing regulatory framework, it is incumbent on developers to be aware of the acoustic impacts that may arise from their activities.

Kongsberg Maritime Ltd helps clients to understand, assess and manage impacts from underwater noise in order to achieve environmental compliance.



Sources of underwater noise

A number of offshore based activities are involved in the production of man-made underwater noise – often as a by-product of their actions. The sectors including: upstream oil and gas activities involving exploration using seismic arrays and explosives, as well as drilling and platform decommissioning; marine renewables involving seabed piling and trenching for cables and pipelines; defence; and shipping and marine aggregate dredging, all introduce high levels of sound into the underwater environment and this can impact on marine life.

In UK and European waters and often elsewhere, activities at sea such as those listed above are becoming increasingly regulated by a legal framework. For the developer, there is an increasing need to understand and reduce the risk to the environment from a wide range of activities that have the potential to generate harmful levels of sound.

As part of the Consents process, it is often a requirement for the developer to publish an Environmental Statement where the impacts on the environment associated with the development, including underwater noise, are assessed and appropriate mitigation measures are proposed.

Kongsberg Maritime can provide professional advice to help you meet these requirements.

Acoustic impacts on marine life

The underwater noise generated from each activity has the potential to impact on the species of marine life found in the vicinity of the development. The acoustic impact from these activities arising on an individual or group of animals depends on the strength of the noise source, the frequency content of the signal emitted, the animal's sensitivity to the sound, its distance to the sound source and the time over which the animal is exposed to the sound.

The impacts themselves may be classed as physiological (consisting of fatality, physical trauma and permanent or temporary deafness) or behavioural – where the resulting reactions to the sound may interfere with feeding or breeding activities. High levels of underwater sound may mask conspecific or inter-species calls and this could affect the longer term viability of species of animals in the locality. In addition, mass strandings of whales and dolphins have often been attributed to noisy activities especially when they take place in environmentally sensitive areas.

Kongsberg Maritime accesses international publications in order to draw on the latest developments regarding acoustic impact modelling.



Many species of marine life are very sensitive to man-made underwater noise

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Exposure level	Effect
230 dB re 1 μ Pa	PTS onset in cetaceans
218 dB re 1 μ Pa	PTS onset in pinnipeds
224 dB re 1 μ Pa	TTS onset in cetaceans
212 dB re 1 μ Pa	TTS onset in pinnipeds
199.7 dB re 1 μ Pa	TTS onset in harbour porpoise
174 dB re 1 μ Pa	Aversive behavioural reaction in harbour porpoise
160 dB re 1 μ Pa	Level B - Harassment in cetaceans and pinnipeds
140 dB re 1 μ Pa	Low level disturbance in cetaceans and pinnipeds

Threshold sound pressure levels for acoustic impacts

Propagating the sound

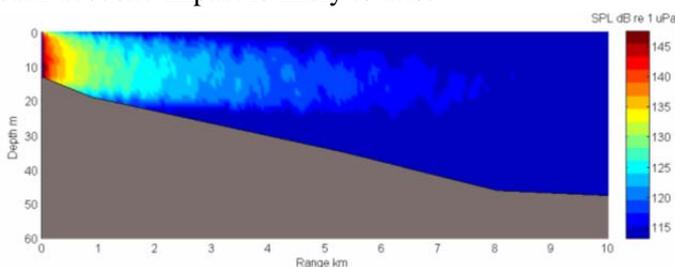
In order to assess the potential acoustic impact on a species, it is necessary to estimate sound levels on the animal when it is in the sound field of the source. This is achieved through propagating the sound from the source position to the animal location.

Kongsberg Maritime recognises that underwater acoustic propagation is a complex process requiring proven modelling techniques and programs that have been benchmarked and peer-reviewed in the international literature.

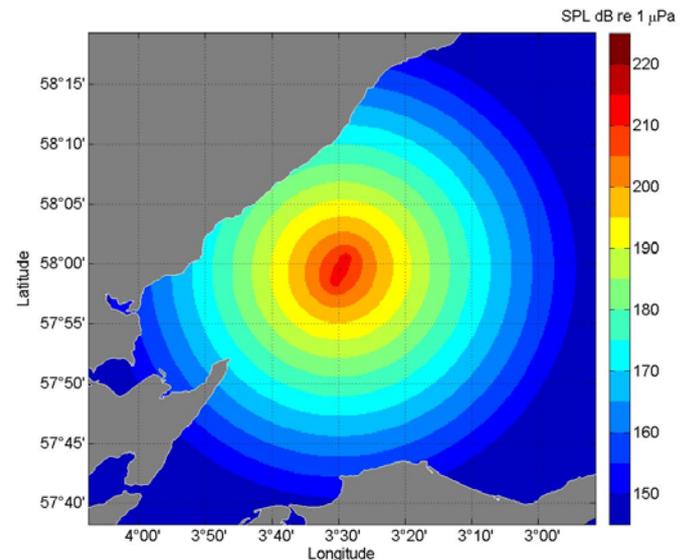
The propagation of sound is a computer-intensive process that requires high spatial resolution, site-specific data representing

- bathymetry,
- oceanography and
- seabed structure,

Kongsberg Maritime understands the significance of these data and can recommend suitable sources with which it becomes possible to estimate the ranges at which each acoustic impact is likely to arise.



Specialist computer programs are used to model the sound propagating through the undersea environment



Site-specific data is necessary to characterise accurately the underwater acoustic environment

Cumulative impacts

The expert modelling advice and interpretive expertise provided by Kongsberg Maritime shows the impact of sound over the full 360° around the noise source.

When a marine receptor is exposed to sound from several noise sources that are in close proximity to each other or when it endures a build-up of noise dose over a period of time, then cumulative impacts may occur. These are of increasing concern to the regulatory authorities and require specific modelling to account for the potential impacts that may arise.

By accurately modelling the acoustic footprint associated with each noise source, practicable mitigation methods may be planned for at an appropriate stage in the project life cycle. This ensures that any potential for acoustic impact is minimised and environmental compliance is ensured.

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