

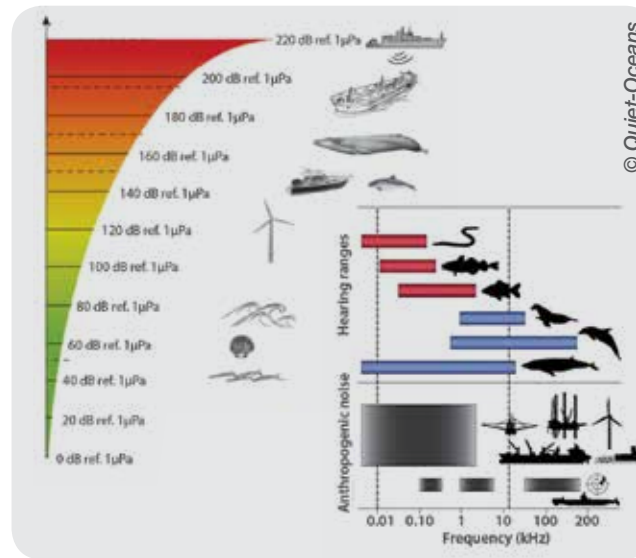
Relevant EU Legislation

The Marine Strategy Framework Directive (2008/56/EC) lists the introduction of energy, including underwater noise, as one of the eleven descriptors to be used by Member States in determining Good Environmental Status. The Directive defines pollution as “the direct or indirect introduction into the marine environment, as a result of human activity, of substances or energy, including human induced marine underwater noise, which results or is likely to result in deleterious effects such as harm to living resources and marine ecosystems” (MSFD, Article 3(8)).

Noise monitoring may also come under EIA Directive (85/337/EEC, as amended) and has been included in Environmental Impact Assessments for some, but not all, ocean energy projects to date.



Static hydrophone which can be deployed underwater to measure ambient noise



Both frequency & amplitude are important in noise studies

Further information can be found in the final report from Work Package 3 available on the SOWFIA website.

Keep up to date with the SOWFIA project by joining the SOWFIA network on www.sowfia.eu.



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Noise Monitoring for Wave Energy Developments



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Introduction

The ocean is not a 'silent world', particularly near coastlines. Wave breaking, seismic events and marine inhabitants all contribute to background noise.

In recent years, sounds from human activities such as shipping, seismic surveys and seabed drilling have increased the ambient level in certain areas. It is likely that the deployment of Wave Energy Converters (WECs) will introduce new sources of noise into this already 'noisy' underwater environment. Due to ocean marine inhabitants' dependence on sound, it is important that potential noise impacts from the construction and operation of wave energy farms are better understood.

Consequently, and also as a result of EU and national legislation, comprehensive environmental assessments examining potential impacts associated with WECs should include an assessment of potential underwater noise impacts.



Marine life soon interacts with man-made objects in the marine environment

Potential Noise from Wave Energy Developments

Noise from wave energy developments can occur during installation and decommissioning and during operation.



Installation of Oyster at EMEC

Installation/Decommissioning Noise Sources:

- ▶ Installation/removal of anchors
- ▶ Piling/drilling
- ▶ Construction traffic
- ▶ Subsea cable/high pressure pipeline installation/removal.

Operational Noise:

- ▶ Energy conversion mechanism
- ▶ Mooring line vibration
- ▶ Waves coming into contact with device
- ▶ Maintenance/repair vessel traffic.

Some guidance on noise impacts can be taken from the offshore wind industry, however, installation methods for WECs differ and many do not require pile driving. There is little data on the operational noise output of WECs. A recent short noise monitoring study of an operational WEC at Lysekil (Sweden) suggested that the risk of injury to marine mammals due to WEC noise is low.

Potential Impacts of Noise

Scientific research is highlighting the impact of noise on marine habitats and species. Effects range from temporary to permanent behavioural disturbance, depending on the frequency or intensity of the sound waves. Measuring these effects in the field is difficult. However, the hearing ranges of many species are known so, by measuring the noise from a sound source, it is possible to make predictions about the impact on different species.

Noise Monitoring for Wave Farms

Baseline Measurement

Noise levels at a site can vary according to wave and weather conditions, season, current, seabed type, amongst other factors. A baseline monitoring programme should take variations of these parameters into account.

Installation/ Operational Measurement

Noise monitoring programmes during installation/operation will be dependent on:

- ▶ The environmental sensitivity of the site;
- ▶ The site classification;
- ▶ Construction methods being used ;
- ▶ The type and number of WECs;

A WEC's noise output will vary under different wave and operating conditions. Noise should be measured for these various conditions.

Equipment and Deployment

There are two components of sound to be considered, pressure and particle velocity. Long term measurements are likely to be needed for wave energy farms. Monitoring equipment need to have sufficient autonomy and be suitably rugged for these deployments. Sensors can be deployed from moorings or bottom mounted.