

Science for Environment Policy

Offshore wind farm construction noise can displace harbour porpoises

Noise caused by construction of Germany's first offshore wind farm caused significant habitat disturbance for harbour porpoises, according to a recent study. Its results suggest that porpoises avoided areas up to 20 kilometres from the noise source during construction of the wind farm's foundations.

Development of offshore wind farms plays a major role in the shift towards [renewable energies](#). The construction of Germany's first offshore wind farm began in the North Sea in September 2008. Offshore wind turbines require solid foundations; typically these are made of heavy posts driven into the seabed with a hydraulic hammer, a process known as pile-driving. With each hammer impact, energy is transmitted into the surrounding water as sound. Sound that causes negative effects, in this context, is referred to as 'noise'.

Manmade [marine](#) noise has been found to have negative effects on some species, such as cetaceans (whales, dolphins, and porpoises), including hearing damage and displacement. Germany has only one resident cetacean, the harbour porpoise, a species considered particularly vulnerable to disturbance, injury or death from human activity. Marine [noise](#) is one of these disturbances, potentially capable of damaging hearing and driving away prey species that harbour porpoises feed upon.

Researchers used a combination of aerial surveys and static acoustic monitoring (SAM), a device which logs harbour porpoise echolocation clicks, to determine the effects of turbine pile-driving noise on the porpoises. Aerial surveys, in an area of 10,900 km², were conducted before, during and after turbine installation between August 2008 and October 2010. SAM data were collected every three months from 12 sites between August 2008 and November 2011. Aerial surveys revealed major differences in harbour porpoise distribution before and during turbine construction. During construction, the porpoises appeared to be avoiding the area. SAM results agreed with aerial survey results, with significantly fewer porpoises detected within 10 kilometres of the pile-driving activity, particularly during longer construction periods. More porpoises were detected at 25 and 50 kilometres from the construction site during pile-driving activity.

The results show a substantial avoidance reaction to pile-driving, suggesting that noise is, at least, unpleasant for harbour porpoises. However, the researchers are unable to assess the level of harm that may result from noise and displacement, both in terms of physical damage to those animals closest to the pile-driving site, and long-term population effects caused by habitat displacement during construction. They suggest that some noise-blocking technologies, such as 'air bubble curtains' and 'hydro sound dampers' (curtains made of foam or balloons), could be used to reduce habitat displacement during pile-driving.

The authority responsible for licensing offshore wind farms in the German EEZ (Exclusive Economic Zone), the Federal Maritime and Hydrographic Agency, has set a threshold for pile-driving noise, based on advice given by the Federal Environmental Agency. Each offshore wind farm project is obliged to carry out an environmental impact study, in which the possible effects of noise emissions on the marine environment are described and assessed. Under the conditions of the license, during the installation of offshore wind turbines, the sound exposure level (SEL) must not exceed 160 dB (re 1 mPa) outside a 750 m radius. During noisy work, such as pile-driving, regular measurements of waterborne sound have to be taken.

As EU countries increasingly invest in renewable energy resources, these results may be important for discussions of regulations and policies concerning the construction of offshore wind farms. Following the 2011 Fukushima nuclear power plant catastrophe, Germany increased its focus on renewable energies further, with planned expansion of offshore wind power to provide up to 25GW by 2030. Denmark, The Netherlands, Belgium and the UK also have a large number of offshore wind farms planned or already in operation.



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