

Environmental Effects Around the World

BACKGROUND

Over the past two decades, researchers, in collaboration with the marine renewable energy (MRE) industry and regulatory agencies, have examined the potential effects of MRE, focusing on the stressor-receptor approach to categorize the most significant potential risks for tidal stream, riverine, persistent ocean currents, and wave energy devices.

Baseline assessments of marine resources that might be at risk from MRE development and post-installation monitoring have become routine requirements to gain regulatory permission for deployment. Many small demonstration and pilot deployments have not collected monitoring data to address the key environmental risks associated with MRE. These risks include:



- ◆ Collision risk of marine animals with rotating turbine blades (only of importance for tidal, ocean current, and riverine);
- ◆ Effects of underwater noise on animal behavior and health;
- ◆ Effects of electromagnetic fields (EMFs) from energized power export cables on animal behavior;
- ◆ Changes in benthic and pelagic habitats that affect marine animals;



- ◆ Entanglement of large marine animals in mooring lines or underwater cables associated with MRE systems;
- ◆ Changes in oceanographic systems from operational MRE devices and arrays; and
- ◆ Displacement of marine animals due to the presence or operation of MRE devices and arrays.

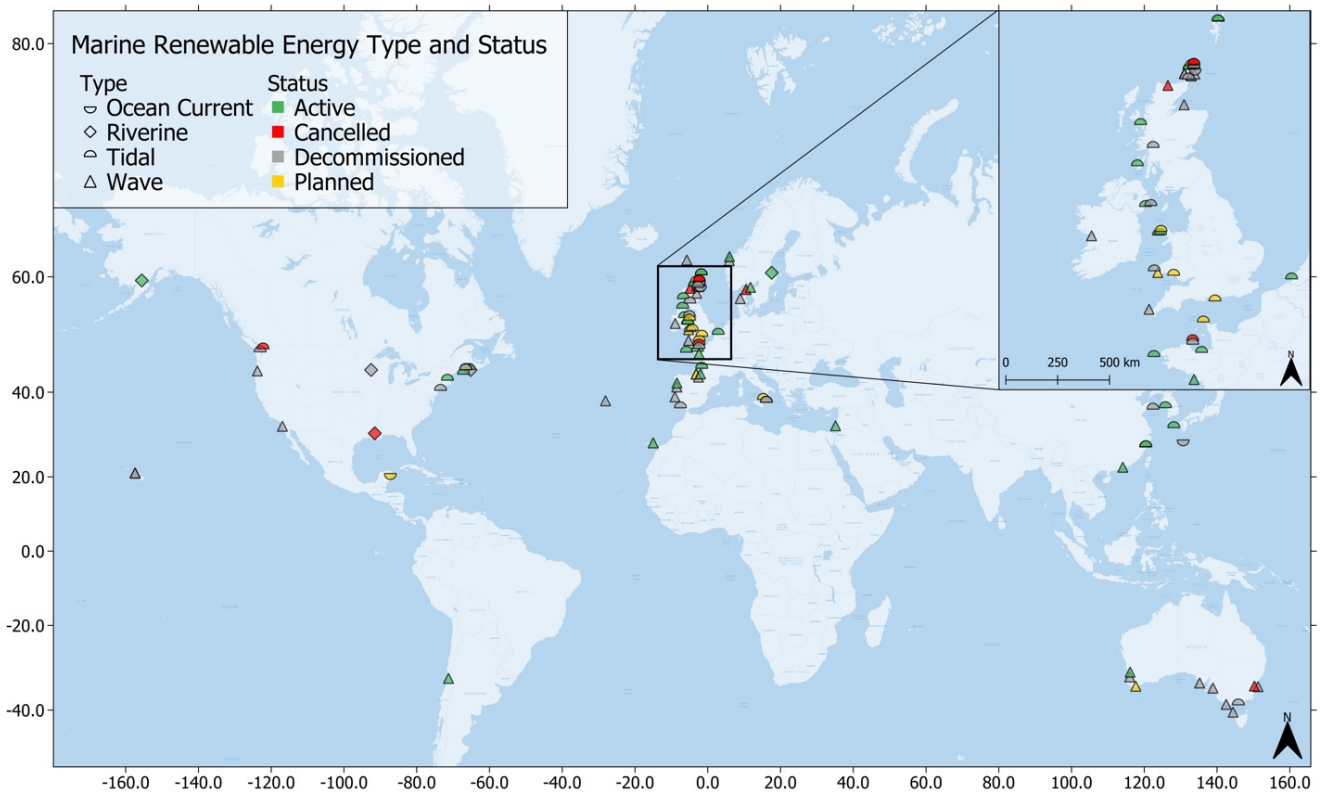
EVALUATING PROGRESS IN EXAMINING ENVIRONMENTAL EFFECTS OF MARINE RENEWABLE ENERGY

Using information collected under OES-Environmental, 86 projects were identified globally with environmental assessments, post-installation monitoring, or extensive planning for monitoring in advance of deployment. Of those 86 projects, 40 were tidal, 39 were wave, two were ocean current (in advanced planning stages), and five were riverine projects, as shown on the map below.



Collision risk studies, underwater noise measurements, experiments to determine effects of EMFs, and measurements of changes in benthic habitats are the most common areas of research. In general, very few effects were noted in any of the projects, partly due to the

very small size of each project, which included mostly single devices up to an array of four to six tidal turbines. Entanglement risk, changes in oceanographic systems, and displacement of marine animals have not often been measured directly, although extensive numerical modeling of oceanographic changes has created a large body of research.



Marine renewable energy projects around the world with associated records of environmental monitoring, separated by type of technology and status of development.

OES-Environmental 2024 State of the Science report and executive summary available at:
<https://tethys.pnnl.gov/publications/state-of-the-science-2024>

Go to <https://tethys.pnnl.gov> for a collection of papers, reports, presentations, and other media about environmental effects of MRE.

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