



# Impacts of wave energy extraction on sea bed morphology

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## Introduction

The UK is ideally located to exploit marine renewable energy resources. Wave energy generation is an option favoured by the UK Government. It is vital that local and regional environmental impacts of wave energy extraction are well understood. However, potential impacts that arrays of wave energy devices may have on the surrounding coastal environment is still largely unknown. Particular concerns are the extent to which the altered wave environment as a result of energy extraction will change the natural sediment transport regime and hence the sea bottom morphodynamics, which may have serious implications on beach stability, coastal ecology and flooding.

## Objectives

Primary objective of the project is to investigate potential changes to the hydrodynamic and morphodynamic environment when wave energy is extracted and the changes to the sea bed at both near- and far-field.

This PhD project is jointly funded by the Low Carbon Research Institute (LCRI) and the College of Engineering of Swansea University. The project is linked to TeraWatt (EP/J10170/1) project funded under Supergen Marine Challenge I. The outputs will complement TeraWatt and LCRI Marine.

### References

Cornett, A.M. 2008, A Global wave energy resource assessment, Proc.18th International Offshore and Polar Engineering Conference, Paper No. ISOPE-2008-579, July 6-11-2008 Vancouver, BC: Venugopal, V. and Smith, G.H., 2007, Wave climate investigation for an array of wave power devices, Proc.. 7<sup>th</sup> European Wave and Tidal Energy Conf., Porto, Portugal.

## Methodology-Work Plan

*Delft3D coastal area modelling suite will be used as the tool to investigate hydrodynamic and morphodynamic aspects of wave energy extraction. Orkney Waters will be used as the test site.*

- *Delft 3D will be setup for the test site, taking initial sea bed bathymetry from high resolution bathymetry maps.*
- *Wave conditions for the model set up will be established using historic offshore wave measurements.*
- *A range of wave energy extraction scenarios including a number of wave device arrays will be identified in consultation with TeraWatt project consortium*
- *Selected scenarios will be modelled in order to identify changes to the morphodynamic regime of the test site.*
- *The resulting morphodynamic changes will be correlated with the wave field in order to map relationships between altered wave climate and seabed change.*

*A numerical simulation showing the expected wave climate in the Irish Sea and off the west coast of Wales. Warm colours show higher waves; we can see that Pembrokeshire shows promise as a potential wave energy site.*

