

# What opportunities are available?

The oceans play a critical role in climate change, but they also represent the largest living space on the planet and contain valuable resources. In taking steps to adapt to a changing world we can also take advantage of new opportunities that the oceans offer and make the most of these to support a sustainable future. Opportunities we are exploring include:



## Carbon capture and storage

Working with the DTI and Defra to investigate the ecosystem risks associated with carbon capture and storage in the marine environment

## Potential of aquaculture

Developing an ecosystem approach to sustainability of food production involving studies in Europe and China

## Energy from offshore renewables

Wave Hub is a groundbreaking project in SW England to create the UK's first offshore facility for the testing and operation of wave energy generation devices

## Marine biotechnology

We are working with industrial partners to identify sustainable and environmentally friendly alternatives to health and beauty products

## Novel Technology

Collaborating with industry to develop autonomous sensors for measuring and monitoring marine environmental impacts and climate change



## What opportunities are available?



### Carbon capture and storage

Our scientists are developing a UK experimental facility and modelling capacity for exploring the effects of high CO<sub>2</sub> (including lowered pH) on UK shelf waters and to make an initial exploration of marine ecosystem response to elevated CO<sub>2</sub> either through ocean uptake of atmospheric CO<sub>2</sub> or through leakage from geological stores.

### Potential of aquaculture

Researchers in Plymouth have long-standing working relationships with colleagues in Europe and China. Work in China is helping to develop better understanding of the interaction between the Chinese (marine) aquaculture industry and the ecosystems that sustain the resources.

Researchers are also working with colleagues in Portugal to apply new interdisciplinary approaches which combine natural and social sciences. These programmes address the complex scaling issues inherent in integrated management within a framework that accounts for watershed interactions, ecological structure and human activities.

### Energy from offshore renewables

The South West of England Regional Development Agency supported Wave Hub project, involving researchers from Plymouth and Exeter, will enable the testing of wave energy generation devices through an electrical infrastructure under the sea. The wave hub is essential in helping to bridge the gap between production prototypes and full commercial wave farms. The project will support the UK's drive to meet the challenges and achieve the goals of the new energy policy including a 60% reduction in carbon emissions by 2050. Researchers in Plymouth and Exeter will use the facility to support further research into wave energy generation and associated impacts.

### Marine (blue) biotechnology

Microscopic plants and bacteria in the sea contain unique suites of compounds of benefit to humans. One suite of compounds provides protection against the sun's intense rays in the surface of the oceans and has

potential in a range of healthcare products. Researchers in Plymouth are working to identify the most suitable conditions for high productivity of these microalgae and bacteria. Collaboration with industry will facilitate transfer of this knowledge and developments to healthcare and energy sectors.

Researchers in Plymouth are also developing innovative ways of solving the dual issues of managing excess CO<sub>2</sub> outputs and increasing supply of energy from renewable sources. Current studies are looking at removal of CO<sub>2</sub> from flue gases and converting it on site into a continuous supply of biofuels.

### Novel Technology

Among a range of novel autonomous sensors researchers in Plymouth have developed and deployed two novel sampling systems to help characterise surface layers in the oceans' a novel near surface sampling device (NSSD) and a microlayer sampling device (MLSD). New instruments are now being developed that will allow us to map the fluxes of CO<sub>2</sub> between the sea and the atmosphere. This is essential for the next generation of climate models being developed by the UK Met Office's Hadley Centre for Climate Change.

### Ocean and human health

#### An opportunity to develop a regional Centre of Excellence

There is increasing awareness that the environment plays an essential role in ensuring good human health. According to the World Health Organization, the major risks include "...climate change, stratospheric ozone depletion, loss of biodiversity... and stresses on food-producing systems." Interactions between living things and the environment are incredibly complex and we are only now beginning to comprehend the magnitude of the problems for our future well-being that human activities have created. There are continued pressures from human development of the coastal zones and from our use of these areas for leisure and tourism. Overall, we have a very poor understanding of how future climate change will affect the behaviour of pathogens and pollutants in the seas around the UK.

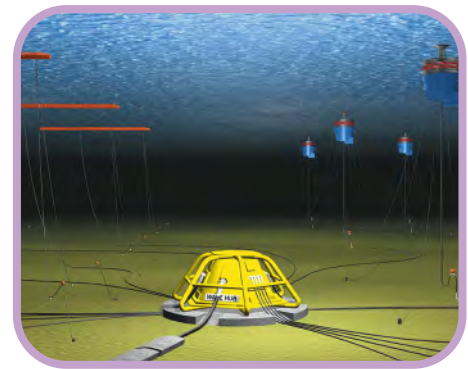


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## CASE study:

### Wave Hub

Wave Hub is a groundbreaking renewable energy project in SW England to create the UK's first offshore facility for the testing and operation of wave energy generation devices. Wave hub will provide an electrical infrastructure under the sea into which wave energy generation devices can be plugged and their outputs and efficiencies tested.

The project will support the UK's drive to meet the challenges and achieve goals of the new energy policy including a 60% reduction in carbon emissions by 2050.

Wave Hub is supported by the South West of England Regional Development Agency (SWRDA) and will involve researchers from Plymouth and Exeter who will use the facility to support further research into wave energy generation and impacts.

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