

Governments and industry need knowledge of the geology of the continental shelf to understand the environment and resources and promote new development. **Robert Gatliff, Alan Stevenson, Howard Johnson, Dave Long, Phil Richards and Dave Smith** describe the BGS's major contribution over 40 years.

Marine exploration

Less than 50 years ago knowledge of the geology of the UK continental shelf (UKCS) was extremely limited. The BGS marine geoscience programme began about 40 years ago in response to the development of the UK oil and gas industry. The BGS was funded by the then Department of Energy to carry out a national mapping programme based on geophysical data, seabed samples and boreholes. By the 1990s, geological maps at a scale of 1:250 000 were published for the shelf regions showing seabed sediments, Quaternary geology and bedrock. The deeper water areas to the north and west continue to be explored with support from the oil industry. A series of regional reports, the offshore equivalent of the BGS regional guides, were published and reports for the Atlantic Margin will be published in 2010. MAREMAP is a new multidisciplinary environmental mapping programme designed to underpin the new marine industries and environmental issues.

The knowledge and expertise generated by the BGS marine programme is used to help the UK Department of Energy and Climate Change (DECC), industry and overseas governments to understand petroleum geology and promote new exploration and development. Current key areas of research include the tectonic history of the UKCS, marine geohazards, and the effects of former glaciation events.

The technological and engineering capability we developed in the course of this research has given us a tremendous set of skills in marine operations. As a result, the BGS now leads the operations for the European contribution to the Integrated Ocean Drilling Program (IODP), which has included missions to the North Pole and the reefs of the Pacific.

This year has seen the completion of a new map highlighting areas where rock or hard substrate is at or within 0.5 metres of the seabed. This map will aid offshore construction planning but its initial purpose is to help define different habitats. A confidence assessment completed as part of this project picked out large areas of the shelf where data is sparse and there is considerable uncertainty in defining the geology of the seabed.

Recent estimates suggest that the marine sector provides five million jobs across Europe. Studies in the UK have demonstrated that nearly all the North Sea has multiple users. To make best use of the space, it is imperative that we understand our environment and map its key elements. Without this knowledge, marine spatial planning will be inefficient and will result in poor decision-making.



The RV White Ribbon, BGS's nearshore survey vessel fitted with a multibeam system.



The Vidar Viking, an ice-breaking supply ship temporarily converted into a drill ship deployed on the Lomonosov Ridge near the North Pole. Photograph by Martin Jakobsson.

Environmental legislation has raised the profile of ecosystem research and it is clear that existing data are insufficient to understand the distribution of delicate ecosystems and the controls on them.

The advent of multibeam sonar systems has enabled a new approach to seabed mapping and has provided a technological means of bringing geologists, biologists, archaeologists, engineers and hydrographers together through common

data collection and interpretation techniques. New developments such as wave and tidal schemes, aggregate extraction and aquaculture will require detailed studies to assess risk, hazard and environmental impacts, and will require the detailed geological analysis that may be developed from multibeam-based bathymetric surveys.

This technology is now revolutionising our understanding of the seabed. The

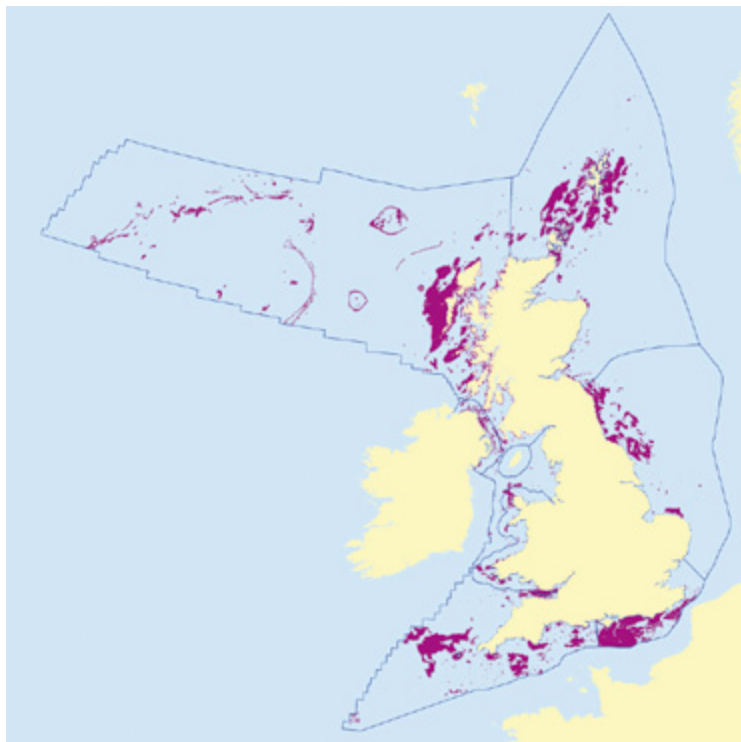
BGS, the National Oceanography Centre, and the Scottish Association for Marine Sciences have initiated a new multidisciplinary mapping programme (MAREMAP — Marine Environmental Mapping Programme) which will provide a step-change in our understanding of the seabed. We are undertaking this work in response to the rapidly increasing number of users of our marine environment and the competition for space across our shelf seas.

MAREMAP research themes:

- coastal and shelf geological and habitat models
- deep water geological and habitat models
- submarine geohazards
- sediment mobility and 4D monitoring modelling technology
- heritage and archaeology
- data and products

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New map of areas with rock or hard substrate at or close to the seabed.



Seabed sediment map of the continental shelf around the United Kingdom.