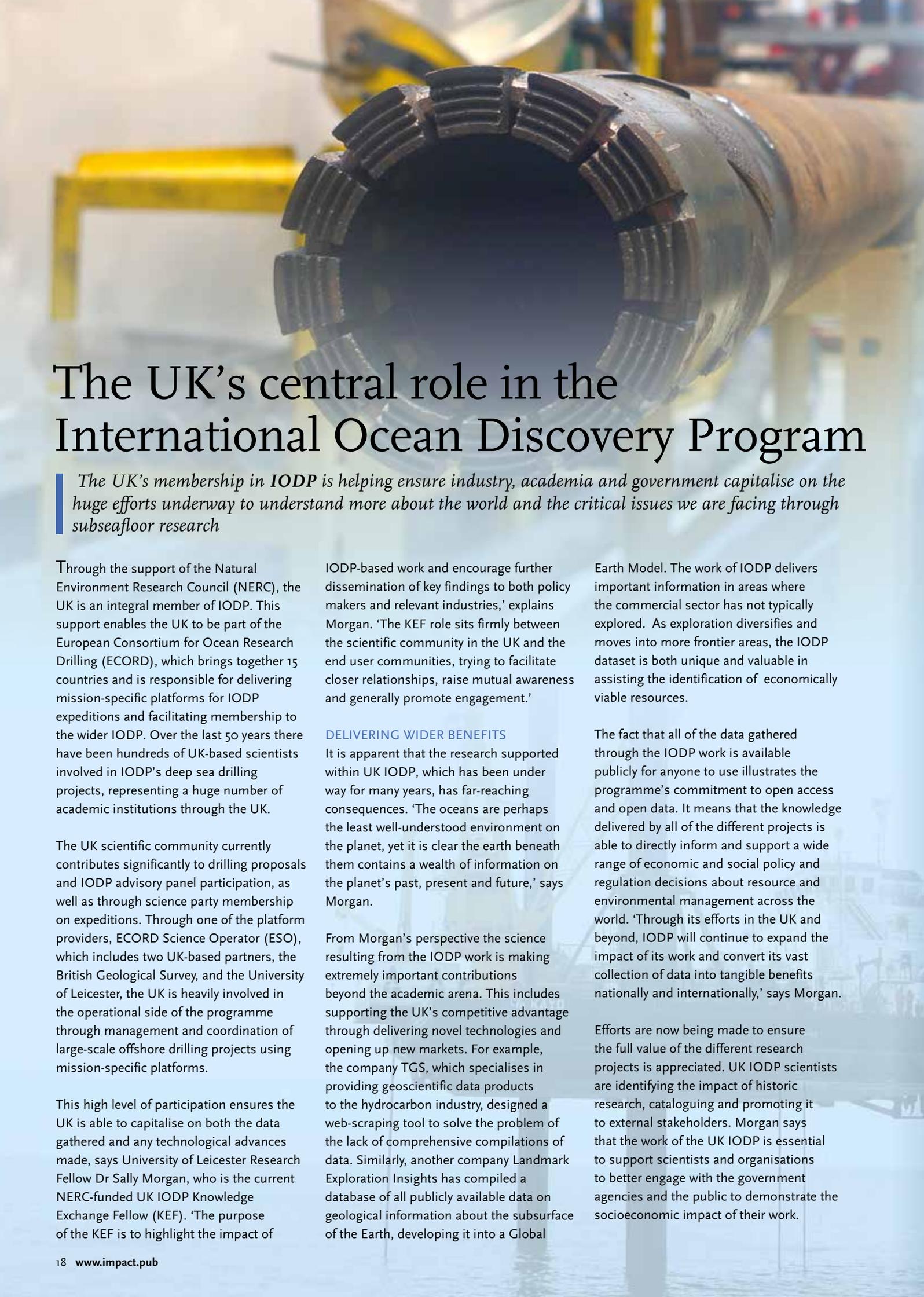


# THE UK'S CENTRAL ROLE IN THE INTERNATIONAL OCEAN DISCOVERY PROGRAM



Picture by S Morgan. IODP/ECORD



# The UK's central role in the International Ocean Discovery Program

*The UK's membership in IODP is helping ensure industry, academia and government capitalise on the huge efforts underway to understand more about the world and the critical issues we are facing through subseafloor research*

Through the support of the Natural Environment Research Council (NERC), the UK is an integral member of IODP. This support enables the UK to be part of the European Consortium for Ocean Research Drilling (ECORD), which brings together 15 countries and is responsible for delivering mission-specific platforms for IODP expeditions and facilitating membership to the wider IODP. Over the last 50 years there have been hundreds of UK-based scientists involved in IODP's deep sea drilling projects, representing a huge number of academic institutions through the UK.

The UK scientific community currently contributes significantly to drilling proposals and IODP advisory panel participation, as well as through science party membership on expeditions. Through one of the platform providers, ECORD Science Operator (ESO), which includes two UK-based partners, the British Geological Survey, and the University of Leicester, the UK is heavily involved in the operational side of the programme through management and coordination of large-scale offshore drilling projects using mission-specific platforms.

This high level of participation ensures the UK is able to capitalise on both the data gathered and any technological advances made, says University of Leicester Research Fellow Dr Sally Morgan, who is the current NERC-funded UK IODP Knowledge Exchange Fellow (KEF). 'The purpose of the KEF is to highlight the impact of

IODP-based work and encourage further dissemination of key findings to both policy makers and relevant industries,' explains Morgan. 'The KEF role sits firmly between the scientific community in the UK and the end user communities, trying to facilitate closer relationships, raise mutual awareness and generally promote engagement.'

## DELIVERING WIDER BENEFITS

It is apparent that the research supported within UK IODP, which has been under way for many years, has far-reaching consequences. 'The oceans are perhaps the least well-understood environment on the planet, yet it is clear the earth beneath them contains a wealth of information on the planet's past, present and future,' says Morgan.

From Morgan's perspective the science resulting from the IODP work is making extremely important contributions beyond the academic arena. This includes supporting the UK's competitive advantage through delivering novel technologies and opening up new markets. For example, the company TGS, which specialises in providing geoscientific data products to the hydrocarbon industry, designed a web-scraping tool to solve the problem of the lack of comprehensive compilations of data. Similarly, another company Landmark Exploration Insights has compiled a database of all publicly available data on geological information about the subsurface of the Earth, developing it into a Global

Earth Model. The work of IODP delivers important information in areas where the commercial sector has not typically explored. As exploration diversifies and moves into more frontier areas, the IODP dataset is both unique and valuable in assisting the identification of economically viable resources.

The fact that all of the data gathered through the IODP work is available publicly for anyone to use illustrates the programme's commitment to open access and open data. It means that the knowledge delivered by all of the different projects is able to directly inform and support a wide range of economic and social policy and regulation decisions about resource and environmental management across the world. 'Through its efforts in the UK and beyond, IODP will continue to expand the impact of its work and convert its vast collection of data into tangible benefits nationally and internationally,' says Morgan.

Efforts are now being made to ensure the full value of the different research projects is appreciated. UK IODP scientists are identifying the impact of historic research, cataloguing and promoting it to external stakeholders. Morgan says that the work of the UK IODP is essential to support scientists and organisations to better engage with the government agencies and the public to demonstrate the socioeconomic impact of their work.

# Value from research reaching far beyond science

*UK-based researchers play an integral role in building the knowledge base about the Earth's history and processes through their IODP projects, and delivering important social and economic outcomes at the same time.*

## SUPPORTING CLIMATE CHANGE POLICY DEVELOPMENT

A research team based at Cardiff University and headed up by Professor Stephen Barker has

been using IODP core samples to examine deep ocean sediments. Their objective is to explore data on long-term temperature changes, ocean circulation and climate feedback systems to help improve knowledge about the underlying mechanisms to these changes and their potential role in long time-scale climate change. Barker's work has been used directly by the Intergovernmental Panel on Climate Change. 'Our results demonstrate the far-reaching impacts of abrupt climate change, providing evidence for direct links between rapid changes,' observes Barker. 'It is clear that UK IODP is providing an essential context for policy makers and the general public about climate change, ultimately enabling governments to make more informed and well-researched adaptation decisions.'



## IMPROVING RESILIENCE TO NATURAL HAZARDS

Natural hazards have devastating effects on society

and economies. The magnitude 9.0 earthquake and subsequent tsunami that hit the Tohoku region of Japan in March 2011 resulted in an estimated loss of \$300 billion. IODP scientists from across the world including the UK secured a drilling project to the epicentre in April 2012, called the Japan Trench Fast Drilling Project (JFAST) expedition. As a result the global scientific community gathered a significant amount of information about protecting areas from future similar risks. One of the Co-Chief Scientists of JFAST, James Mori of Kyoto University, says: 'Investigations and research findings from the expedition have obvious consequences for evaluating future tsunami hazards at other subduction zones around the world.' The value of this rapid response IODP drilling project provides influential impacts in terms of delivering key data to inform future natural hazard planning and policy development on risk management.



## A POTENTIAL PARADIGM SHIFT IN RISK MANAGEMENT

Since 2010 UK IODP has been supporting the development of a global database of volcanic ash layers to provide new insights into the global rates of extreme volcanism over tens of millions of years. University of Bristol researchers have been studying the potential of recorded data for a global database and have subsequently developed the database for Japan. Professor Neil Chapman, partner at McCombie, Chapman, McKinley Consulting, observes: 'The offshore data provided by this project extend and complement the often patchy and constrained onshore datasets considerably.' He believes that this research will greatly benefit governments and industry in terms of understanding and assessing natural hazard risks. The project team are keen to see the 'trickle-on effects' produced through their work, including local and national governments able to deliver improved hazard risk mitigation policies.



## SECURING FUTURE ENERGY SUPPLIES

Comprehensive compilations of all of the IODP data do not exist

because they are divided between a number of research centres that store them differently. By using their web-scraping tool to pick up different datasets, TGS has compiled and then analysed a massive database called the Deepwater Borehole Data Atlas. 'This database is an invaluable tool to aid in the exploration and discovery of oil and gas for the benefit of society,' observes Steve Allen, International Sales and Business Development Manager for TGS's Geological Products and Services Division. Companies like TGS are essentially picking up the publicly available data generated by IODP and turning it into valuable information to support decision-making. 'By enhancing and repackaging the most relevant data we can help the industry improve their understanding of these frontier regions, which could ultimately lead to the discovery of new hydrocarbon resources,' explains Allen. This will potentially help secure new sources for future energy supplies across the world.



## TRAINING FUTURE RESEARCHERS

Providing opportunities for young researchers

is essential to building a solid research future within the field of marine geology and geophysics. For many years PhD and masters' projects have utilised IODP core samples and data to offer insights into global records, evolution and climate change. IODP enables the opportunity to build knowledge for a whole range of early career scientists and next generation researchers across various disciplines. Research institutions' capacity building of young researchers is supported by access to IODP's vast body of data, delivering investigations which would otherwise be impossible for early career scientists. Of much benefit to training the next generation is the academic and industry partnerships that centre on IODP data and samples, including industry-funded PhD studentships in biostratigraphy and paleoceanography at University College London and a UK CPD accredited summer school in petrophysics hosted at the University of Leicester.

## Project Insights

### FUNDING

IODP is funded by 24 member countries: USA, Japan, the European Consortium for Ocean Research Drilling (comprising, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom), Korea, Australia & New Zealand, India, China, and Brazil. The UK's membership is funded by the Natural Environment Research Council (NERC).

### CONTACT

**Dr Sally Morgan**

UK IODP Knowledge Exchange Fellow

**T:** +44 1162523922

**E:** sally.morgan@le.ac.uk

**W:** www.iodp.rocks and www.iodp.org



## Impact Objectives

- The International Ocean Discovery Program (IODP) is providing a better understanding of plate tectonic processes, the Earth's crustal structure and composition, environmental conditions and life in ancient oceans, and sea level and climate change by building upon the legacies of the earlier ocean drilling projects
- IODP is made up of an international partnership of scientists and institutions with nearly 50 years' experience in ocean drilling
- The UK is an integral member of the European Consortium for Ocean Research Drilling (ECORD) which, together with the wider IODP, funds and steers the research

# Shaping the future through subseafloor exploration

*The International Ocean Discovery Program is a global research network exploring what lies beneath the Earth's oceans. By using novel tools and approaches and promoting public engagement, the network is shedding light on some of the planet's best kept secrets*

For 50 years the multidisciplinary global network the International Ocean Discovery Program (IODP) and its predecessors have been studying the world beneath the seas through drilling and sampling the subseafloor. The goal of this international collaborative effort is to uncover the knowledge held beneath the seafloor to address some of the most pressing issues facing the world and help forecast the Earth's future conditions.

In 1966 the Deep Sea Drilling Project (DSDP) launched the vessel *Glomar Challenger* which focused on drilling and coring in the Atlantic, Pacific and Indian Oceans and the Mediterranean and Red Seas. The Ocean Drilling Program (ODP) superseded the DSDP in 1983, with the *JOIDES Resolution* replacing the *Glomar Challenger*. Over nearly 20 years ODP completed 110 subseafloor drilling expeditions across the world. In 2003, building on the successful partnerships developed through DSDP and ODP, the Integrated Ocean Drilling Program (IODP1) facilitated research by the 26 participating nations to advance into new geographic areas. This included studies undertaken by a new Japanese deep sea drilling vessel *Chikyu* and mission-specific platforms coordinated by a European consortium. With the International Ocean Discovery Program (IODP) succeeding IODP1 in 2013, the impact of this significant international research collaboration has reached even

further and deeper into the oceans. The work continues to be a collective effort of exploration by a number of key contributing partners including the USA, Japan, Europe, and various other countries.

### THE VALUE OF SUBSEAFLOOR DATA AND SAMPLES

The overarching aim of IODP is to facilitate the collection of data from beneath the floors of the world's oceans, ultimately supporting the improved understanding of how the Earth has developed over millions of years. The programme's efforts in turn enable collaborative research across the international scientific community and support public engagement in ocean drilling. Over the decades IODP has collated a wealth of data and samples from a range of geological and subsea environments, including information about ancient and modern biology, and the climatic history of the planet. The scale of the subseafloor data collection and sampling of sediment, rock, fluids and the deep biosphere is immense, covering a wide range of spatial and temporal scales. The data and samples gathered span many different environments, including deep sea sediments, shelf and landslide deposits, corals and carbonates, and volcanic basement.

The current work of IODP is guided by its Science Plan for 2013–2023 entitled *Illuminating Earth's Past, Present, and Future*, which sets out 14 'challenge

questions' within four areas: climate change, deep life, planetary dynamics and geohazards. Scientists prepare hypothesis-driven proposals seeking support for the research within the programme.

The primary resource for the basis of these investigations are the cores recovered from the seafloor using the different IODP platforms. Extensive data are gathered from these cores including petrology, geology, physical properties, geochemistry, biostratigraphy and paleontology measurements. Using the cores collected by IODP, scientists can investigate features that are relevant to their field. In doing so, new information is generated about the material and logged through IODP and scientific publications. These cores are ultimately archived in one of the three IODP core repositories in Germany, Japan and the USA. From there, they can be accessed and examined further by researchers in a range of fields.

One of IODP's valuable legacies is its decision to make this data publicly available after a moratorium period. Data can be publicly accessed online via a series of databases, while samples can be requested from one of the core repositories and utilised for the ultimate benefit of the world's economy and society.

