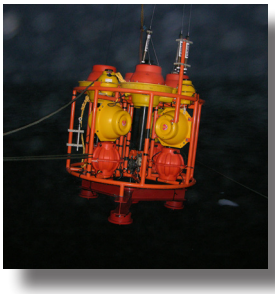
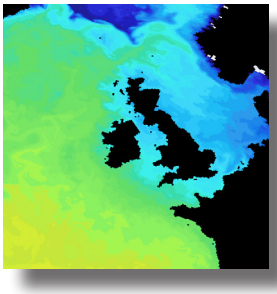
National
Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

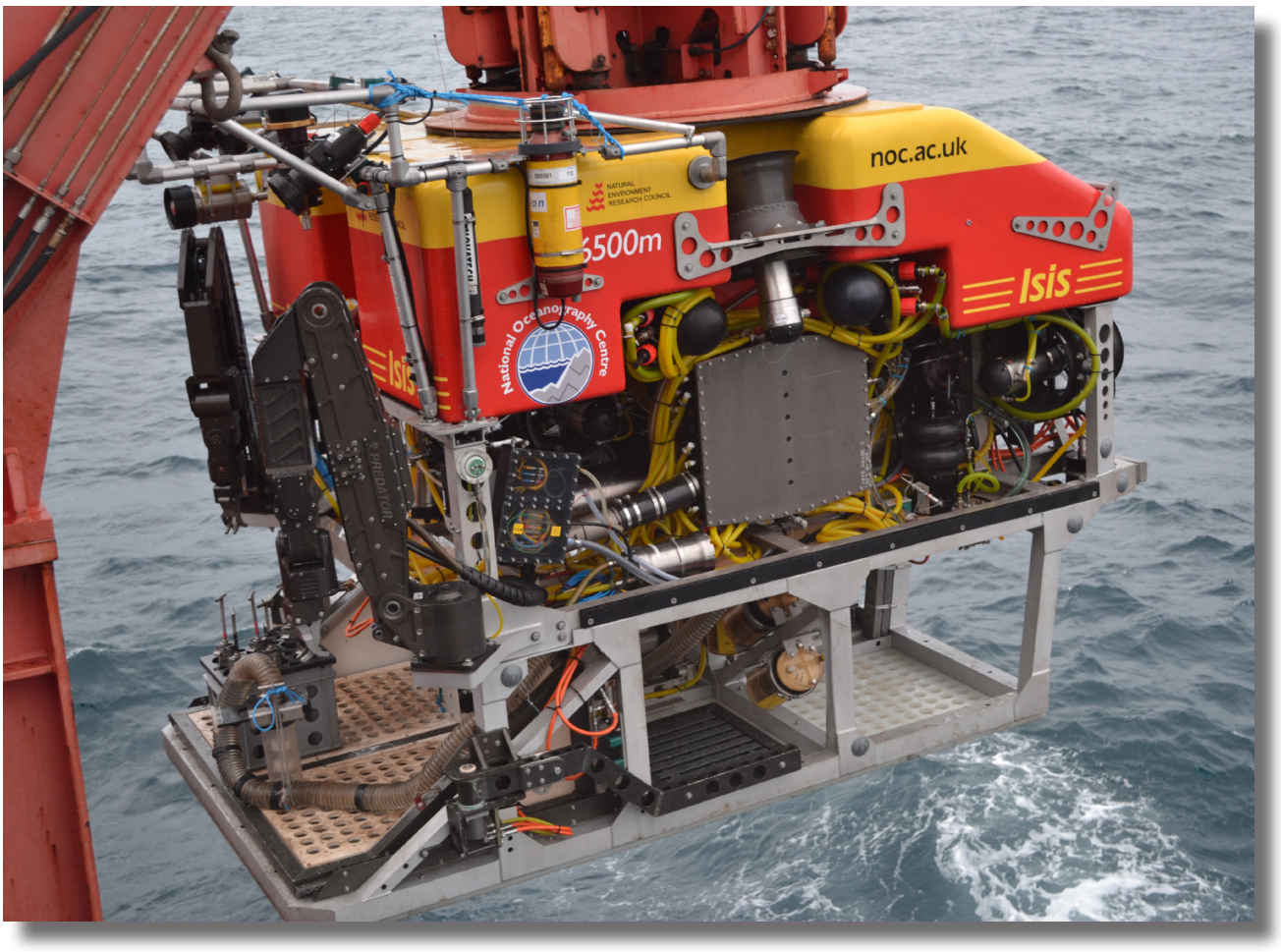
Taking the Lead

The strategic priorities of the National Oceanography Centre

Taking the Lead

The strategic priorities of the National Oceanography Centre



This page has been intentionally left blank

The big picture

1. There is one ocean and it, and marginal seas and coasts, are integral to the Earth system. Without them there could be no life – they make up 97% of all living space (the biosphere) and produce half of the oxygen we breathe. The sea and seafloor cover 70% of the Earth's surface and are home to some of the most unusual ecosystems on Earth, yet the surface of the Moon and Mars are more accurately mapped than the seabed of our own planet – even the UK's own coastal seas.
2. The ocean, seafloor and its microbial life make up a vast factory for processing chemicals (such as carbon, nitrogen, oxygen, sulphur, phosphorous and iron) as they move invisibly between the atmosphere, land, and ocean in vast quantities – all day, every day. These natural biogeochemical cycles within the ocean contribute to marine 'ecosystem services' valued at $19 trillion in 1997, equivalent to the Global GDP.
3. The top ten metres of the ocean contain more heat than the entire atmosphere above – they make the Earth's climate habitable. Today, one billion people depend directly on seas for their primary source of food; the lives of the rest depend on the sea for rainwater to grow crops and livestock on land – but subtle changes in ocean circulation and mixing can change patterns of rainfall across the world on seasonal and climate timescales in ways that are not properly understood and so remain hard to predict.
4. By 2050 there will be nine billion people on Earth – with populations growing fastest in coastal mega-cities, many of them vulnerable to flooding due especially to rising sea levels.
5. The oceans are important economically – they provide 20% of the world's protein; offshore wind could provide one third of the global energy demand and wave and tidal power even more. Sea floor fibre optic cables carry 95% of data transmission for the internet and financial markets. Over 90% of world trade is by sea, contributing 45% of global GDP. As resources on land come under pressure it is inevitable that economic activity will move offshore. The marine industries sector is expected to continue its present growth into the coming decades. Beyond the immediate users of the sea, the ocean's influence on weather and climate impacts influences the productivity and costs of many business sectors (both public and private), including agriculture, health, transport and water.
6. Yet the ocean is also under pressure from human activity, whether through over-fishing, or the direct or indirect effects of pollution, such as emissions of carbon-dioxide. The ocean is changing in temperature, sea level, chemistry and biology in ways that will fundamentally impact the occurrence of natural hazards (extreme weather, for example) and risk damaging the valuable economic resources and services the ocean provides to people.

Moreover, human-induced changes and natural variability interact in ways that are hard to predict (fish stocks, for instance, are impacted by both rising temperatures and fishing activity).

7. So changes in the ocean affect us all – directly or indirectly – whether we realise it or not, whether we live by the sea or far inland.

8. Our current understanding of the marine system predicts significant change but with large uncertainty. For example mean sea level is predicted to rise by 56-200 cm by 2100[1], and expected to become more acid by 0.3-0.4 pH units in the same time period[2]. This uncertainty characterises changes that will affect communities, ecosystems, resources and services with impact on the decisions and future of our societies.

9. Understanding change and uncertainty, as well as discovering new processes of the marine environment, is at the root of many other challenges, including some of the greatest that humanity faces:

   - **Addressing increasing pressure on natural resources** – living and non living resources for food, energy, water, materials, natural products, medicines as well as space for living, working, security and transportation – managed sustainably, the ocean is a valuable economic resource.
   - **Increasing resilience to natural hazards** – protecting lives and economic prosperity – especially in coastal regions where populations and urbanisation is growing fastest; the ocean is directly responsible for some of these hazards (coastal flooding) and is the hidden-hand in others (extreme weather).
   - **Managing rapid environmental change and variability** – both natural and human-induced that affect people, property, land, infrastructure and livelihoods – and the ocean and marine life themselves are being impacted by these changes (including, climate change, biodiversity, ecosystem function and habitat loss).

10. The ocean and seas are some of the least explored areas of our planet and offer opportunities for discovery- led research that is expanding our knowledge of the Earth's physical and biological diversity, and the role of ocean in the whole Earth system. Exploration of the ocean needs new technological and engineering innovation every bit as advanced as any used for the exploration of space. The ocean remains endlessly fascinating and inspirational – a hidden world and the cradle of all life on earth.

11. If the challenge of 20th century science was to understand the Earth's processes, the challenge of the 21st century is to translate what we already know, and knowledge from new discoveries, into practical solutions and to be more continually aware of our changing environment and the ways in which it impacts on all aspects of human well-being – so society can make better decisions for the future.

1 (2010). Advancing the Science of Climate Change, *The National Academies Press*
2 Caldeira, K., et al., *Nature*, 2003. 425(6956): p. 365-365

Our mission

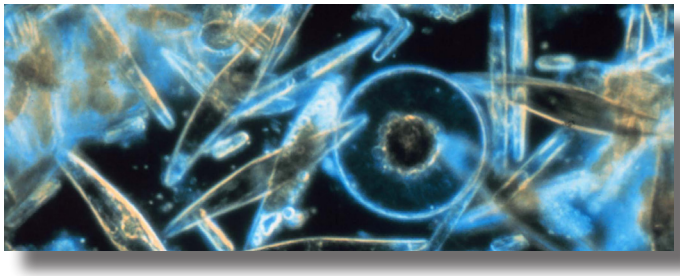
12. The National Oceanography Centre (NOC) is part of the Natural Environment Research Council (NERC). It is NERC's centre of excellence for oceanographic sciences with a remit to provide leadership and national capability in the marine sciences – from coast to deep-ocean.

13. Our basic mission is two-fold:

   - Undertake internationally competitive marine science in an Earth system context and especially with a long-term focus – working with others for the effective translation of new and existing knowledge into demonstrably high societal benefit.
   - Manage, develop, coordinate and innovate high quality, large research infrastructure, equipment pools, facilities, databases and other science enabling functions for the benefit of the whole UK science community to deliver excellent science with impact.

14. This mission embraces:

   - Advancing knowledge of marine systems through world-class, multi-disciplinary research – especially where long-term vision and commitment at global or regional-scale is needed.
   - Innovation, development and timely uptake of ocean measurement technologies.
   - Expertise for assimilation and translation of new and existing knowledge and technologies into beneficial impact for the United Kingdom economy and society – by creating new business opportunities and providing the best available evidence for decisions. Marine industries are worth £50bn gross added value to the UK economy and even more economic activity depends indirectly on the sea.
   - Stewardship of, and accessibility to, irreplaceable marine data and information assets.
   - Planning, operation and access to large research infrastructure – research ships and major oceanographic equipment – for use by the UK science community.
   - Providing a focus for national and international issues affecting the UK marine science community and its stakeholders.



External influences

15. Several UK strategies frame the way we work – the *UK Marine Science Strategy*; *The Business of the Environment* (the NERC strategy); *Setting Course – a community vision and priorities for marine research*. These interact within a wider international setting.

16. Important changes are taking place around us to which we must adapt and respond:
    - Growing recognition that environmental questions and associated scientific evidence and expertise need to be at the heart of key investment and public-policy decisions.
    - The continued gross under-sampling of the ocean, seafloor and marine atmosphere in space and time – relative to that needed to resolve the most important questions and uncertainties.
    - Technological advances which promise a radical transformation in the way we measure and simulate the ocean.
    - A drive by funders to strategically align research programmes funded by multiple agencies and delivered by multiple research organisations to optimise use of resources nationally and internationally.
    - The growing imperative and desire to demonstrate clearly to Government the beneficial economic impacts of previous investments in science to strengthen the case for further investment.
    - The importance of attracting, developing and retaining talented staff in a globally competitive market.
    - Tight constraints on public funds, compounded by the high costs of marine science infrastructure (ships, satellites, high-performance computers).
    - The risk to investment in marine research globally by the far too limited appreciation by decision-makers and wider society of just how profoundly and pervasively the ocean impacts every-day lives – they remain largely 'out of sight, out of mind'.
17. A specific challenge for the NOC is the changing balance of our science funding, with an increasing proportion planned to come from fixed-term grants and contracts (projected to be 50-60% by 2015), whilst we strive to deliver a long-term scientific mission.
18. Against this background, this document describes the strategic priorities of the National Oceanography Centre and how we will go about delivering them. Its purpose is to remind our own staff of our collective aims and to inform our collaborators and partners.

Strategic aims

19. We have four strategic aims, to:
    - **Undertake world-class marine research in an Earth system context**

      Because tackling the most important questions needs discovery science as well as strategic focus to gain knowledge of how fundamental processes and long-term change and variability in the Earth system fit together across global, regional and local scales – and to test and use this new knowledge by increasing the predictive capability of models of the Earth system. Humans are part of the Earth system.
    - **Support and transform ocean measurement capabilities**

      Because we cannot address most of the key questions and support the evidence needs for decisions without making measurements at sea, but the present gross under-sampling of the ocean in space and time must rapidly improve. New technologies will generate new business opportunities.
    - **Translate knowledge about the marine environment into demonstrable benefit for the UK economy and society**

      Because used sustainably the ocean is an important economic resource – seas and coasts offer many solutions to pressing challenges and we have an obligation, working with others, to meet expectations from research users for information and knowledge to inform public and business decisions.
    - **Provide leadership in national and international marine science and technology programmes**

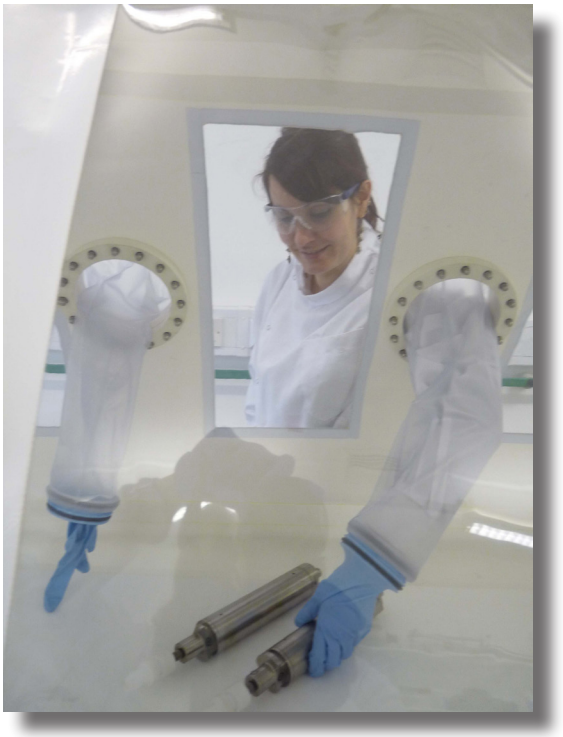
      Because the social, economic and scientific questions concerning the ocean and marine science are truly

global in reach – research and technology needs to be developed and enhanced by internationally coordinated programmes.

20. Four approaches will characterise how we go about delivering these priorities:
    - Investing in excellent people – recruiting and developing highly capable researchers, engineers and professional support staff, especially those excited by being part of a strategic team tackling the most ambitious problems.
    - Innovating through new technologies – investing in the creative potential of scientists and engineers, developing innovative sensors, instrument platforms, vehicles, communications systems, data-processing algorithms, data archival and retrieval systems, modelling systems and being early adopters of new technologies to transform marine measurements and modelling and increase cost-effectiveness.
    - Focussing resources – evaluating what we do and deciding where and how we will make the greatest impact and maximising resources for front-line science, and ensuring we have appropriate mechanisms in place to do this.
    - Building partnerships – building strategic relationships with research collaborators in both the natural and human-system sciences, research infrastructure providers, industry in the UK and internationally, and intermediate and end users because we cannot do everything ourselves.

World-class marine research

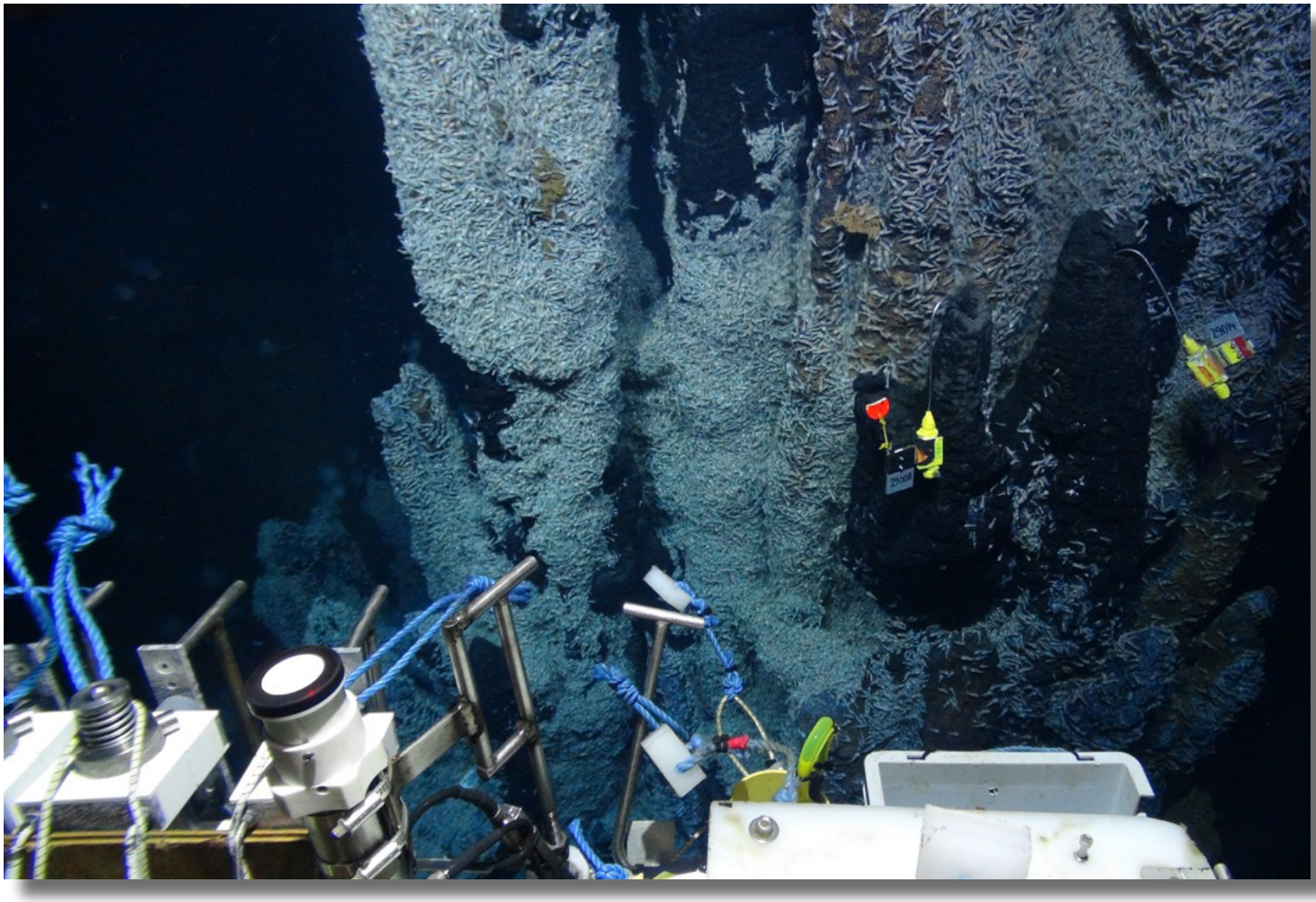
21. We will work on the most challenging scientific problems, which means viewing the ocean and their living systems in a wider Earth system/biosphere context. This entails focus on:
    - Small-scale marine physical, geological, biogeochemical, microbial and ecosystem processes.
    - Ocean interfaces with the atmosphere, land, ice, crust and Earth-interior.
    - Large scale interactions, global cycles and evolution and function of ecosystems.
    - Long-term change, variability, and rapid state-transitions.
22. Virtually all of these problems – and their integration in an Earth system context – call on scientists to work together across scientific disciplines and with technology innovators. Our scientific breadth, depth, capacity and appetite to do this are a distinctive strength.
23. However, to be effective in connecting our science with the human dimensions – that drive ocean and coastal changes and concern how the ocean impacts on people – we will need to work in wider partnerships including disciplines beyond the natural sciences. Increasing engagement with the human and economic dimensions of Earth system science will be a critical element in increasing the wider societal beneficial impact we can aspire to deliver.
24. Our main themes of scientific focus (described more fully in the NOC Science Plan) will be:
    - Sea level change, variability and extremes at global, regional and local scales – leading long-term coastal sea-level and ocean bottom pressure measurements through the Global Sea Level Observing System (www.ioc-goos.org/) and maintaining the global database of monthly mean sea levels.
    - Continental shelves and coastal zones in the Earth system – and contributing long-term data through programmes concerned with shelf and sediment transport processes; long-term observing campaigns at the UK shelf edge, the North Sea and Celtic Seas; shelf sea and coastal modelling capability, and integrating these into a global context. The coastal zone is where the seas and people interact most directly and is a field where closer interaction with social and economic sciences will be particularly important.
    - The ocean in the climate system – leading decadal-scale measurements of the Atlantic overturning circulation, the Antarctic and Arctic Ocean; North Atlantic water mass change and variability; measurement, parameterisation and global datasets of air-sea fluxes; maximising, particularly on account of their global coverage, the use of space-borne sensors for ocean measurement.
    - Global biogeochemical cycles – leading long-term, global measurement of ocean carbon fluxes and characterisation of ocean biogeochemical provinces,



through long term oceanic research at the Porcupine Abyssal Plain and repeated ocean transects, and through wide UK and international collaborations; researching anthropogenic impacts including climate change and natural resource usage through studies of elemental cycling, biodiversity and taxonomy, ecosystem function in relation to important research topics such as ocean acidification, pelagic benthic coupling and carbon sequestration.

- Seafloor geological, geochemical, sediment and ecosystem processes – understanding physical, biogeochemical and ecological processes at the seafloor, habitat loss and developing plans for seafloor observatories, with particular emphasis on seafloor fluid emissions and sub-seabed fluxes, including hydrocarbons, methane hydrates, CO_2 and hydrothermal fluids; submarine geohazards, including landslides, sediment gravity flows, and associated tsunamis; integrating work on habitat mapping, hotspot seafloor ecosystems and deep-sea resource exploration.
- Integrating the ocean and shelf seas and their ecosystems into Earth system models. – contributing, particularly in partnership with the Met Office, long-term capability to model the ocean and its links to the atmosphere and land-surface for hind-casting, forecasting, climate projection and hazard research through the Joint Ocean Modelling Programme, the Joint Coastal Ocean Modelling Programme the Joint Weather and Climate Research Programme and the UK Earth system Modelling Strategy with the Met Office and other NERC Research Centres.

25. To achieve these our approach will be to:
    - Ensure critical-mass of excellent, internationally competitive researchers working in these priority fields of research, placing a strong emphasis on growing talent through recruitment, training and development of all our staff and particularly for early-career researchers and by maintaining UK expertise through clear science career pathways that are flexible, rewarding and enable workforce diversity.
26. Our offer to researchers is the opportunity to work on the most ambitious problems with a long-term focus, in large teams in a well resourced institute with superb facilities. We will capitalise on this through co-location with two world 'Top 1%' Russell Group Universities (Universities of Southampton and Liverpool) with vibrant communities of academics and graduate students. We will:
    - Use flexible appointments, where appropriate, including joint NOC-University positions.
    - Use secondments, studentships and other placements to enable the best to work with or alongside us.
    - Support learning and development and strategic workforce planning with significant professional support.
    - Be clear about our expectations and values.

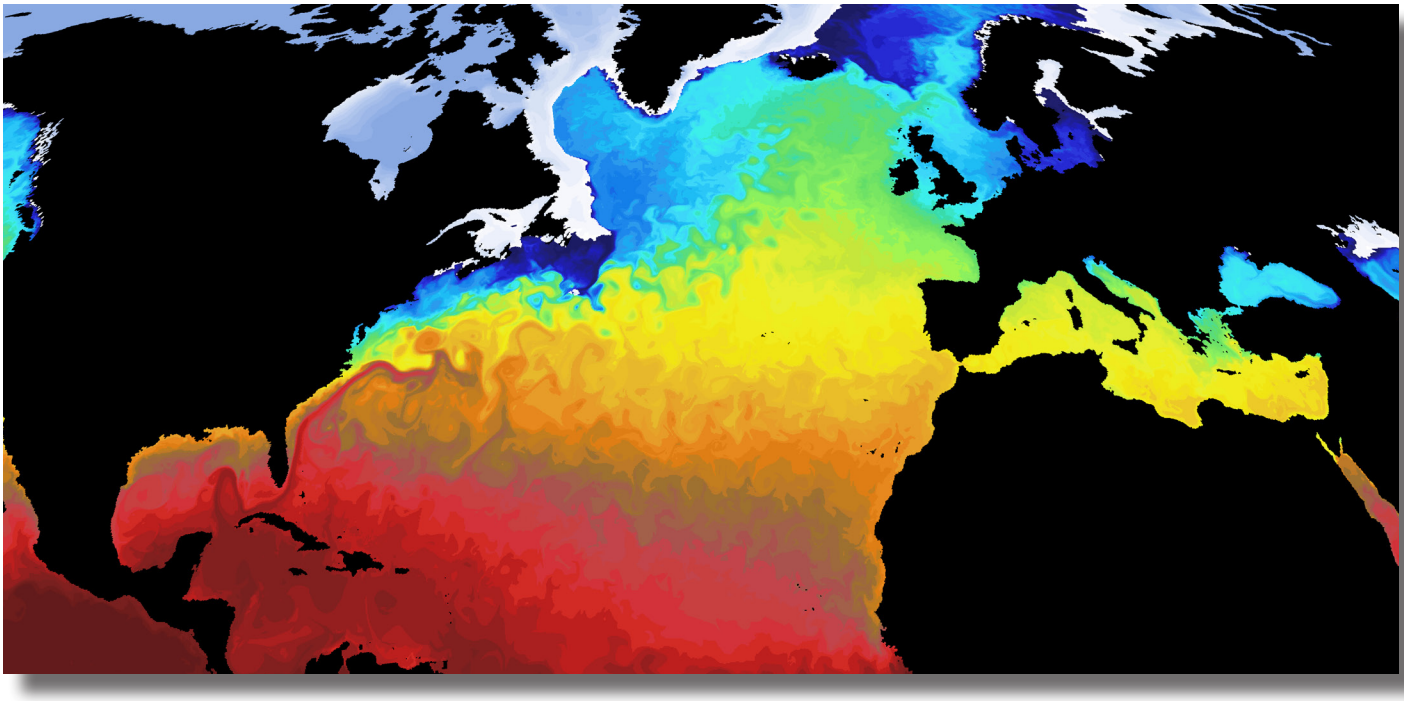


- Focus the significant proportion of our funding that is allocated by NERC to provide long-term national capability (likely 40-50% of total science income by 2014-15) on the critical long-term programmes and facilities needed to deliver these priority areas. In particular, this means our broad thematic areas of scientific research will be threaded through by four key enabling capabilities that provide:
  - technology development
  - sustained ocean observing
  - survey and mapping
  - community ocean model development and application

  Our scientific and technological distinctiveness will be built on these contributions (see *figure on page 11*).
- Ensure our research efforts, particularly the long-term science programmes are set within a clear national and international framework of partnership and that successful collaborations are built to maximise expertise brought to bear on these problems.

Supporting and transforming measurement of the ocean

27. New knowledge of the ocean in the Earth system depends critically on measurements. Our priorities will be to:
    - Manage, on behalf of NERC, two modern, state-of-the art, global class research ships (RRS *Discovery* and RRS *James Cook*) for the benefit of the whole science community for sampling, measurements and experimentation at sea needing large multi-disciplinary teams. Ships remain vital assets for marine science, especially for work in the deep sea, and for some scientific disciplines.
    - Maintain and improve the National Marine Equipment Pool facilities and provide high quality technical support at sea and build strategic partnerships to increase access to cutting-edge research equipment and facilities within the UK and across Europe.
28. Major advances in marine science frequently stem from new measurement technologies. The ocean, seafloor and marine atmosphere remain grossly under-sampled in both space and time. If this continues the key questions concerning long-term change and variability cannot be addressed. The time has come to radically transform the way we measure the ocean *in situ*, complementing measurements that can be made from space and necessary ship-borne observations.
29. NOC will therefore lead the transformation of the way we make some measurements at sea by increasing use of marine autonomous and robotic systems, *in situ* sensors and samplers: We will achieve this through:
    - Investing in marine autonomous and robotic system technologies and skills and expertise to develop, adapt and adopt them to support measurements that can be made independently of research ships in the near future – and recognising the need for some overlap in ship-borne and autonomous approaches as part of any transition.
    - Sharing access and support to UK science for use of autonomous technologies through the Marine Autonomous and Robotics Systems Facility, MARS, (http://noc.ac.uk/research-at-sea/nmfss/mars).
    - Investing in sensor and sampler technologies to enable measurement of a greater range of biological, biogeochemical and physical parameters by these systems.



- Critically reviewing, with others, sustained ocean observing and mapping programmes and plan the transitioning of all or parts of these to delivery by autonomous systems.
- Building effective relationships with the UK marine science community (including other public sector departments such as Defra and Met Office) to develop a coordinated programme of autonomous systems development, leading to an ambitious programme that would not be achievable cost effectively, or at all, by research ships.
- Supporting the development of a UK marine autonomous systems, sensor and sampler innovation, production and service industry, through close cooperation with industry, including people exchanges and co-locating some businesses close to technology innovators.
- Developing a ten-year community roadmap showing how a proportion of ship operating capacity might be ultimately translated into matured autonomous observing programmes.

30. Measuring the ocean from space provides unparalleled coverage at global and regional scale. Satellite measurements will be central to delivering our aims and, working with partners, our priorities will be to:
    - Secure access to satellite data and continuity of key satellite missions.
    - Drive innovation in space-borne instruments and data processing algorithms.
    - Maximise synergy between satellite- and new *in situ* ocean-observing technologies (above) – for science and applications.
31. Investment in expensive ocean observing infrastructure and technologies would be pointless if the resulting data were not managed for the long-term and were not widely accessible to the marine community in a timely manner. The management of marine data is an important function of the NOC. Our priorities will be:
    - Through facilities managed by NOC – the British Oceanographic Data Centre; the Permanent Service for Mean Sea Level, the British Ocean Sediment Core Research Facility – ensure that expensively-collected, irreplaceable marine data is quality assured and managed for the long term.
    - Make data openly accessible to the UK and international marine communities and assist the UK science community in accessing data held in other data centres world-wide – following the principle of 'collect once, use many times', and in accordance with public policies and regulations concerning access to data.
    - Working with partners, rapidly improve the ease with which marine data can be fused with other environmental data in support of integrated Earth system science and the creation of added value data and information products.
32. The ultimate test of understanding within the scientific method is the ability to make predictions that stand the test against measurements. In terms of translating scientific knowledge into beneficial information, the key is also predictive capability – either to make forecasts or to test future scenarios for outcomes in the event of different decisions being made. Consequently, the major goal of technology innovation for data collection is to better understand the key processes in the ocean, so that we can build better representations of the processes in Earth system models to predict environmental change in the coming decades. Our priorities will be to:
    - Critically evaluate the UK's key predictive models, to understand where they are deficient (in terms of mean patterns, natural variability, and long-term change) so that they can be improved.
    - Initialise the UK's Earth system models so that better forecasts and predictions can be undertaken.
    - Test and improve the effectiveness of integrated global and regional observing systems and networks through testing their impact on predictive capability.

Translating science into benefit

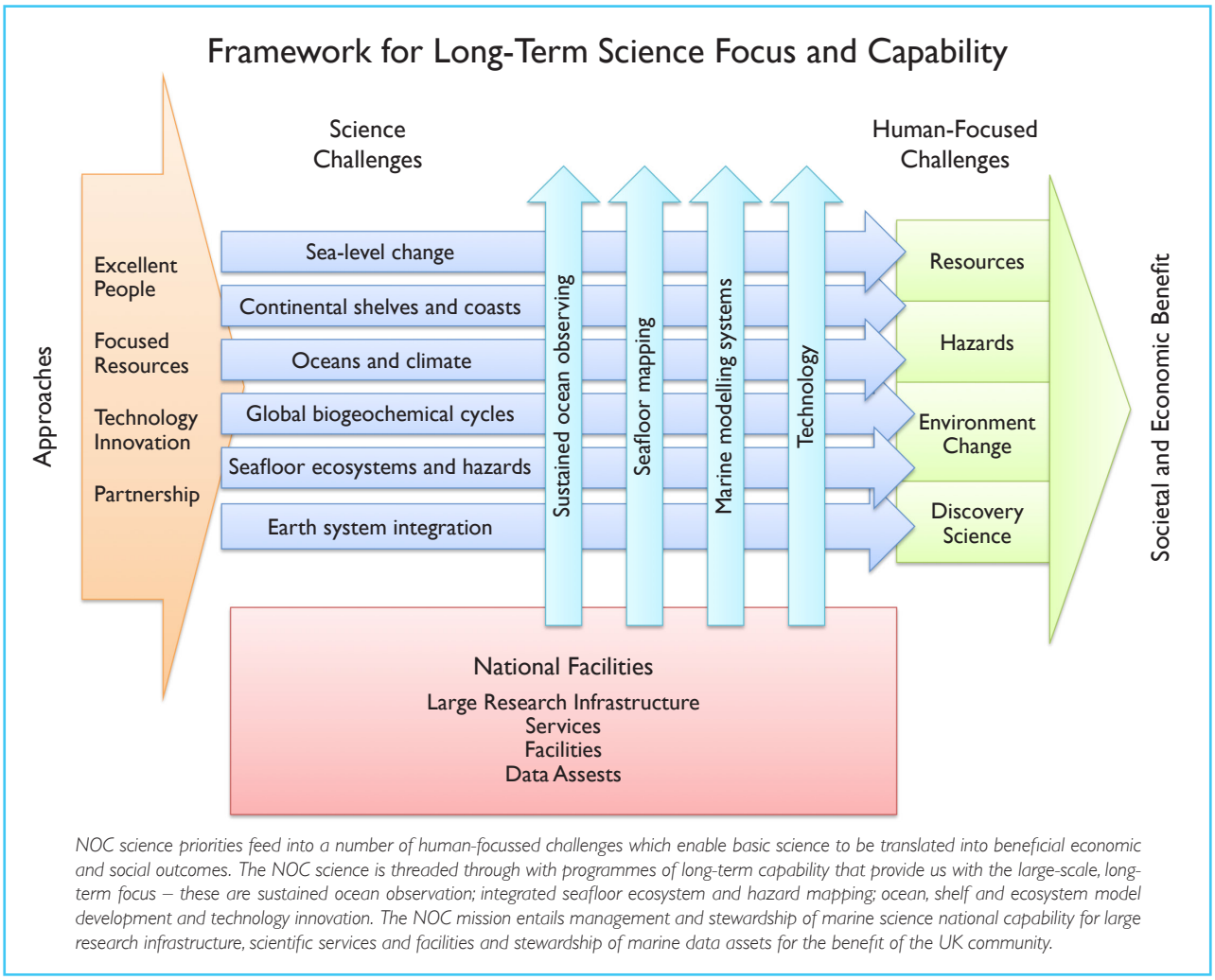
33. Our science will have the greatest impact where it relates to questions of how people and the natural environment interact. Broadly speaking these concern:
    - Sustainable use of marine natural resources.
    - Better prediction and increasing resilience to marine and climate related hazards.
    - Better estimation of the economic value of marine ecosystem and biogeochemical stocks and services.
    - Stewardship of the marine environment for marine ecosystem services.
34. We recognise that the foundation of the wider impact we make stems from:
    - The expertise and know-how of our people.
    - Data, information and predictions to underpin decisions (public policy, business investments, safe and efficient operations, effective regulation and improved quality of life).
    - The transfer of our knowledge and technology to wider users, especially where this leads to growth and jobs in the UK economy.
35. Our approach to translating science to impact will be focused on the following priorities:
    - Active engagement in key partnerships with intermediate users of science (eg, Met Office, Natural Hazards Partnership, Environmental Sciences to Services Partnership) which provide a natural interface between basic science and the ultimate end-users of research outcomes, data and knowledge.
    - Close engagement in supporting the scientific evidence needs of Government departments, Devolved Administrations and other national, European and international public and non-governmental bodies.
    - Strengthening knowledge of the needs of, and developing more effective strategic-level links with, the key business sectors with whom we already interact (Oil and Gas; Marine Renewable Energy; Space Technologies; Marine Scientific Equipment and Survey; and Defence).
    - Active programmes and partnerships with companies operating in environmental measurement and associated markets, including exploitation through licensing or spinout.
    - Indentify and rapidly develop understanding of – and links with – new, emerging or non-traditional sectors – especially where marine environmental science may be used indirectly (eg, through climate or seasonal weather information).
36. In support of the above priorities, we will:
    - Engage with funders, research users and intermediate users at the early stages of conceptualisation and design of research projects.
    - Work with partners, support more effectively the creation of added value information products (by us or by others) from fundamental and freely accessible basic datasets.
    - Develop medium- to long-term relationships with commercial partners with whom we have clear synergies, and which will benefit both parties.
    - Provide and access more professional leadership and expertise to support the research translation process and engagement with research users.
    - Diversify the scope and range of added-value information products that we currently generate from our research programmes.
    - Target more effectively the Knowledge Exchange funds allocated to us by NERC on a small number of initiatives.
37. We will explore opportunities for working more closely within regional business clusters, including by the creation of 'enterprise zones' within NOC as a home for closely allied, knowledge-intensive small and medium sized enterprises (SMEs).
38. Given the critical importance of this agenda we will significantly improve the short- and long-term effectiveness of how we communicate our present and future achievements and capability in translating science to beneficial impact – and the science, technology and expertise upon which it is founded.

Delivering our aims

39. To achieve our aims we will configure all our effort (scientific, technical and support functions) to be much more explicitly focused on their delivery.

40. In managing our financial resources our priorities will be to:
    - Diversify income sources, whilst not skewing our funding so far away from NERC as to lose strategic focus on delivering NERC science and national capability priorities. We aim to increase the share of non-NERC science funding from 27% to 40% of the total from 2012 to 2016 and, of that funding, increase the proportion of it from non-public sources from 25% to 40% in the same period.
    - Invest £10m of capital in marine autonomous and robotics systems, sensors and samplers, achieve greater community access to and use of such systems, and deliver a plan to transition some existing ship-based sustained observing programmes to autonomous delivery.
    - Develop a sustainable funding model for research ships, which fits our future needs, comprises scaling options (including charter, where this is appropriate) and is aligned to overall UK research fleet capability.
    - Strengthen expertise and capacity in business planning, project management, commercial contracting and business development.

41. We will shape our support services so that they are:
    - Clearly focused on supporting the priorities described.
    - Flexible with the appropriate skill mix to meet future challenges.
    - Efficient – enabling resources available to deliver front-line functions to be maximised and to ensure NOC remains financially competitive.
    - Integrated – supporting the integrated science and facilities of NOC across its Southampton and Liverpool sites.



NOC science priorities feed into a number of human-focussed challenges which enable basic science to be translated into beneficial economic and social outcomes. The NOC science is threaded through with programmes of long-term capability that provide us with the large-scale, long-term focus – these are sustained ocean observation; integrated seafloor ecosystem and hazard mapping; ocean, shelf and ecosystem model development and technology innovation. The NOC mission entails management and stewardship of marine science national capability for large research infrastructure, scientific services and facilities and stewardship of marine data assets for the benefit of the UK community.

Measuring success

42. We will measure progress against our aims by the following:

Undertake world-class marine research in an Earth system context

- Citations of published research (overall and by major research areas) are comparable or exceed those of international equivalents.
- Our researchers are visibly shaping the international research agenda, especially in areas where a long-term focus is needed.

Support and transform ocean measurement capabilities

- We are supporting the UK science community with high quality research infrastructure, facilities and access to publicly-funded data – with users of those facilities engaged in shaping their development and expressing high levels of satisfaction with the service provided.
- We are delivering high profile uses of autonomous/ robotic ocean measurement systems for scientific and wider applications and being internationally acclaimed as leading the way – making a real difference to what can be achieved.
- Our technology innovations are taken up widely internationally and result in reduced cost per measurement, new methods, products, industry and impact.

Translate knowledge about the marine environment into demonstrable benefit for the UK economy and society

- We have traceable, effective processes, partnerships and resources in place to manage active translation of science into actionable information, products, services and usable technologies for wider use beyond the science community.
- Cases of the wider impacts of research and technology crucially dependent upon NOC contributions are being cited by the beneficiaries of that research as exemplars of the benefits of science investment and we are effectively communicating what we are doing – such that delivery of high impact is an integral part of the reputation of NOC.

Provide leadership in national and international marine science and technology programmes

- NOC is viewed as an effective leader or partner in formal national and international fora for coordinating and strategic planning of marine science.
- Our researchers and technologists are in high demand as scientific collaborators and are winning funding in open competition in line with or exceeding projections.

43. We will measure the effectiveness of our support services by their demonstrably contributing to these achievements and that they are efficient in enabling us to diversify funding and remain financially competitive.

44. We expect to see clear progress towards these aims within three years and significant tangible achievements in their delivery within five years. Independent verification of this progress will be our performance within the NERC and the academic community, as judged through the centre evaluation exercise (peer reviewed), with demonstrable progress at each evaluation.

National Oceanography Centre

NATURAL ENVIRONMENT RESEARCH COUNCIL

National Oceanography Centre
University of Southampton Waterfront Campus
European Way
Southampton SO14 3ZH
United Kingdom

Switchboard: +44 (0)23 8059 6666

National Oceanography Centre
Joseph Proudman Building
6 Brownlow Street
Liverpool L3 5DA
United Kingdom

Switchboard: +44 (0)151 795 4800

www.noc.ac.uk