

**House of Commons Select Committee on Science and Technology
Inquiry on Marine Science**

Response from the National Oceanography Centre.

1. The National Oceanography Centre (NOC) is a wholly NERC owned centre undertaking research to address the oceans' influence, impacts and potential to help address the big societal challenges of food and energy sectors, biodiversity and climate change. Research priorities include the oceans' role in climate, sea level change, ocean acidification, and the changing Arctic Ocean. NOC underpins the UK marine science base long-term through the provision of infrastructure and long-term research capability, enabling the UK community to deliver world-leading science, as well as supporting national strategic needs.

Declaration of interests

2. NOC hosted the secretariat of the former Inter Agency Committee on Marine Science and Technology (IACMST). Professor Ed Hill, Executive Director NOC is the NERC representative to the Marine Science Coordination Committee (MSCC) and NOC provides a small staff resource, NERC funded, as a contribution to the Secretariat. NOC staff have contributed to the development of the evidence submitted both by the Government (MSCC) and by NERC.

Q1 Since 2007 has there been improved strategic oversight and coordination of marine science?

Government framework

3. There has undoubtedly been an improvement in the strategic oversight and coordination of UK marine science since 2007. This can be attributed to a combination of factors, including the creation of the MSCC, the impacts of new UK and European legislation, and financial constraints that have led directly to self-organisation and closer collaboration between members of the marine scientific research community.
4. The establishment of the cross-departmental Marine Science Coordination Committee in 2008 has provided a 'reinvigorated' and high-level Government forum for exchange of information and for strategic planning. The National Oceanography Centre has been actively engaged in MSCC from the outset. The Executive Director NOC represents NERC at MSCC and provides leadership for the NERC-funded research community and from within its International and Strategic Partnership Office¹ (ISPO) NOC provides a modest staff contribution, NERC funded, to the Defra-led Secretariat comprising secretariat support and access to scientific expertise. This is built on the long-standing NERC/NOC

¹ Formed 2006 at NOC. Initially called NOCs National Marine Coordination Office, the name was changed in 2011 to avoid confusing with the growing recognition of the MSCC brand.

provision of the secretariat to the former Inter-Agency Committee on Marine Science & Technology (IACMST). NOC staff members were instrumental in the development of the UK Marine Science Strategy, published February 2010, and participate actively in the various MSCC working groups.

Marine science community developments

5. Whilst the focus of the MSCC membership is on the key public-sector funders of marine science in the UK the marine science community has also taken steps to improve coordination and engagement, driven by the need to address big science problems which are not capable of being realised by one organisation alone. Collaboration is also driven by funding schemes at national and international level which have cross-community or cross border collaboration as a prerequisite.
6. NOC led the coordinated development and delivery of the Oceans 2025² programme 2007-2012, the first time that the, then 7, NERC-funded marine centres had been pro-active in developing a joined-up approach to bidding and cooperating at programme level. Wider community engagement was achieved through the external Programme Advisory Board and through grants, studentships and community workshops funded via the Strategic Ocean Funding Initiative (SOFI). Scientific highlights and impacts are given on the Oceans 2025 website and these demonstrate the benefits of proactive collaboration in programme planning and execution.
7. In April 2010, the Natural Environment Research Council (NERC) announced the formation of the National Oceanography Centre (NOC) by bringing together the NERC-owned Proudman Oceanographic Laboratory in Liverpool and NERC-managed activity at the National Oceanography Centre, Southampton into a single institution. NOC also established a network of ‘delivery partners’³ and this mechanism enabled a coordinated response to NERC’s national capability prioritisation exercise.
8. As is reported in the NERC response, in June 2012 NERC announced that it is currently considering the merger of NOC with the British Antarctic Survey.
9. The creation of the NOC in 2010 spawned a wider association of Universities and research institutions - the ‘NOC Association’ - that provides a strong voice to the NERC, to Government and internationally on issues affecting marine

² See www.oceans2025.org

³ Plymouth Marine Laboratory; Marine Biological Association; Sir Alister Hardy Foundation for Ocean Science; Scottish Association for Marine Science, Scottish Marine Institute; Sea Mammal Research Unit; British Antarctic Survey; British Geological Survey

science and its delivery. Over 25 UK based Universities and centres are represented, typically at level of Head of Department.

10. The NOC Association collectively developed a NERC marine sector research strategy, published in December 2011. '*Setting Course*⁴' sets out a broad view of the priorities for marine science and national capability within the context of the NERC and UK Marine Science Strategies. The Association is now gathering evidence to demonstrate the impact of marine science and is scoping the community in terms of its strengths, facilities and training capabilities – work within the academic community that complements the information gathering done at cross government departmental level under MSCC.
11. At European level NOC has driven forward the increased coordination and strategic oversight of marine science. Through participation in the European Science Foundation Marine Board NOC was instrumental in the development of community wide Declarations (Aberdeen 2007, Ostend 2010⁵) which have influenced the European Framework Programmes, the European Commission's Marine and Maritime Research Strategy and implementation of European Marine and Maritime policies. Further long-term coordination is anticipated through the new 'Joint Programming Initiative' mechanism where JPI Oceans and Seas can offer a high level process for strategic planning and coordination at Member State level. NERC, with Ministerial agreement, was a founding participant and now leads for the UK, along with Defra, as the second UK departmental representative. The MSCC provides a channel for cross-departmental engagement.
12. At the level of research programmes and projects there is also increased international cooperation. For example NOC and its UK partners are leading discussions on the marine component of the International Carbon Observing system (ICOS). A European project led by NOC will coordinate deep ocean observation infrastructure and programmes such as RAPID-Wave, in partnership with counterparts in Germany, the USA, Canada and others are driving the research infrastructure and research that is monitoring changes in the circulation of the Atlantic Ocean.
13. New legislation has also been a major driver for improved strategic oversight and coordination of marine scientific activities. The Marine and Coastal Access Act (2009) and Marine (Scotland) Act 2010 encouraged closer links between marine science delivery organisations, and the European Marine Strategy Framework Directive's target of achieving '*Good Environmental Status*' by 2020 is already pulling together the efforts of Defra, NERC, JNCC, Marine Scotland, WAG and

⁴ <http://noc.ac.uk/news/launch-vision-statement-uk-marine-science>

⁵ Ostend Declaration 2010: <http://www.eurocean2010.eu/declaration>

Aberdeen Declaration 2007: http://ec.europa.eu/research/environment/pdf/aberdeen_declaration.pdf

other players, building upon the work achieved by the community with ‘Charting Progress 2’ in 2010.

Q2. What progress has been made in delivering the 2010 Marine Science Strategy?

14. Specific progress is reported in detail in the written evidence submitted by the Defra and by NERC.
15. The strategy is long-term and progress is still in early stages. For example the MSCC with NERC and UKMMAS support has instigated the UK-IMON (Integrated Marine Observation Network⁶) initiative (led by Cefas but with wide representation, including NOC, on a steering group) that will account for the majority of observations on UK shelf seas. NERC and the Environmental Research Funders Forum⁷ contributed to the MSCC’s Long-Term Sustained Observations working group, including helping to develop a decision support tool for identifying priorities in science funding.
16. The MSCC has built upon the successful Underwater Sound Forum started by the IACMST, including merging its work with that of the Military Underwater Sound Forum. This is an example of direct and productive collaboration between scientists, government, the armed services, and NGOs. NERC has also initiated work with MSCC on starting an Operational Oceanography Forum, to be launched in at a meeting at NOC in January 2013.
17. NOC is represented in the MSCC Communications Working Group, in the International Subgroup and in the Marine Industries Liaison Group and is engaged in discussion of science alignment and on provision of research vessels.

Q3. How effective have the Marine Science Co-ordination Committee (MSCC) and Marine Management Organisation been and what improvements could be made?

The Marine Science Co-ordination Committee

18. The MSCC has provided a forum within which the funders of UK public-sector marine science are able to work together. The fact that MSCC is overseen by a Ministerial Marine Science Group lends it an authority, which the predecessor IACMST lacked. Importantly from a scientific perspective this coordination mechanism is operating across the devolved administrations.
19. The presence of senior marine scientists on MSCC working groups has helped ensure that MSCC is informed by sound scientific advice. However it will be vital to ensure that the early levels of commitment and engagement by departments are maintained. Some observers believe that industry, NGOs,

⁶ See <http://www.westernshelfobservatory.org/uk-integrated-marine-observing-network-ukimon-initiative>

⁷ <http://www.erff.org.uk/>

Learned Societies and Academia lack representation in the current MSCC structure. The NOC Association is playing a role to fill a gap in terms of direct engagement with the marine science academic community, and the secretariats are in close contact. Though it is early days more might be done to ensure that the actions of the MSCC are visible to the wider community.

20. Whilst there are advantages to having a large MSCC representing all funding departments, the size of the committee and gap between meetings slows decision-making. Perhaps a smaller Executive sub-group could be formed which meets more frequently in order to move things along at a sharper pace.
21. Some MSCC strategies are proving hard to deliver within the resources available. For example, of the 9 objectives listed under the Communications Strategy only 3 can be supported in the short term. MSCC needs the resources and operational freedom to be able to work with others such as academia, research centres, NGO's and professional bodies to fully deliver their objectives. In certain situations the MSCC secretariat appears to have been hampered by having to operate within the Defra framework, for example the long delay in establishing a website.

Marine Management Organisation

22. NOC does not have any specific comments on the effectiveness of the MMO in respect of its core remit (licensing). NOC staff have been working with MMO and CEFAS to refine the licensing procedures for undertaking marine scientific measurements, but in general there have been comparatively few interactions to date with the MMO.
23. NERC and its centres (NOC and others) are in a strong position to work alongside MMO to meet their research and environmental data needs. The NERC-funded Marine Environmental Mapping Programme (MAREMAP <http://www.maremap.ac.uk/index.html>) aims to achieve common, national objectives in seafloor and shallow geological mapping addressing themes such as habitat mapping, Quaternary science, coastal and shelf sediment dynamics and the assessment of human impacts and geohazards in the marine environment. The MMO has a seat on the advisory board for MAREMAP.
24. The British Oceanographic Data Centre (<http://www.bodc.ac.uk/>) provides a key data source for the MMO, and the Marine Environmental Data Information Network (<http://www.oceannet.org/>) is developing links with the MMO.

Q4. Has the selection of proposed Marine Conservation Zones (MCZs) been based on robust scientific evidence? How well has the scientific evidence been balanced with socio-economic considerations and communicated to affected coastal communities?

25. NOC is not in a position to answer these questions; indeed the second may be premature.
26. Much information exists already; strengthening the mechanisms of pull-through between the academic community and the MMO could be beneficial, particularly as the MMO's budget to commission new evidence is very restricted.

5. How effectively does the Natural Environment Research Council (NERC) support marine science in polar and non-polar regions?

27. NERC has provided detailed information on its marine science spend in its return. NOC welcomes the commitment to the replacement of RRS Discovery, and investments in autonomous underwater and remotely operated vehicles that will be of major benefit to the UK marine science community through the 'Marine Autonomous and Robotic Systems' facility (MARS⁸).
28. NOC is a NERC-owned Centre that operates within the constrained funding environment of the outcome of the comprehensive spending review. NERC Council policy has been to increase funding for its Research Programmes (RP) (thematic), to maintain the Responsive Mode (RM) elements of funding and to decrease the percentage of its investment in National Capability (NC) funding.
29. In 2010/11 NERC's National Capability prioritisation exercise provided an opportunity for NOC to engage with NERC and the community to prioritise NC funding against funding scenarios. The necessary cuts for marine science are not disproportionate to those experienced for other areas of the NERC NC portfolio (of order 20% over the 4 year CSR period). The high cost of major infrastructure, e.g. ships, was a key driver of the scenarios in the marine science area.
30. NC is a significant part of NOC's income and hence NOC has taken action to meet the future income projections. NOC approached this in Spring 2012 by undertaking a voluntary redundancy exercise within its Directorate of Science and Technology (DST). The outcome is that some 35 science staff from this group (approx 25%) will have left by the end of March 2013. In this process NOC has maintained discipline spread and is well placed to operate successfully in an environment in which at least 50% of our funding will be won competitively. The supporting Engineering services are being reviewed and the Business Support Services will be restructured in 2013. The opportunity will also be taken to achieve efficiencies as a result of the proposed merger with BAS.
31. A number of new multi-funder research programmes have been developed to succeed the Oceans 2025 mechanism, and NOC staff compete successfully in open competition for such funds on the basis of scientific excellence. However the experience of the NOC research community was that marine biodiversity was not adequately captured in the early thematic programmes, and together with

⁸ <http://noc.ac.uk/research-at-sea/nmfss/mars>

some delays in commissioning, this resulted in a significant dip in bidding opportunities over the last 2 years. The programmes mentioned in the NERC evidence, now coming on stream, should help alleviate this situation.

Training the next generation

32. NERC supports development of the next generation of marine researchers. At Southampton the graduate school operates jointly across the NOC/University of Southampton site with total PhD students now numbering >190. Postgraduate students have access to the Centre's comprehensive array of cutting-edge equipment and facilities, an extensive level of resource that is not available in standard university environments.

Research to support UK Growth and Sustainability

33. Some examples of NOC research to support UK growth and sustainability are given in Annex 1.

Q6. How well are the current and potential impacts of global warming on the oceans (for example temperature changes and acidification) being monitored and addressed by Government and others?

34. With funding from government via NERC and other departments, NOC scientists are at the forefront of research into the current and potential impacts of global warming on the oceans, and have played leading roles in understanding ocean acidification and change in the oceanic ecosystem. Although the underlying physics and chemistry is increasingly well understood, much remains to be discovered, there are major gaps in the understanding of complex biological systems, and there are likely to be climate “surprises”. The monitoring of impacts of global warming is a long-term activity requiring multi-disciplinary study and close cooperation with international partners – the ocean does not respect human geopolitical boundaries.
35. Current impacts. NOC scientists contribute to the annual reports produced by the Marine Climate Change Impacts Partnership⁹ which illustrate the current state of knowledge of impacts on the seas around the UK. The next full report in 2013 will cover over 30 marine and coastal topics, and a Knowledge Gaps report was published earlier in 2012. The Defra-led ‘Charting Progress’ series (most recently CP2 in 2010) pulls together the efforts of many in the marine science community to identify current impacts of both natural and anthropogenic change, including climate, and forms the basis of the initial State of the UK Seas assessment for the Marine Strategy Framework Directive.

⁹ www.mccip.org.uk

36. Observational monitoring is not yet as joined up as it could be; UK-IMON (with MSCC oversight) should help, and the field of operational oceanography is still in its early stages. NOC is a partner in the National Centre for Ocean Forecasting, part-supported by the EU GMES MyOcean project¹⁰, which provides products based on assimilation of observations into forecast models. Defra has recently funded measurements of marine pCO₂/pH. NOC's major contribution to the North Atlantic moorings array used by the RAPID family of research programmes has substantially improved our understanding of the circulation of the North Atlantic ocean and the possibility of rapid changes in climate that could be caused by changes in circulation.
37. Potential impacts. Research continues across the UK marine science community to address potential impacts of climate change including ocean acidification, and NOC is a major contributor to those programmes. Scientists are beginning to be able to understand change at a much finer scale than before, and to make regional and decadal-scale predictions. There are still gaps in fundamental knowledge of the responses of biological systems in particular, made more complicated because anthropogenic impacts from fishing affect natural biodiversity so strongly that climate induced variations are harder to discern. We don't yet know how the loss of Arctic sea ice is affecting climate at regional scale, leading to uncertainties over the evolution of the UK's climate.
38. In collaboration with the Met Office NOC contributes strongly to future UK climate scenario construction, the joint ocean modelling programme, joint coasts ocean modelling, and collaborative work on the NEMO project. Together these models are becoming more accurate at predicting future climate, and are enabling scientists to understand how much of present day observed change is caused by human activities.
39. NOC scientists support the IPCC process in developing a UK / International consensus and mitigation strategies for global climate change, and provide the international coordination for the World Climate Research Programme on Climate Variability and Predictability.

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¹⁰ <http://www.myocean.eu.org/>

Annex 1 – examples of research supporting UK growth and sustainability:

1. The research undertaken by NOC is contributing to Economic Growth & Societal Need. NERC-funded research and knowledge exchange at NOC is underpinning the growth of the nascent UK marine renewable industry; and new technology for satellite oceanography is supporting the growth of the UK space industry. Novel AUV and sensor technologies for seafloor and sub-seafloor imaging offers security applications for rapid environmental assessment as well as new technologies that can support the growth of marine scientific / survey industries and the high-tech blue growth economy. Providing the critical flow of data applications direct to market is supporting coastal engineering, the leisure industries, and the growing field of marine spatial planning.
2. Oceanographic modelling is supporting the Met. Office's production of better weekly / seasonal climate services forecasting for agriculture / horticulture industries and flood warning for civil defence and the prediction of regional and global climate change assessments is informing Defra / DECC mitigation strategies. Better knowledge of probabilities of marine-sourced natural hazards (e.g., sea-level rise, storm surge, tsunami) is used to make more efficient policy interventions or infrastructure investments (e.g., Thames Barrier).
3. Seafloor biology / geology research will enable better policy outcomes for marine zone management, including marine protected areas, International Seabed Authority, UN General Assembly etc. Science capacity within the international Census of Marine Life project has underpinned UK position and implementation on various UN conventions on biodiversity / environmental protection.
4. Scientific evidence has been used to substantiate the UK's submission to the UN for an extended continental shelf where the UK will have sovereign rights over seafloor and sub-seafloor resources. Building science capacity in deep geophysics and rock physics, and seafloor observatories is enabling an expansion of deep-water / frontier oil / gas exploration and better imaging and extraction utilization of existing hydrocarbon reservoirs as well as a better understanding of the risk to the global seafloor cable network from continental margin / deep-ocean turbidite flows.