Brexit science and innovation Summit Inquiry

Written evidence submitted by the National Oceanography Centre

The National oceanography Centre

The National Oceanography Centre (NOC) is wholly owned by the Natural Environment Research Council and provides UK national capability in oceanographic sciences. The NOC mission entails:

- undertaking integrated ocean research and technology development from the coast to the deep ocean. The NOC is the UK's leading institution for deep ocean research, sea level science, coastal physical processes and technology development
- providing large research infrastructure (global class research ships, nationally pooled marine equipment, marine robotics facilities and management of national marine data assets and samples including ocean sediment cores).
- working with government and business to translate science and technology into independent scientific advice, data products and commercial products.

1. Comment on the Government's Future Partnership Paper 'Collaboration on science and innovation', including any challenges not fully acknowledged and opportunities not fully explored.

1.1 In providing input to the Parliamentary Inquiry on leaving the EU, the NOC expressed two major concerns: the potential impact on 1.) staff and 2.) funding. Both are acknowledged by the Future Partnership Paper.

1.2 The NOC looks forward to receiving more information about the proposed science and innovation agreement with the EU and how scientists will be involved.

1.3 Paragraph 5 refers to the UK's pledge to invest in research and innovation, and notes that Government has made a commitment to raise research and development spending as a proportion of GDP to 2.4% by 2017 and to 3% over the longer term.

1.3.1 A 2018 Nature news article notes that Germany has plans '*over the coming years […] to increase the country's overall research spending from just under 3% of gross domestic expenditure to 3.5% by 2025. This would bring Germany into third place globally on the proportion spent on research and development, behind only Israel and South Korea'* (ref 1).

1.3.2 A 2018 paper by the US National Science Foundation notes that '*China has grown its R & D spending rapidly since 2000, at an average of 18% annually. […] China's growth rate is exceptional'* (ref 2) and shown in Figure 4-7, below, for the period 1981 – 2015.

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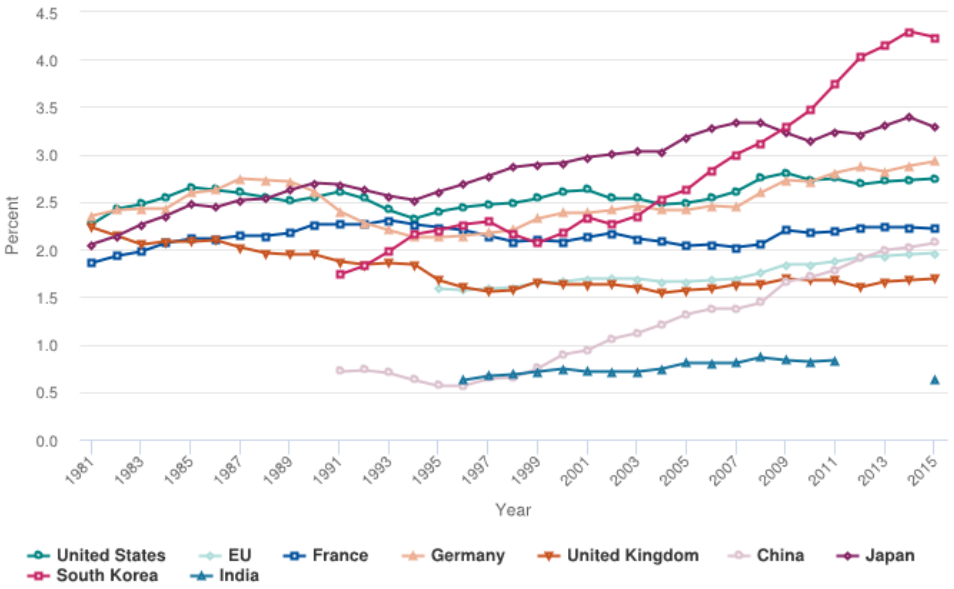
Figure 4-7

Gross domestic expenditures on R&D as a share of gross domestic product, by the United States, the EU, and selected other countries: 1981–2015



EU = European Union.

Note(s): Data are for the top eight R&D-performing countries and the EU. Data are not available for all countries for all years. Data for the United States in this figure reflect international standards for calculating gross expenditures on R&D, which vary slightly from the National Science Foundation's protocol for tallying U.S. total R&D. Data for Japan for 1996 onward may not be consistent with earlier data because of changes in methodology. Data for Germany for 1981–90 are for West Germany.

Source(s): National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series); Organisation for Economic Co-operation and Development, *Main Science and Technology Indicators* (2017/1); United Nations Educational, Scientific and Cultural Organization Institute for Statistics Data Centre, data.uis.unesco.org, accessed 13 October 2017. See Appendix Table 4-12.

Science and Engineering Indicators 2018

Figure 4-7 taken from NSF 2018 report, ref (2)

1.3.3 Figure 4-7 shows that South Korea is the lead nation for Gross Domestic Expenditure on R&D as a share of Gross Domestic Product. In this figure the UK's position, up to 2015, is second from bottom, thus the goal to increase to 3% in the long term is warmly welcomed by the NOC. We look forward to Government continuing to work towards enabling the UK to become a powerhouse of world-class research and technology capability.

1.4 Paragraph 15. '*These terms include the size of any financial contribution, which the UK would need to weigh against other spending priorities*'. How would this work in practice?

1.5 Paragraph 16. The Paper notes that '*the UK will discuss with the EU future arrangements to facilitate the mobility of researchers'*. We welcome clarification on this and look forward to reassurance for our EU staff. Figures collated in 2016 showed that for the NOC, some 27% of our early career

researchers are working on EU funded projects. Of this number, 47% are EU national (excluding UK).

1.6 The NOC benefits from scientists choosing to work in the UK. Similarly, UK scientists in working in international institutes, gain knowledge and experience which they can bring back to the UK. Paragraphs 16 and Box 3 refer to the value of the mobility of researchers and the need for discussion as to how to take this forward. We would welcome the opportunity to be take part in the discussion.

1.7 Paragraph 20 refers to Horizon 2020. We would like to emphasize two key advantages of this programme:

Horizon 2020 has enabled coherent multi-national European programmes to be planned, developed, peer-reviewed and funded and then managed as a single scientific project from the outset. This has given European science considerable competitive advantage.

Horizon 2020 is more strategic and user-led than many traditional research council funding streams. In terms of science it is more explicitly engaged with European maritime policy users of science. In terms of technology innovation, it is much easier for the NOC to work in the mid-range technology readiness levels (TRL4 – TRL7 – operational field trials and demonstrators) than it is with research council funding which tends to be focused at the early TRL stages.

The NOC is hopeful for a new mechanism that will enable streamlined development and funding of joint scientific multi-lateral scientific programmes with European partners.

1.8 Paragraph 33 refers to European Research Infrastructure Consortia (ERICs). The legal relationship of the UK within ERICs (ERIC's fall under the jurisdiction of the ECJ) will need to be reviewed and managed. The NOC relies directly on infrastructures owned and/or coordinated by three existing ERICs. These are the

- Integrated Carbon Observing System (ICOS)
- the EuroArgo profiling float programme
- the European Multidisciplinary Seafloor and water-column Observatory (EMSO).

However, one of the benefits of ERIC membership is that these entities can apply for EU funding (e.g. Horizon 2020) in their own right. Hence one of the benefits for the UK of ERIC membership would be lost if the UK were no longer participating in Horizon 2020.

The NOC welcomes the Future Partnerships Paper and looks forward to opportunities to engage in discussions for next steps.

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2 Issues below identified in previous S&T Committee reports that have since been addressed, and which still require attention:

2.1 The pros, cons and remaining uncertainties for science and research following the recent UK/EU Agreement for an '**Orderly UK withdrawal**'.

People

2.1.1 The NOC would like to stress the importance of rapid progress to ensure the residency and other EU nationals working in the UK is clarified to provide better certainty as presently, the situation is very unsettling. Scientists operate in a globally competitive employment market and have choices to go elsewhere other than the UK.

2.1.2 The NOC would like to see an outcome that leads to the minimum of impediments to mobility of early career post-doctoral researchers who as part of the process and culture of science move between institutions and countries. The cross-fertilisation of ideas and collaborative networks built are of immense benefit to UK science – both from inward movement of international researchers and the experience gained and brought back to the UK by British researchers.

Funding

2.1 The UK was one of the largest recipients of research funding in the EU. Over the period 2007 – 2013 the UK received €8.8 billion out of a total of €107 billion expenditure on research, development and innovation in EU Member States, associated and third countries. This represents the fourth largest share of the EU. In terms of funding awarded on a competitive basis in the period 2007 – 2013 (Framework Programme 7), the UK was the second largest recipient after Germany, securing €6.9 billion out of a total of €55.4 billion. Adjusting these figures for GDP shows that the UK has performed well for the size of its economy (Ref 3). According to a 'conservative' estimate about the leverage effect of EU funding, the 2017 Technopolis Group report, commissioned by the Royal Society, notes that '*the UK's participation in EU Framework Programmes – the €9.6bn awarded to UK participants from FP7 and Horizon 2020 (so far) – will lead to a total increase in research and innovation expenditure of €16.6bn*.' (Ref 4).

2.2 The NOC would be gravely concerned about rapid collapse of access to EU funding without some means to substitute or buffer the impact of withdrawal of funding. In 2016/17 the NOC received 15-20% of its funding for science via the European Union. This corresponds to ~ 42% of the NOC's non-NERC competitively awarded income for science and technology development. Some areas of activity where the UK is unequivocally world leading (like marine sensor technology development) are highly dependent on EU funding as it allows work in the TRL4-7 space that is critical to bringing concepts to operational use. In this area of the NOC exposure to loss of EU funding is at

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least 40-50% and could lead to rapid loss of UK capability without substitution or buffering.

2.2 The consequences of any short-term uncertainty during the negotiation period, and how these can be addressed.

People

2.2.1 The NOC is concerned about the unsettling nature of the current period for researchers – scientists operate in a globally competitive employment market and have choices to go elsewhere other than the UK. People need access to concise information, as quickly as possible, that will clarify their position.

2.2.2 We will continue to seek to appoint EU nationals to long-term tenured positions in science, engineering and technology, and will want to recruit with the minimum of barriers and be able to assure staff that their contracts will be secure. If the UK moves to a points-based immigration system, we hope that skills in the scientific, engineering and technology disciplines will be high priority.

2.2.3 For staff appointed on fixed term appointments, especially at the postdoctoral level, it is important that the NOC is able to continue to recruit, not just from the EU but from all over the world. Scientists at this early stage of their career optimise their experience by being able to move between institutions both in the UK and overseas and this experience is incredibly valuable, especially when the NOC has opportunity to recruit UK scientists who have had opportunity to work overseas and then return to the UK.

Funding

2.2.4 Strong investment in science stemming from successive Government recognition of the need for a healthy science base to underpin a healthy knowledge-based economy in a global economy (especially where emerging economies are fast investing and growing scientific capability). The science base has enjoyed relative protection during a period of constrained public finances.

2.2.5 Regardless of the changing nature of the UK's future relationship with the EU, the UK will continue to have a shared vision for '*clean, healthy, safe, productive and biologically diverse oceans and seas'* as set out in the UK Marine Policy Statement. At present some of the research and observations required to achieve the vision are underpinned by EU resources, so the UK marine community will be looking for some reassurance as to how shortfalls in funding can be met.

2.2.6 The marine community looks forward to Government working to ensure that the UK does not lose its global leadership in the development and use of marine autonomous systems.

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2.2.7 As the UK shares its seas with our European neighbours, science-based evidence gathered on a collaborative basis will still be needed, particularly if the UK decides to continue to work with neighbouring States on measures to achieve 'Good Environmental Status' under the Marine Strategy Framework Directive.

2.3 The UK's future participation in Horizon-2020 and its successor programmes, including any alternative models that should be explored.

2.3.1 The Horizon 2020 research funding programme is the EU's current flagship programme for science and innovation. We hope that some mechanism may be found to enable streamlined development and funding of joint scientific programmes with European partners

Associate members such as Turkey and Israel are able to take part in H2020 programme and as a minimum such an associated membership should be maintained in the next Framework programme.

Example existing multi-partner programmes

There already exists a number of frameworks that enable bi- and multi-agency/country participation in collaborative programmes. We highlight here some examples of the varying types, from frameworks where countries provide funding for particular purposes and that are outside of the EU H2020 framework e.g. JPI, as well as collaborative programmes that currently drawn down on EU funding e.g. Galway Statement, but could be contributed to post-Brexit with direct funding of UK based projects.

JPI Oceans

The Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans) is an intergovernmental platform, open to all EU Member States and Associated Countries who invest in marine and maritime research.

JPI Oceans covers all European sea basins with 21 participating countries and provides a long-term integrated approach to marine and maritime research and technology development in Europe.

The 2003 Galway Statement

In 2003 the EU, the United States and Canada signed the Galway Statement on Atlantic Ocean Cooperation with the aim of furthering research into the workings of the Atlantic Ocean and its interaction with Arctic. A contributing factor to the development of the Statement was the fact that Atlantic research cannot be seen from a European perspective alone.

OSNAP – A Subpolar Measure of the Atlantic Meridional Overturning

The UK-OSNAP programme is part of an international collaboration led by the United States which includes partner countries Canada, China, France,

Germany and the Netherlands. The research aims to provide a continuous record of the full-water column, trans-basin fluxes of heat, mass and freshwater in the subpolar North Atlantic.

The RAPID-Atlantic Meridional Overturning Circulation Programme

The RAPID-AMOC programme is a continuation of two previous programmes to study the Atlantic meridional overturning circulation and involves the UK Natural Environment Research Council and the US National Science Foundation funding agencies.

An analysis in 2017 of who the NOC collaborates with most frequently resulted in Germany, France, Italy and Ireland in the top 5 of all countries, the 5th being the USA. Options to consider the establishment of bi-lateral agreements with such countries should be considered as a mechanism to continue collaborative efforts e.g. the NOC has close collaborative ties with the Helmholtz Centre for Ocean Research Kiel (GEOMAR) and NOAA in the USA.

2.4 Whether recent science co-operation deals (eg. the Joint UK-China Strategy for Science and UK-US Science and Technology Agreement) provide a suitable model for collaboration with other countries post-Brexit, including the EU.

2.4.1 It is encouraging to see development of the recent science co-operation deals noted above. At the moment, in addition to applying for funding from the EU, the NOC applies to several other mechanisms, examples of which include:

The **Newton Fund** uses science and innovation partnerships to promote economic development and social welfare of partner countries. It does this through collaboration with partner countries and working with 15 UK delivery partners.

The **Global Challenges Research Fund** is a 5-year £1.5Bn fund and a key component in the delivery of the UK Aid Strategy: tackling global challenges in the national interest. The fund aims to ensure that UK research takes a leading role in addressing the problems faced by developing countries.

The **Prosperity Fund** aims to help promote economic growth in developing countries and is worth £1.2 billion over 6 years. Its priorities include improving the business climate, competitiveness and operation of markets, energy and financial sector reform, and increasing tackling corruption.

The **Conflict, Stability and Security Fund** is a pot of money that the Government spends on tackling the causes and effects of conflict and instability in countries of strategic importance to the United Kingdom. The CSSF was launched in April 2015 to deliver a “new, more strategic approach to [the UK’s] work in conflict-affected states”.

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The NOC looks forward to Government continuing to enable the UK marine science community to deliver world class science and technology.

References

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