National Oceanography Centre

Future frameworks for international collaboration on research and innovation Professor Sir Adrian Smith call for evidence

Pages one to seven provide background information; contributions to the 'areas of interest' start on page seven.

Introduction

The National Oceanography Centre (NOC) undertakes world-leading research in large-scale oceanography and ocean measurement technology innovation. We work with Government and business to turn great science and technology into advice and applications. We support the UK science community based in universities and smaller research institutes with scientific facilities, research infrastructure and irreplaceable data assets - enabling the UK to harness the full power and diversity of its scientific talent in ocean science.

Our main mission is to make sense of changing seas, upon which future human prosperity and wellbeing depends. The way in which we intend to achieve our mission is by:

- Undertaking internationally competitive marine science research in an Earth system context with a long-term focus – working with others for the effective translation of new and existing knowledge into demonstrably high societal benefit.

- Managing, developing, coordinating and innovating 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.

The NOC is part of the Natural Environmental Research Council (NERC), which is part of UK Research and Innovation, an organisation which brings together the UK's seven Research Councils, Innovate UK and Research England to maximise the contribution of each Council and create the best environment for research and innovation to flourish. The vision is to ensure the UK maintains its world-leading position in research and innovation.

Summary

The key observations are:

1. Ocean science is inherently international by nature. For ocean science, international scientific collaboration is essential to address the global scientific issues whilst also providing the evidence base for marine policy and environmental management. Effective frameworks for international cooperation are not only desirable but essential - especially as ocean issues and the need

for science-based evidence and solutions to address them rises in prominence in the international agenda (e.g. UN System, G7, G20).

2. A number of published UK strategies emphasise the importance of ocean science and its global dimensions including:

- GO Science Future of the Seas Foresight Report (2018) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/706956/foresight-future-of-the-sea-report.pdf

- DfT Maritime 2050 Strategy (2019)https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/773178/maritime-2050.pdf

- FCO-led International Ocean Strategy (due for publication 2019) https://www.gov.uk/government/news/foreign-secretary-announces-uk-strategy-to-protect-worlds-oceans

3. There should be more effective, explicit and conscious engagement between research funders (UKRI) and the relevant departments about the priorities and research needs associated with these strategies – presently they are too easily overlooked.

4. International Research Programmes in ocean science are critically underpinned by research infrastructures and these are key to the success of many collaborations. The UK has world-class research infrastructures, like research ships. However, the global scale infrastructure for ocean observations (which underpin science concerned with global/basin scale change and variability in ocean and ecosystem process) is not viably funded in the UK for a variety of reasons. Degrading data quality is some areas is affecting the international credibility of UK contributions to global systems (one example being the global sea-level record from coastal tide-gauges). The basic problem is that business model innovation has not kept pace with technological innovation in ocean measurement – such that continuous, globally distributed observations essential for science and other applications continue to be funded by short-term science projects (or as incidental to other primary purposes) rather than viewed as infrastructural in nature. It will be crucial to address this issue if the UK is to position itself as a credible, reliable partner in international ocean science - developing frameworks to supporting short-term programmes without being prepared to contribute to their underpinning infrastructures is not sustainable.

5. Horizon 2020 (Horizon Europe) not only provides access to substantial funding, but the nature of that funding occupies a niche in funding available to the UK ocean science community in that it is strategic, long-term, enables multi-institution programmes to be developed and delivered through a 'one stop shop' funding mechanism. The Joint Programming Initiatives (JPI) provide a means to align national funding across Europe (outside of the institutions of the EU) and could become a very important mechanism should the UK leave the EU in a manner that did not provide access to Horizon Europe. However,

although a member, the UK has not been a strong player in JPI-Oceans http://www.jpi-oceans.eu/ as it seems various barriers make this an unattractive mechanism for developing joint programmes. These obstacles will need careful consideration with a view to overcoming them should JPI become one of the few mechanisms available for developing and delivering multi-national ocean science programmes.

6. Official Development Assistance (ODA) funding is important and an appropriate mechanism for pursuing many ocean science and capacity building issues. However, the traditional short-term approach in science funding does not deliver effectively to the ODA agenda. It risks undermining credibility with partners and causing reputational damage at both the national and institutional levels; especially as ODA is not just about achieving science outputs and moving on to the next project but inherently involves longer-term capacity building, relationships and duty of care.

7. In the Ocean domain, the UN Decade of Ocean Science for Sustainable Development 2021-2030 https://en.unesco.org/ocean-decade is now setting the agenda as the key framework for scientific cooperation with science directed at addressing major societal and environmental challenges. The UK Government (FCO) is strongly engaged and it will be important that the research base (UKRI) becomes engaged too (as per point three above about UKRI engagement with key government departments and policy priorities). Mechanisms to resource and support national scientific focal points to coordinate scientific engagement and influence in major global initiatives such as this are urgently required.

Background

1. This input from the NOC is made particularly from the perspective of **oceanographic science** which is highly international in nature. Given that the ocean respects no administrative or political borders, the scale of the science is often global and the scale and nature of the measurements required needs international scientific cooperation.

2. Moreover, **ocean science is of national strategic importance** for the UK to underpin a variety of UK interests including:

- As a **maritime nation** (90% of trade is seaborne and with an ocean economy worth £50 billion/year and supporting almost 1 million jobs).

- As a **global influencer** in which international ocean affairs and the international rules-based governance of the ocean (e.g. UN Convention on the Law of the Sea and other maritime conventions) are central to many other global concerns requiring extensive international cooperation in finding evidence based solutions (including climate change and global biodiversity loss). For example, a new 'High Seas Treaty' concerning conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ) - a legally binding instrument under the UN Convention on the Law of the Sea - is

currently being negotiated after 10 years of preparatory consideration in which scientific evidence and expertise is important.

- Supporting the UK's **national security** interests (the world's 5th most powerful navy).

3. Many of these issues were identified in the Government Office for Science 'Future of the Seas' Foresight Report (March 2018). That report emphasised the inherently global dimension of ocean issues and ocean science as one of four structural issues which affect the UK's ocean interests. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/706956/foresight-future-of-the-sea-report.pdf

4. Following a recommendation of the GO-Science Future of the Seas Report, the UK Government is about to publish in 2019 its **International Ocean Strategy (led by FCO)** and relating to the UK's diverse marine and maritime interests and emphasising the importance of science and technology in supporting and advancing those interests.

5. In particular, the '**ocean economy'** is based on all businesses with reliance on the sea and includes fishing, aquaculture, marine biotechnology and coastal tourism. It is forecast to double globally from $1.5Trillion to $3 Trillion by 2030 (The Ocean Economy in 2030, Report, OECD 2016). https://www.oecd.org/environment/the-ocean-economy-in-2030-9789264251724-en.htm

The report emphasises the importance of science and innovation in supporting sustainable growth of the ocean economy.

6. In January 2019 the Government (**Department for Transport**) published its **Maritime 2050 strategy** which emphasises the importance (though often unrecognised) of this sector (a subset of the ocean economy focussed on ports, shipping, offshore technologies, maritime services such as insurance, classification, consultancy, legal) to the UK economy, and the many competitive advantages that the UK enjoys, including its legal framework, fiscal regime, financial, brokering and insurance services, strong reputation for maritime safety, environment, training standards, influence international governance, a diverse skilled workforce and **world leading marine science & technology base**.

   https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/773178/maritime-2050.pdf

7. The **Global Ocean Science Report** published by the Intergovernmental Oceanographic Commission of UNESCO in 2017 https://unesdoc.unesco.org/ark:/48223/pf0000249373 shows the UK to be a leader in ocean science in terms of scientific outputs and citations (**Figure 1**)

The production of global ocean science is increasing. Between 2010 and 2014 more than 370,000 manuscripts in ocean sciences were published and more than 2 million articles were cited. There is some relationship between quantity and quality in ocean science performance, however, countries with the largest numbers of publications are not necessarily the most highly cited (Figure ES7).

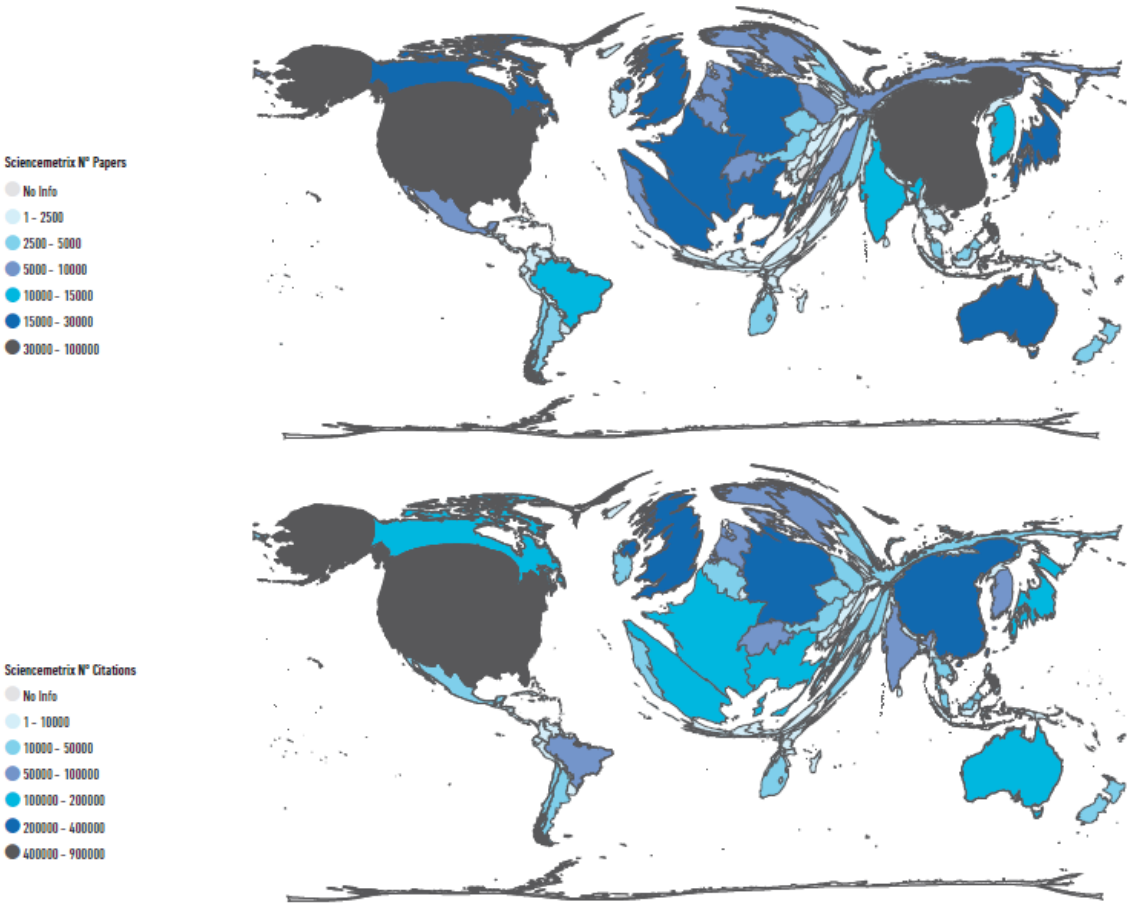

Figure ES7. Publication and citation map of the world. The area of each country is scaled and deformed according to the number of ocean science publications (top) or citations received (bottom). Different colours indicate a different number of publications (top) or citations (bottom). Source: ScienceMetrix, 2015.

Figure 1

8. In December 2017 the United Nations General Assembly (UNGA) declared the **UN Decade of Ocean Science for Sustainable Development (2021-2030)**. https://en.unesco.org/ocean-decade. This was strongly supported by the UK in the UNGA process. Meaningful UK engagement with the 'Decade' means enhanced international and interdisciplinary scientific collaboration to achieve coordinated global action.

9. A roadmap for implementation of the 'Decade' has been developed by the lead UN body for ocean science (the Intergovernmental Oceanographic Commission of UNESCO, IOC). The aim is for transformational science ("*the ocean science we need for the future we want*") to address key societal and environmental issues facing people and the ocean in the coming decade, namely the need for:

- ***A clean ocean - pollution*** *identified, quantified, reduced, removed.*

- ***A healthy and resilient ocean - ecosystems*** *mapped, protected, multiple impacts measured reduced ecosystem services maintained.*

- ***A predicted ocean -*** *society has capacity to understand* ***current and future ocean conditions,*** *forecast their change and impact on human wellbeing and livelihoods.*

- ***A safe ocean -*** *human communities protected from* ***ocean hazards and safety*** *of operations at sea and on the coast is ensured.*

- ***A sustainably harvested and productive ocean -*** *ensuring the provision of* ***food supply*** *and alternative* ***livelihoods.***

- ***A transparent and accessible ocean -*** *all nations, stakeholders citizens have access to ocean* ***data/information****, technologies have capacities to inform their decisions.*

10. The Decade has two high level goals:

- **Goal 1:** To generate the scientific knowledge and underpinning infrastructure and partnerships needed for sustainable development of the ocean.

- **Goal 2:** To provide ocean science, data and information to inform policies for a well-functioning ocean in support of all Sustainable Development Goals of 2030 Agenda.

Under these sit six strategic objectives. The first three define the scientific basis for the ocean we need:

- **Objective 1**: To **generate knowledge of the ocean system**, its role in the earth and climate system, including the human component, its biodiversity and the seabed, to support sustainable management.

- **Objective 2**: To develop and provide access to a comprehensive **evidence base and capacities for ecosystem-based management** that will improve ocean health and support a blue economy; Emphasis will be given to research on socio-economic aspects of sustainable use of the ocean, and as well as understanding and managing the effects of cumulative stressors.

- **Objective 3**: To save lives and reduce risks from extreme events and ocean-related hazards through an accelerated programme **of research and development supporting integrated multi-hazard early warning** systems, accompanied by improved community preparedness and awareness.

The second three cross-cutting objectives enable and support the first three objectives:

- **Objective 4**: To enhance ocean **observing networks, data systems and other infrastructure**, and their supporting cooperation and partnerships to service the demands of all nations by 2030.

- **Objective 5**: To transform the **scientific and technical capacity** of the ocean stakeholders, especially for Small Island Developing States ('Large Ocean States') and Least Developed Countries through greater access to and more informed use of scientific knowledge and accelerated transfer of marine technology, training and education, and increased ocean literacy so that all can participate in, and benefit from, developments in ocean science and technology and its application for sustainable economic development, food production, ocean management, assessments, and responses to climate change.

- **Objective 6**: To enhance **cooperation, coordination, and communication** between stakeholders, including the private sector, in ocean science, with immediate delivery of new and existing knowledge to policy and decision-makers in the context of the 2030 Agenda, and beyond.

11. However, the internationally strong scientific capability of the UK is no cause for complacency as stiff international competition continues to grow (including competition for talent). It is notable that investment in marine science by China is very significant in terms of building new institutes and expanding existing ones and investing heavily in oceanographic research infrastructures such as research ships and deep-sea submersibles and is engaging ever more strongly in international scientific cooperation (e.g. Decade of Ocean Science). This is not only a reflection of China's general growth of its science base, but also recognition of the importance of being a player in international ocean affairs for strategic national interests and global influence.

12. In the above context, the call for evidence regarding future frameworks for international collaboration on research and innovation is welcome and timely. International cooperation is not merely desirable but essential in an ocean science context.

1. Methods by which new funding arrangements can:

Support research discovery of outstanding quality in all disciplines through international partnerships;

General Approaches and Culture

- In the ocean science context described, it is essential that new funding arrangements are able to strategically align with major international programmes and initiatives (e.g. UN Decade of Ocean Science for Sustainable Development) and the relevant UK strategies and stakeholders (e.g. International Ocean Strategy and Foreign & Commonwealth Office and other key policy departments).

- Whilst the UK science base rightly emphasises scientific excellence and science based on coherent, tractable scientific questions (rather than

generically framed policy aims or general issues), the framing of science programmes in the UK Funding Agencies (now UKRI) do not yet seem to sufficiently adept at engaging with key policy customers at a sufficiently strategic level at the point of design. Engagement between NOC and FCO and Defra for example has elucidated some of strategic concerns in the ocean realm (and in the international space) and need for science – but this dialogue needs to take place at the Funding Agency level.

- The forthcoming Spending Review would provide an opportunity for strategic level engagement between UKRI and FCO and Defra on science needs to support key international agendas.

- There is an unhelpful cultural issue in some sections of the science base (a 'not invented in the UK' mentality) that affects the design and funding of international collaborative programmes – with strong emphasis on UK leadership, the UK designing programmes and seeking international partners downstream. Indeed, pitching science as contributions to established international programmes is sometimes perceived by scientists as a 'kiss of death' which encourages downplaying the cooperative elements and playing up UK leadership.

Scientific Infrastructures – getting the UK national picture right in order to be an effective international partner

- In some fields of science (e.g. particle physics, space science), the scale of the infrastructures needed are so large that it forces international collaboration and frameworks (e.g. subscription based) for supporting those infrastructures.

- This is not yet the case in ocean science where the infrastructure takes a different form. The largest single infrastructure items (research ships) are not large enough to make transnational construction and operation essential (the are just about affordable nationally and there has never been any serious drive for jointly-owned and managed transnational ships). Nevertheless, the UK was the pioneer and active partner in international mechanisms for bi-lateral (UK-USA) and multi-lateral (Ocean Facilities Exchange Group, OFEG) for international barter of ship-time and large marine research equipment http://www.ofeg.org/np4/home.html

- On the other hand, the major infrastructure in oceanography is the global ocean observing system consisting of satellites and multi-platform 'in water' based basin-decadal scale measurements using (ships, drifting buoys, moored arrays, profiling floats, autonomous underwater and surface platforms etc.). However, this is constructed from national contributions and loosely coordinated internationally. Indeed, technological innovation is enabling ocean measurement by more globally distributed, continuous presence (using autonomous vehicles). The traditional framework for funding ocean science measurements has been individual short duration (five years, say) project funding. However the nature and technology-enabled ocean measurement approach is much more infrastructural in nature (not tied to individual projects and with multiple beneficiaries – science and non-science users). This poses a

massive problem for the present UK science funding system (and for many others too) which needs to be addressed. The UK's contributions to global observations lack long-term resilience and we punch below our weight in terms of what we ought to contribute to global endeavours. The fact that some beneficiaries are non-scientific only adds to the complexity by raising questions as to who should pay.

- Resilience in UK contributions to distributed, international ocean measurement infrastructures will be essential for the UK to play a significant role in international science programmes. The business model (funding framework) for international ocean observation is now in need of innovation to match the technological innovation that has enabled new approaches to ocean observations. In terms of method, the basic principle would seem to be a shift from project–based funding to a more infrastructure model. Science funding agencies (for understandable reasons) do not like long term infrastructure capital and resource commitments because it limits headroom – however it is an inevitable implication of the course of advancement of ocean science (and Earth science more generally) and the nature of the scientific and societal issues being addressed.

- The above matter of resilience of key observing infrastructures is not merely one of science funding but also of multi-use infrastructures (of which science use may be one but not the primary user). A key current example is the UK's contribution to the Global Sea Level Observing System (GLOSS) based on coastal and island tide gauges. The UK's contribution to this programme is made up of a subset of seven out of 43 tide gauges operated by the Environment Agency, primarily for flood warning. The seven gauges at least should be maintained to climate quality (GLOSS) standards but are not, to the extent that the data quality is at its poorest for 100 years. This has become noticed internationally – this is hardly a great advert for the UK as a responsible international contributor to scientific information gathering (concerning one of the most iconic data sets - the global sea-level time-series). Despite the issue being raised in government, there is little sign of a solution.

Summary of methods for funding arrangements

The following are suggested as approaches:

- An explicit process for taking up recommendations for GO-Science Foresight exercises not only within Government Departments but within the considerations of science funding agencies (UKRI).

- More effective and explicit engagement between science funders and key policy customers on international research needs – especially where there are published UK Government strategies/assessment or those which have resulted from intergovernmental processes (e.g. IPCC, IPBES).

- Review of the need for different approaches to supporting (ocean) science distributed global observing infrastructures providing data addressing large-scale long-term change and variability. There is a need to shift from project-

based to a more infrastructural programme framework funding model for some systems (business model innovation needs to match the technological innovations that have transformed measurement capabilities)

Attract to the UK researchers of outstanding capability from around the world; and

- International inflow of researchers is as important for ocean science as for all other branches. Hence our issues are generic and likely to be covered by others.
- An interesting example of good practice was identified by the Netherlands Organisation for Scientific Research's (NWO) WISE programme (Women in Science Excel, https://www.nwo.nl/en/research-and-results/programmes/women+in+science+excel). WISE is a tenure-track programme that gives talented women scientists the opportunity to develop or expand their own research group at one of NWO's institutes, with attractive conditions sufficient to recruit the highest level of talent, internationally. Although designed to address gender issues in the Dutch science base a programme akin to WISE could also be a significant factor in encouraging a continued flow of highly motivated, international researcher talent into the UK against stiff international competition. The WISE programme is certainly achieving that benefit for the Netherlands. On the most recent round not of the finalist were Dutch and the successful candidates were of the very highest international calibre.

attract further R&D investment to the UK, thereby contributing to the Government's 2.4% agenda

Meeting the 2.4% GDP target will require increased business R&D investment and especially the attraction of inward business R&D investment into the UK. The natural instinct will be for the research base to look to investing in sectors that already have high R&D intensity (dialogue with these sectors is straightforward because there is a good cultural fit and science investments into high-R&D-intensity sectors is likely to be lower risk).

However, this is not likely to be an effective strategy for the level of growth aimed for. On the other hand, where R&D intensity is presently low then there is scope for growth and for attracting inward R&D investment, especially where the regulatory environment can be made attractive for innovation.

The Maritime 2050 strategy identifies the importance of that sector to the UK economy. However, parts of that sector (which is quite heavily service orientated) have low R&D intensity and dialogue between Maritime UK and UKRI is recommended to open the dialogue supporting R&D growth in the sector using the stimulus of some public R&D and innovation funding targeted on that sector in a coherent way).

Recommendations from the Maritime 2050 Strategy include:

- Strengthen the UK profile as the place for maritime thought leadership through government and industry hosting top academic maritime conferences and shipping events.

- Maximise our leadership role in the IMO and other international bodies through continued and enhanced thought leadership.

- Invite leading figures from the UK maritime academic sector to work with government, industry and social partners to create a blueprint for future maritime thought leadership collaboration, including cluster success.

- To ensure that the most innovative companies and ideas are brought to market for the benefit of UK maritime, government will explore further opportunities to continue to support maritime innovation.

- The UK will be at the forefront of international efforts to chart the international seabed area, helping us to understand how to sustainably manage and benefit from the global ocean environment and creating exportable hard technology and soft skills.

2. The optimum balance of emphasis for any new funding arrangements in each of the following dimensions:

European collaboration, Official Development Assistance and global collaboration;

All three dimensions of international funding arrangements are important for ocean science:

Europe

Horizon 2020 (Horizon Europe). Aside from the question of the volume of research funding this provides (20—25% of the NOC research income), the European Framework programmes have a special functionality within the ocean science research landscape with the following characteristics:

- Strategically orientated to societal problems – which aligns with the drivers for many ocean science issues and strongly aligns with global agendas
- The programmes are one important element in sustaining long-term ocean observations including through European Scientific Research Infrastructures. They provide a vital complement to NERC's programmes of national capability funding which enable some long-term ocean observations to be supported. Without access to these programmes, the UK will need to think more carefully about the question of how to support basin-decadal ocean measurements. The European Commission has recognised more clearly than any other research funder the increasing infrastructural nature of ocean science observing

systems, exemplified by the recent AtlantOS programme: https://www.atlantos-h2020.eu/

- The 'one stop shop' ability to put together large collaborative programmes with the key oceanographic players in Europe. Without these mechanisms we would be reliant on having to stitch together multiple national programmes (formulated on different timescales) and possibly retrospectively.

There seems to be an ambivalence in the UK research base towards European funding. On the one hand, it is seen as a vital ingredient in the health of the UK's science base (and one where more funding is secured into the UK from the EU than is nominally contributed). On the other hand, there are few examples in the marine science space where significant UK research programme funding has been explicitly designed to take account of or align with major EU programmes (though in some cases this has been done retrospectively). In other cases, EU funding is simply regarded as a risk for individual institutions, not actively encouraged or facilitated, and by implication viewed as something different from UK research funding.

Mechanisms in Europe such as the Joint Programming Initiatives (JPI Oceans) have had weak UK engagement. Whilst the JPI mechanism is designed to enable EU Member States to align their national science efforts (which collectively far exceed EC Research Funding), there appear to be particular barriers which mean funders find it not a useful mechanism for this purpose. Were the UK to leave the EU on a basis that did not provide for access to Horizon 2020 funding then the JPI mechanisms (which is independent of the institutions of the EU) would have to be looked at much more seriously as one of the few remaining ways ('last show in town') for providing multi-lateral design and funding of programmes with key European partners (albeit based on national funding). Consequently, it is suggested that the disincentives for engagement in the JPI mechanisms should be examined with a view to seeing what might be done within the UK to overcome these.

Official Development Assistance

In the ODA context, there is a need for improved multi-donor funding schemes to deliver better international coordination of capacity building efforts (e.g. joint initiatives between UK and other countries to provide marine institutional capacity in developing countries). A more joined-up approach across UKRI and other government departments is a necessary precursor. Whilst the Newton Fund delivers excellent science in a bilateral context, the model is geared towards traditional science outputs rather than more strategic outcomes; other models of longer term joint strategic partnership are used elsewhere and could be considered, e.g. the joint strategic programmes employed by the Netherlands:

https://www.knaw.nl/en/international/scientific-cooperation-with-indonesia/joint-research-projects

There are also sensitivity issues about the ODA 'badging' of the Newton Fund with some larger countries on the DAC list with good science capabilities (India is a good example). One size does not fit all in these bilateral and multi-lateral schemes and a broader range of mechanisms could be considered.

Long-term capacity building is central to the successful delivery of objectives for both the UN Decade and the UK's imminent International Ocean Strategy. Capacity building with fully engaged international partners is essential to achieve the use of

scientific evidence and data to support marine policy and management globally. That scientific advice has to be sourced locally. A long-term programme of capacity building is necessary to achieve this and is not achievable on the basis of three-to-five year projects (as per Summary point six, page three).

Global

Mechanisms for engagement in global programmes will become increasingly important in ocean science. Existing mechanisms like the Belmont forum provide one way of aligning national science funding contributions.

There a few international sources of public funding for supporting international programmes (though there are increasing philanthropic and even industrial sources which can support this). Consequently, in terms of public funding the key will likely continue to be securing national funding and having in place effective mechanisms to coordinate and align this with internationally agreed science goals. Two elements would greatly facilitate this:

- Breaking down some of the perception barriers ('not invented here') that inhibit being much more explicit that a contribution to an international programme is being developed.
- The ability to support and resource national scientific focal points (science leaders, a national committee of experts and stakeholders, and an appropriately resourced secretariat) to build and develop the national science communities thought leadership and input to national programmes and to develop and coordinate UK inputs and visibility and influence. This is something we would want to do to maximise the opportunities for the UK of the UN Decade of Ocean Science for Sustainable Development.

Support for: outstanding individuals; blue-skies research; business innovation and research impact; and research facilities and infrastructure; and

Research and innovation domains (research disciplines, business sectors etc.).

See comments made previously about the Maritime Sector.

3. Methods and timescales for introducing any new funding arrangements for international collaboration, including those that

- **reflect the ambitions of small and large businesses**
- **foster new systems of international peer review and funding**

4. The roles of Government, UKRI, National Academies and other organisations in defining the agenda for European and international collaboration and administering any new funding arrangements for such activities.

5. Existing evidence on the efficiency and effectiveness of funding for international collaborations.

6. **Any other issues relating to this work that you wish to bring to our attention**

This is covered in the introduction/summary.

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