Written evidence from National Oceanography Centre (SUK0054)

The UK's National Oceanography Centre (NOC) is one of the world's leading ocean scientific research and technology institutions, with a remit to deliver research from the coast to the deep sea. We are an independent research organisation, with charitable status. We were formerly part of the Natural Environmental Research Council (NERC), which is part of UK Research and Innovation, until 2019, and remain one of six NERC research centres.

We undertake and facilitate world-class, agenda-setting scientific research and technology development to understand the ocean, which in turn underpins international and UK public policy, business and societal outcomes. We are in a unique position of having world-leading multi-disciplinary scientific and technical expertise from coast to deep ocean, and from physics to fish.

NOC operates the Royal Research Ships *James Cook* and *Discovery* and develops technology for coastal and deep ocean research. This includes autonomous vehicles and sensors, which can be used to explore the oceans and collect data to better understand and monitor marine environments. Working with our national and international partners, we provide long-term marine science capability including sustained ocean observations, data management, mapping of the seafloor and its habitats, scientific research and advice.

Among the resources that we provide on behalf of the UK are the British Oceanographic Data Centre (BODC), the Marine Autonomous and Robotic Systems (MARS) facility, the National Tide and Sea Level Facility (NTSLF), the National Marine Equipment Pool (NMEP) and British Ocean Sediment Core Research Facility (BOSCORF).

Our headquarters in Southampton are also the home of our Innovation Centre, where we develop world-leading technology to drive innovation in marine science. Here we work on autonomous vehicles, such as gliders – which are robotic underwater vehicles used for measuring oceanographic parameters and transmitting it back to the shore, robot submarines such as Autosub Long Range, also known as *Boaty McBoatface*, which are programmed with instructions of where to go, what to measure and what depths to go to and can be adjusted to meet the needs of a specific expedition, and other similar marine technology. Alongside this, our

world-class staff also work on sensors and other hardware, as well as software.

Scaling UK science and technology

1. Translating excellent basic science and technology into global companies has long been recognised as a problem for the UK. Many policy initiatives have tried to address this. What are the key barriers that the Government must address to fix this? What specific policies need to change? Why have previous attempts not succeeded?

The ocean connects us all and has a critical role in supporting life on Earth. It can bring immeasurable benefits in the fight against the climate change. Blue economy refers to a sustainable ocean economy relating to activities associated with the ocean, seas and coastal regions. These activities include activities to preserve and restore marine habitats, as well as economic activities, such as shipping and renewable energy.

As an island nation, the UK has the potential to have a thriving sustainable blue economy sector – something that would be good for the economy and the country. The preservation of marine ecosystems and the creation of this blue economy relies heavily on technological advancements. There should be more recognition from the government of the importance of the ocean, its wide-ranging impact on the UK (including in terms of economy, environment and national security) through an overarching international ocean strategy that deals with all matters related to the ocean and how the UK government will address them consistently.

Many promising innovators and businesses have no clear path to market entry. This is due to many factors, including a lack of resources, funding, and access to specialised facilities. This process can be assisted by building relationships between research institutions and industry, ensuring scientific and technical experts from those institutions have access to facilities and each other's expertise. The Government can help with facilitating this process and providing support and funding to set up such facilities.

Our Ocean Catalyst programme is the first of its kind in the UK, as the only business accelerator dedicated to ocean technology. Launched earlier

this year, this programme will provide early-stage marine tech startups with an ecosystem that nurtures their growth and fosters collaboration among scientists, innovators, and industry leaders. The programme will include skill-building workshops, mentoring and access to our facilities.

This builds on our existing efforts as part of our Innovation Centre and Innovation Hub. The Hub, which was recently refurbished, currently has over 40 members and it facilitates business access to a network of experts, potential partners, and cutting-edge research, as well as opportunities to collaborate on industry-led projects, align with funded research initiatives, and accelerate the development of new ocean-related solutions. The Hub provides a vital environment for leading marine and maritime technology industries to connect, innovate, and lead in the evolving ocean economy.

We're proud of the work we're doing but government support to allow the scale up of such resources and to support the further development of UK's blue economy would create greater impact.

a) What lessons can be drawn from international comparators for innovation ecosystems such as the US, Germany, France, Ireland, Sweden, the Netherlands, or Singapore? Which international innovation ecosystems offer the most relevant policy lessons for the UK, and why? Are there specific policies the UK should adopt or case studies from which we can learn?

As above, the co-location of researchers and the industry can facilitate a thriving research and development sector. These already exist in a number of places across the world. Most notable example is the Silicon Valley in the US, which has fostered tech start-ups for decades.

Closer to home, the Brest-Iroise Technology Park in France brings together industry, higher education and research, with a specific focus on, amongst other things, marine science and technology. 6,300 people work and study on site, which includes 2,600 in businesses, 2,100 students, 900 researchers, 700 administrative staff. The French Research Institute for the Exploitation of the Sea is headquartered at the park.

The growth of this park has been impressive, growing from 100 companies in 2000 to 200 companies now. In the last year, 40-45 new entrepreneurs have become involved with the Technopole with 20 new projects. Approximately 11-15 new companies are started up on an annual basis. However, the Technopole also works with older established companies who want to innovate. These have the advantage that they

can take risks on single ventures or projects. Some of the companies have been very successful, with a medical devices company being highlighted as being recently sold to a US company.

Strategic priorities for UK science and technology in a changing world

2. How should the UK's science and technology strategy respond to ongoing major changes in the economic, geopolitical, and technological landscape? What challenges and opportunities now face the UK's science and technology sector? What policy actions would you prioritise?

Various reviews have tried to address the science landscape, for example, Sir Paul Nurse's Review of the Research, Development and Innovation Organisational Landscape published in 2023[1], and a fundamental challenge is that there is not a sustainable research funding landscape. This needs addressing.

The governments ambition to create continuity in research funding through 10-year funding certainty is a step in the right direction, but many research organisations struggle with piecemeal funding streams. Comparing the UK to other nations like Germany and France, where there appears to be more willingness to invest in institutes, such as, the Helmholtz, with substantial and wide-reaching programmes is something we should consider.

The focus of these programmes should, of course, address the challenges of the day, but these challenges do not change on the tides of changing government priorities and so need to be stable over substantial periods.

This additional financial stability would also help attract best talent today and in the future.

a) Is there clear cross-government coordination on delivering the UK's science and technology strategy, including from the Treasury and central Government as well as DSIT? How could cross-Government coordination be improved?

Coordination is currently lacking and a move to a 'national capability' setup that cuts across government departments would be a step forward.

[1] Research, development and innovation (RDI) organisational landscape: an independent review - GOV.UK

As an example, the Natural Environment Research Council's national capability programme supports many parts of Whitehall (including other parts of the Department for Science Innovation and Technology (DSIT)) and is aligned with other departmental research activities (most notably, in Department for Environment Food and Rural Affairs and Department for Energy Security and Net Zero) but it is not coordinated or easily jointly funded.

Finding ways of working together to create and implement a new vision for nationally important marine science infrastructures will create additional relevance of the science done in DSIT, be more efficient and create economies of scale.

Additionally, as previously set out, an overarching ocean strategy would allow for a consistent approach to ocean issues, including in terms of ocean science, research and technology.

b) Does the UK Government have the right strategic priorities for its R&D spend? For example, do the five critical technologies identified in the Science and Technology Framework align with the UK's strengths and weaknesses? What about the emerging prioritisation in the Government's Industrial Strategy? What implications will a required shift to defence spending in R&D have?

The Science and Technology Framework is lacking in recognition of areas of ocean science, research and technology.

As it stands, the maritime sector alone supports 1.1 million jobs, contributing significantly to UK's economy, with 95% of all goods are moved by ship and through ports – totalling over £500bn. The continued sustainability of this sector is key to the British economy. Additionally, the marine energy sector has the potential to create 22,000 jobs in the UK by 2040 and could add £50bn to the UK economy by 2050.

As an island nation, the UK has a great opportunity and potential to be a leader in research, innovation and technology development, which can enable the creation of a vibrant and strong sustainable blue economy sector.

c) Given that the UK cannot be world-leading in everything, which sectors should the UK prioritise (and de-prioritise)? Which sectors offer opportunity for the UK to obtain a

strategic advantage, given global supply chains and the nature of the UK economy?

UK should prioritise ocean science and technology. As set out above, the ocean has a significant potential to contribute to the UK's economy. UK is a world leader in science and research. The non-governmental body, UK Research and Innovation (UKRI) and their nine councils, supports the research and innovation environment within the UK through its work. Two of the councils, NERC and Innovate UK, together have over £3,000m funding used to fund their operations and UK science and innovations initiatives. Other national funding is available, for example, we were recently awarded more than £11 million in funding, from the UK's Advanced Research & Invention Agency (ARIA), to lead on the development of novel and innovative new ways to detect early warning signs of a change in the Atlantic Subpolar Gyre, which is part of their £81-million five-year programme.

NOC is a world leading ocean science, research and technology institution. Many of our facilities, such as the British Sediment Core Research Facility (BOSCORF) and the Discovery collections, which is the only collection consisting solely of deep-sea and open-ocean invertebrates in the UK, attract researchers from the UK and the rest of the world. Our Royal Research Ships*, Discovery* and *James Cook*, operate globally – most recently delivering oceanographic science and survey across the Atlantic and Pacific Oceans, up to the ice edge in both the Arctic and Antarctic and across the Caribbean and Mediterranean Seas. At the same time, they also support global science and discovery programmes such as Seabed 2030, which is a collaborative initiative between The Nippon Foundation and General Bathymetric Chart of the Ocean (GEBCO) aimed at mapping the entire ocean floor by the year 2030, and ARGO, which is an international program that measures water properties across the world's ocean using a fleet of robotic instruments that drift with the ocean currents and move up and down between the surface and a mid-water level.

Our Marine Autonomous and Robotic Systems (MARS) fleet is one of the largest and most advanced in the world, having benefited from a £10 million investment as part of the UK Government's 'Eight Great Technologies' initiative, and £16 million from the Industrial Strategy Challenge Fund. This fleet includes six Autosub Long Range Autonomous Underwater Vehicles, also known as *Boaty McBoatface*.

We continue to develop our marine technology at our Innovation Centre, which also hosts our Innovation Hub, which currently has over 40 members and facilitates business access to a network of experts, potential partners, and cutting-edge research, as well as opportunities to collaborate on industry-led projects, align with funded research initiatives, and accelerate the development of new ocean-related solutions. The Hub provides a vital environment for leading marine and maritime technology industries to connect, innovate, and lead in the evolving ocean economy.

We have also recently launched our Ocean Catalyst programme, which is the first of its kind in the UK, as the only business accelerator dedicated to ocean technology. This programme will provide early-stage marine tech startups with an ecosystem that nurtures their growth and fosters collaboration among scientists, innovators, and industry leaders. This will include skill-building workshops, mentoring and access to our facilities.

Our experience shows that there is a lot of potential to create more opportunities in marine science, research and technology space, and there's potential to facilitate better connections between research institutions, like ours, and business enterprises.

Financing investment in UK science and technology

The UK research and innovation landscape

3. Is the UK's research and innovation landscape well-structured to support science and technology commercialisation, economic impact, and strategic advantage for the UK?

There are some improvements that could be made. There are currently some barriers to bridging the gap between science and technology and commercial opportunities. Our Innovation Hub, as outlined above, has been a great example of where this gap can be closed by co-locating scientists, technology experts and enterprises enabling them to work together.

One of the successes included the creation of the Blue Ocean Research Alliance (BORA) partnership with Subsea7, an engineering, construction and services company serving the offshore energy industry, to engage the offshore energy sector in funding key research projects and providing access to their infrastructure and data.

a) Is there a clear pipeline of investment, across the public and private sector, for science and technology companies that want to bridge the valley of death from initial idea to billion-dollar company––and if not, where are the gaps?

The biggest challenge for creating commercial value from science and technology is in bridging the gap from good engineering prototype or science application to the commercially scalable product or service.

Science organisations need to employ business-aware specialists who are able to spot commercial opportunities and provide guidance on how to take best advantage of them.

Equally, businesses need to consider how they can access the scientific expertise. As previously noted, this can be done through creating co-location hubs that bring this expertise together in one place. The time spent identifying and working with key industry partners to determine what would bring value to them, and then bringing this demand back into the science organisation, can help build a sense of science and research value in the commercial organisation and allows the research organisation to orientate, particularly its applied end of research, to developing a service or product that meets the needs of an industrial partners.

This colocation of science and business can work well, and with initiation investment and supportive investment and tax regimes, will stimulate economic growth.

Additionally, it may be worth considering any creative ways to get the valley of death funded. Research organisations are very good at applying for discovery and traditional research funding, but they tend to apply the same mindset to translational funding. These funding types are not the same and the organisation should work collaboratively to use their business-aware experts to assist writing bids for translational funding.

A good example of this is the UK Research and Innovation Proof of Concept funding, which aims to support and accelerate the development of new or improved technologies, products, processes, and services arising from research activities at eligible UK research organisations.

The Proof of Concept funding is a great resource, but it is not sufficient. For example, they had over 2,500 expressions of interest,

which would not be sustainable with the funding available. Additionally, the funding typically funds the scientists but there needs to be the expertise and infrastructure that helps them commercialise, with the infrastructure for commercialisation not funded through the programme. This means that the understanding on how to set-up and scale a business isn't injected early enough in the process, and this can limit the chances of successful commercialisation at a later stage.

In addition, research organisations shouldn't be afraid to talk about the assets they have and use them as currency when talking to, for example, investors. Investors are open to funding the valley of death, particularly when they have a commercialisation team in the research organisation and all the infrastructure to support the start-up.

Bringing these potential investors together with research organisations in a structured way may also help tackling this issue and may be something that the government could look to coordinate.

Private sector investors, companies, and capital markets

4. How can the Government encourage more private-sector investment in R&D, and in R&D intensive companies, including technology start-ups and scale-ups, in the UK? What are the major factors behind the exodus of capital and companies to the US, and is there anything that the UK can do to prevent this? We would welcome case studies from entrepreneurs or investors who have moved abroad, setting out their reasons for doing so.

As set out above, NOC has been working to bring private sector and our scientific and technological expertise together. Since 2020, NOC has invested over £1.5 million in dedicated expertise to accelerate the commercialisation and industrial upscale of our science and research. This has resulted in the creation of two cutting-edge start-ups and an estimated job creation externally of over 25 FTE.

Our commercial arm, NOC Innovations, has been key in this process. The work has included the creation of the Blue Ocean Research Alliance (BORA) partnership with Subsea7, an engineering, construction and services company serving the offshore energy industry, to engage the offshore energy sector in funding key research projects and providing access to their infrastructure and data.

The aforementioned Innovation Hub and Ocean Catalyst programme is part of our ongoing work in this area and we would like to develop this further, see the creation of more catalyst programmes ours nationally and lead on the creation of Solent Technolpole, similar to the Brest-Iroise Technology Park in France, to enhance our current facilities in Southampton.