



Department for
Science, Innovation
& Technology

Rt Hon George Freeman MP
Minister of State for Science, Innovation and
Technology
100 Parliament Street
London SW1A 2BQ

W: www.gov.uk/dsit

Rt Hon James Gray MP
Chair, Environmental Audit Sub-Committee
on Polar Research
Via email

02 August 2023

Dear James,

Thank you for your letter dated 24 July 2023, inviting me to provide information to aid your committee's inquiry into *The UK and the Arctic Environment*.

As you are aware from our discussions at the Polar Roundtables which I convened, polar research is an area in which it is clear to me the UK has real scientific and geopolitical influence and can demonstrate leadership internationally, contributing to our Global Science Superpower goals. With the growing scientific importance, resource cost and geopolitical significance of polar research, and the growing interdisciplinary nature of different research platforms and datasets, from earth observation data to AI, my officials are exploring options to convene likeminded countries for a polar 'minilat', so that we can work together to make an impact greater than the sum of our parts.

I very much look forward to taking part in the Committee's follow up session after the summer recess. In the interim, I have asked my officials to provide interim answers to your questions, which I hope is helpful in advance of our meeting.

1. How do you believe the Government can improve the UK's contribution to Arctic science, with particular regard to (a) funding; (b) interdisciplinarity, especially between the physical and social sciences; and (c) strategic co-ordination across UK research institutions?

The UK has an excellent track record in Arctic science – we are 4th (behind US (1st), Canada and Russia) in the number of Arctic papers in peer-reviewed journals (2016 figures, due to be updated this year). Two-thirds of those UK papers have international co-authors, showing the vital importance of international collaboration, and over 70 universities and research centres across the UK are involved in Arctic research.

I believe that we can build on these strengths and increase our contribution to Arctic science by making a commitment to sustained funding, aligning with partners to leverage more funding, promoting existing strengths in

interdisciplinary science and bringing together the strategic aims of our institutions. My thinking on how to do this is set out in more detail below.

UK researchers understand the scale of the challenge in the Arctic. Change in the Arctic is at a depth and breadth that is unprecedented in human history, and this will impact the UK and the rest of the world significantly. Yet the Arctic is under-observed. It is still an inhospitable location for research; difficult to access; largely un-studied in winter; and with 'black holes' of information. The UK is extremely well-represented in satellite and remote sensing; in the development and use of autonomous and remotely operated technology; and has had great success in Arctic marine work in recent years.

We need to ensure that we have research funding with the right mixed model of long-term and short-term funding; some of which is strategically directed, some of which is led by researchers. Strong international partnerships are also key. The big strategic investments by NERC/UKRI in Arctic science in recent years have had international co-funding partners, for example the Changing Arctic Ocean Programme (2017-21) with Germany and the Canada-Inuit Nunangat-UK Arctic research programme (2021-25).

The 5th International Polar Year in 2032-33 offers an important opportunity for leadership in Arctic and Antarctic science, to coalesce international commitments, skills and funding, leading to a step-change in understanding the polar regions.

On interdisciplinarity, UKRI in general is funding more transdisciplinary work across its portfolio, including through the Building a Green Future cross-research council programme. That is a trend that is likely to increase as we understand the importance of transdisciplinarity in solutions-orientated research.

Given the environmental impacts, NERC is the major funder of Arctic research within the UKRI portfolio. However, the Economic and Social Research Council (ESRC); the Arts and Humanities Research Council (AHRC) and Engineering and Physical Sciences Research Council (EPSRC) all also fund Arctic research.

The most recent UKRI strategic investment in Arctic research – the £8m Canada-Inuit Nunangat-UK (CINUK) Programme – was the result of a joint bid to the UKRI Fund for International Collaboration jointly by NERC, ESRC, AHRC and EPSRC. The social, human, environmental and economic impacts of change in the Arctic is at the heart of that programme.

Regarding strategic co-ordination, the NERC Arctic Office – hosted by the British Antarctic Survey in Cambridge – has an important strategic and co-ordination role. The NERC Arctic Office represents the UK research community

in international settings, building new international partnerships, and creating a more cohesive community. Polar issues are considered by the UK Arctic and Antarctic Partnership, a community-led initiative to bring together senior researchers interested in the polar regions. This meets regularly and provides an important opportunity for the community to speak collectively and directly to NERC.

I am confident that the polar landscape is well serviced by polar focussed research institutions. In the UK, relating to the Arctic we already have:

- the British Antarctic Survey (which is a member of COMNAP (the Council of Managers of National Antarctic Programmes) and FARO (the Forum of Arctic Research Operators), and is active in the Antarctic Treaty System),
- the Scott Polar Research Institute (Cambridge University),
- UK Arctic and Antarctic Partnership (a community-led initiative to bring together researchers interested in the polar regions).

2. How much importance does the Government attach to in-situ research in the Arctic, and what assessment have you made of the platforms available for UK researchers to conduct fieldwork in the Arctic? Would you consider having another platform, or opening the British base in Svalbard for longer periods of the year?

The NERC Arctic Research Station is an important facility for researchers. It has provided a safe, secure and efficient location for Arctic science for over 30 years. Situated within the international research community in Ny-Ålesund, alongside stations from nine other nations, it offers UK-based scientists and their international colleagues a fantastic location for in-situ research in one of the parts of the Arctic that is changing most rapidly. The ability to access the Station easily, to deliver focused research alongside longer-term observations, and to benefit from the world-class support of the British Antarctic Survey operational staff is extremely valuable.

NERC's Arctic Research Station opens when there is demand from funded research projects, and it can support projects at any time of year. Although it is typically open for periods between March and September, there are no 'set' periods when it is open and closed. It would not be cost or carbon-effective to have the Station staffed continuously, unless the research requirement is there. NERC has recently set up a Station Access Scheme to provide funding for new users/innovative use of the Station, to encourage new and innovative projects.

3. How comparable is UK expenditure on Arctic research with support for research Antarctica?

NERC – the major UKRI funder of polar science – funds around 40 competitive grants per year related to the Arctic, worth on average £10m in total. The total fluctuates year to year, but there is no trend since 2010 in this data. Arctic grants make up about 8 per cent of the total competitive NERC grants in any given year.

Excluding the Antarctic Logistics and Infrastructure (ALI) funding, in comparison with Antarctic funding, the number and value of competitive funded Arctic grants is very similar.

ALI funding, comprising £49m annually to British Antarctic Survey, is mainly - but not exclusively - focused on the Antarctic to support the UK's presence there. ALI funding does also benefit the Arctic, for instance through funding the provision of the ice-strengthened research ships which benefit the Arctic when deployed there.

Separate to the c.£10m annual grants, there is also NERC's National Capability funding for its Centres, with two large programmes relevant to the Arctic announced recently:

- BIOPOLE – led by BAS (£9m) – biogeochemical and ecosystem processes in the polar system.
- CANARI – led by National Centre for Atmospheric Science (£12m) – climate change in the Arctic-North Atlantic and impact on the UK.

4. Why must UK Arctic researchers pay for the use of Government aircraft out of their grants? Is this also the case for Antarctic research, and would the Government consider making Government aircraft free to use for UK Arctic researchers?

UKRI pays for the costs of using all large infrastructure by all UK-based researchers anywhere across the globe and there is no geographic restriction.

The operating costs for the BAS-operated polar aircraft in Antarctica are met directly from NERC's Antarctic Logistics and Infrastructure (ALI) funding line. This is because the aircraft perform an essential role in maintaining BAS - and therefore the UK's - year-round presence in Antarctica, which is a responsibility prioritised by the Government. Researchers wanting to use the BAS-operated polar aircraft in the Antarctic do not need to include the operating costs of these aircraft directly in their grant proposals because they are already covered in the ALI budget.

The ALI budget does not cover a 'presence' role in the Arctic and so the polar aircraft are not free at the point of use when used anywhere outside Antarctica. As a result, researchers wishing to use these aircraft in the Arctic or elsewhere are required to obtain grants from NERC or another funding body to contribute

to the daily operating cost of the aircraft (e.g. fuel, pilot/mechanic hours, pilot/mechanic travel and subsistence). In practice these costs go into the researcher's funding proposal and where the application is successful are covered by the funder, either NERC directly, or via reciprocal arrangements with other funders.

The practical effect of having polar aircraft based regularly in the Antarctic means that the economies of scale in using the aircraft there will often work in researchers' favour. Whereas long transit times and other costs such as use of airports and facilities will mean that like-for-like operating costs will often be higher in other regions. Where the size of the overall available grant is constrained, this may have an effect on the funding available to the researcher for the non-operating cost elements of their proposal.

The Facility for Atmospheric Airborne Monitoring (FAAM) aircraft is also available for use in the Arctic, again with requirements to obtain grants to support costs but with several routes of access available; NERC funding supports a set number of flying hours of FAAM per year for NERC-funded research so grants need only include the marginal costs of using the aircraft, known as "superstructure" costs which are those costs that are needed over and above ensuring the aircraft is in a 'ready to go' state (i.e. not costs such as fuel and similar). The FAAM is formed of a collaboration between the Met. Office and NERC. Due to operational limitations, it does not operate in Antarctica, but has worked in the Arctic on a number of occasions.

5. What progress has the Government made on the agreement to re-join Horizon Europe?

The Government is moving forward with discussions on the UK's involvement in Horizon and hope that negotiations will be successful. That is the Government preference, but participation must work for UK researchers, businesses and taxpayers. Talks are ongoing and therefore we have not yet agreed a deal.

Whilst association to Horizon is our preference, the Government is prepared for all scenarios. We have set out our bold, ambitious alternative, Pioneer, if we're not able to secure association.

6. What is the Government doing to ensure that UK engagement with indigenous knowledge holders is ethical and equitable?

10 per cent of the Arctic population are Indigenous (400k/4m). Many of those communities have a long history of successful adaptation to change and a rich history with strong ties which cross international boundaries. There is a rapidly growing recognition of the importance of Indigenous and traditional knowledge

in understanding environmental, social and cultural changes, alongside the need for self-determination and empowerment in research.

UKRI has made a strategic investment (£8m) in this area with key Canadian funding partners to create the CINUK Arctic Research Programme. It puts Inuit researchers and communities at the heart of an international programme, working together with UK and Canadian researchers. The research questions come from the community, they were part of the peer-review process, are funded researchers, and will publish and own the data. This is a major investment in a new way of doing Arctic research, and we hope it will inspire many others. I look forward to welcoming the teams to Cambridge for the annual science meeting in November.

7. What assessment has the Government made of the impact of Russia's war with Ukraine on UK research capacity in the Arctic? What role do you think there is for diplomacy to ensure that climate data on the Russian Arctic is made available to UK researchers?

It is important to note that access to Russia and inclusion of Russian data – on permafrost, wildfires etc – was far from perfect before February 2022. There were good examples of cooperation, for example through the EU Horizon INTERACT scheme, facilitating mutual access to research stations, but picture was far from comprehensive. What we have lost is mostly valuable potential.

Since February 2022, the other seven Arctic States ceased meaningful scientific cooperation with Russia through the Arctic Council. Some links were re-established in June 2022. Since May 2023, Norway as the new Chair of the Arctic Council has expressed their hope of re-establishing more links – but practical details are still to be confirmed.

However, through several international treaty systems Russia is still contributing data – through the UN World Meteorological Organization; through the International Maritime Organization; through the Central Arctic Ocean Fisheries Agreement; through the newly-signed High Seas Biodiversity Treaty.

Since Russia's egregious invasion of Ukraine, we have assessed and stopped research collaborations with Russia that are of benefit to the Russian state. This sent a clear message that we will not support Putin's regime, but do not intend to sanction individual innocent Russian scientists with benign research interests.

In line with the sanctions that I announced, NERC paused and reviewed all Russia-related grants in March 2022. NERC subsequently un-paused 90% of these research activities after determining that they did not benefit the Russian state, or where minor mitigations were put in place to ensure compliance. 10

per cent of NERC's activities moved location but have now resumed. This work has meant that NERC has been able to preserve their important research.

However, the implications of Russia's invasion of Ukraine have impacted international research and nowhere more so than in polar research. While we must continue to send a clear message that we will not support the regime and will continue to hold it to account in international fora, we must ensure that important science continues. This is why I intend to use science diplomacy to leverage the UK's leadership in Polar science to align our ambitions and efforts with new and likeminded groups of countries to strengthen and build new partnerships in this critical area of research.

Cooperation with other Arctic states is now even more important. UK-based Arctic researchers have an excellent track record of joint work on shared programmes and research platforms with colleagues in Norway and Canada, amongst others. Cooperation with Germany on research in the Arctic Ocean has been particularly fruitful in recent years, through both jointly funded programmes such as the NERC Changing Arctic Ocean Programme, and participation in the MOSAiC international Arctic expedition. NERC's appetite for further international collaboration is strong.

8. Does the Government see these agreements as beneficial, and do you believe that UKRI should seek to replicate these agreements with other countries? If so, which countries should be considered?

Although MoUs are not legally binding documents, they can frame the relationship between two countries, set out agreed areas for mutual interest, and can help unlock research collaborations without having to have multiple institute to institute agreements.

For example, the recently signed landmark MoU with India cut red tape, easing collaboration in R&I. As a result, we have been able to make significant progress on delivering on our shared priorities such as the opening of a Net Zero Innovation Centre where we are jointly enabling decarbonisation of the pharmaceutical and fine chemicals industries. We also launched an innovation sprint with TATA to develop the use of hydrogen in the steel sector, and phase 4 of our flagship UKIERI (UK India Education and Research Initiative) to strengthen science partnerships between the UK and India. These are just a few examples of projects the MoU has empowered us deliver.

Polar MoUs can be especially useful, given the need and opportunity to consider the mutual use of polar infrastructure such as ships, aircraft and stations. They also present the ability to streamline application and assessment processes, removing 'double jeopardy' constraints with the analysis of potential projects and incentivising international partnerships. The requirements for MoUs will vary from case to case and country to country. I have raised the

possibility of framing coordination on Polar science through a government-to-government MoU with several countries.

9. What impact did UK Arctic Research have on the development of Looking North, the Government's recent Arctic Framework? How does the Government use UK Arctic research in developing policy?

Looking North sets out the UK's approach to the Arctic, underlining our longstanding interests in the region, particularly at a time of heightened tension in the region, following Russia's invasion of Ukraine and amid growing competition from China. The policy framework is a collection of government policy.

Across Government, policy makers adopt an evidence-based approach to designing and implementing policy. Research outputs are a key element of a strong evidence base, a foundation for effective decision-making, as set out in HM Treasury's *The Green Book* and *The Magenta Book*.

To further ensure that robust, joined-up evidence is at the core of decisions within departments and across government, departmental Chief Scientific Advisers (CSAs) are senior science advisers embedded in the majority of departments.

a. How is the Government using the findings from Arctic research to inform adaptation plans for areas where climate change in the Arctic will potentially affect the UK, such as higher sea levels, more extreme weather and changes to fisheries?

We know that changes in the Arctic environment are already affecting the UK through global sea level rise, changes to our climate and weather patterns and threats to our shared biodiversity. The UK uses cutting edge science, including advances in climate modelling and projections, to inform and prepare our response to rising sea levels and changes to our weather. The Government continues to work closely with the Met Office to assess the science of sea-level rise as part of the Met Office Hadley Centre Climate Programme, including examining the implications of the latest IPCC's 6th assessment report (AR6).

In the UK we are committed to ensuring that climate change adaptation, resilience and mitigation are fully considered and integrated in our marine and fisheries policies. The third National Adaptation Plan (NAP3) was published on 17 July 2023 and marks a step-change in the UK government's approach to climate adaptation, putting in place an ambitious programme of decisive action for the next 5 years. The NAP3 showcases our plans to adapt to and mitigate the risks of a warming climate in the marine environment, including plans to protect, restore and create blue carbon habitats and manage the risks and opportunities to marine species, habitats and fisheries.

The Marine Climate Change Impacts Partnership (MCCIP), the primary independent source of marine climate change impacts evidence and adaptation advice in the UK, provides updates on observed and potential future climate impacts to support adaptation to these changes. Many UK scientists have made significant contributions to these assessments and those that underpin the forthcoming OSPAR Quality Status Review of the North East Atlantic including the Arctic Region, which will be formally launched in autumn 2023.

Mean sea level around the UK has risen by about 12-16cm since 1900 and is projected to rise further, e.g. by 45-78cm in London by 2100, with increases in flooding and erosion. Some of this will be driven by the contributions of ice loss from Arctic glaciers and ice sheets to global sea level rise.

Evidence for impacts of polar warming on mid latitude weather is increasing but they are projected to be modest, compared to natural variability. Potential impacts of a warming Arctic on UK climate may include a weakening of the polar vortex, weakening of storm tracks, and shifting positions of the jet stream, leading to changes in climate extremes (both winter cold spells and summer heatwaves, droughts and floods).

Sea level rise up to the end of the 21st Century is also assessed using the UKCP18 marine projections, which give a range of sea level rise between 1.5 and 5 degrees of warming. The UKCP18 projections for time mean sea level rise around the UK improve upon the previous generation of climate projections (UKCP09) through improved understanding of the components of sea level rise (as demonstrated by a better agreement between models and observations) and the inclusion of ice sheet dynamics (Palmer et al., 2018).

Climate-induced changes in seasonal sea ice extent and thickness are altering marine primary productivity in the Arctic Ocean, with impacts on ecosystems and implications for fisheries and conservation of ice dependent species, relevant to the UK. Commercially and ecologically important fish stocks like Atlantic cod, haddock and mackerel have expanded their spatial distributions northwards many hundreds of kilometres.

In addition to the impact on ecosystem and fisheries, rising sea levels can cause coastal flooding and coastal erosion. Our long-term policy statement sets out our ambition to create a nation more resilient to future flood and coastal erosion risk. It includes five ambitious policies and over 40 supporting actions we will take to accelerate progress to better protect and prepare the country against flooding and coastal erosion from more frequent extreme weather as a result of climate change.

An example of a long term-approach is the Environment Agency's (EA) Thames Estuary 2100 Plan (TE2100), upgrading flood defences to manage rising sea

levels while delivering wider social, environmental and economic benefits for the Thames Estuary. TE2100 was designed with climate change at its core. It was the first adaptive flood risk management strategy developed in England, and is internationally recognised as a leading example of a climate adaptation strategy. By taking an adaptive approach, the EA can better anticipate and respond to a range of future climate scenarios, ensuring it is investing in the right flood risk management actions at the right time, to ensure the resilience of the estuary and its communities in the future. The EA expects the Thames Barrier to continue to protect London from tidal flooding until 2070. TE2100 identifies several options for a future Thames Barrier to protect the Thames Estuary and London to the end of the century and beyond. It outlines three possible options, including upgrading the existing Thames Barrier and two proposed locations for building a new barrier.

The UK was one of the first nations in the world to enshrine climate adaptation into law in the Climate Change Act 2008. The Act created a framework for strengthening UK preparedness to climate change risks. These include preparing, on a five yearly cycle, a UK Climate Change Risk Assessment (CCRA). The government published CCRA3 in January 2022, informed by an independent assessment undertaken by the CCC, which identified 61 climate risks and opportunities impacting multiple sectors of society, including risks arising from changes in the Arctic.

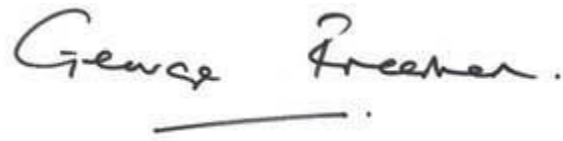
b. What routes are there for Arctic researchers to communicate their findings to policymakers in Government?

There is no one route for researchers to talk to policy and decision-makers, but the range includes:

- Direct information and evidence straight into Departments – for example from the Met. Office to DSIT on climate change, weather and regional impacts.
- Secondments and exchanges connected to COP, Intergovernmental Panel on Climate Change (IPCC) report leadership.
- Dedicated publications and events – for example through the NERC Changing Arctic Ocean Programme and its predecessor.
- The Cross-Whitehall Arctic Network – chaired by the FCDO – with representation from DSIT, NERC Arctic Office and others.
- The UK Arctic and Antarctic Partnership – gathering of senior polar researchers with representation from FCDO and other Government Departments and agencies as required.
- UK Arctic Conference (11-13 September this year) – open to policy and decision-makers to speak directly with researchers.

I look forward to your Committee's report once finalised.

Yours ever,

A handwritten signature in black ink that reads "George Freeman." The signature is written in a cursive style and is underlined with a single horizontal line.

GEORGE FREEMAN MP
Minister of State
Department for Science, Innovation and Technology