THE ROYAL SOCIETY

# Royal Society submission to the House of Lords Committee on the Arctic inquiry

1. The Royal Society welcomes the opportunity to respond to the House of Lords Committee on the Arctic inquiry.

2. The Royal Society is the National Academy of Science in the UK. It is a self-governing Fellowship of many of the world's most distinguished scientists. The Royal Society draws on the expertise of the Fellowship to provide independent and authoritative scientific advice.

3. The Arctic features in many areas of the Royal Society's work. Much of the Society's work has focused on the science behind observed changes in the Arctic, understanding why they are happening and how the Arctic may change in the future. For example, a recent discussion meeting was held on 22 and 23 September 2014 on *Arctic sea ice reduction: the evidence, models, and global impacts*[1]. Recorded audio of the presentations is available on the Royal Society website and the papers will be published in a future issue of Philosophical Transactions A.

4. In response to the Committee's questions, this submission sets out a few observations that draw upon the Society's work, in particular, the Society's 2010 publication *New frontiers in science diplomacy*[2] and a forthcoming report on *Human resilience to extreme weather*[3]. The latter report is due to be published in December 2014.

**The Role of Science**

5. The Arctic Ocean is currently crossing an environmental threshold, from a perpetually ice-covered region to a seasonally ice-free one. This is altering the geo-strategic dynamics of the Arctic, and awakening national interests in energy, fishing, shipping and tourism by Arctic States, China and the European Union.

6. There are many direct scientific issues arising from change in the Arctic. For example, changes in sea ice affect ocean ecosystems and atmospheric chemistry; rapid warming will affect terrestrial ecosystems and permafrost stability.

7. Arctic change may affect lower latitudes. For example, some studies have suggested that the reduction in sea ice may change the dominant pattern of atmospheric circulation that controls weather patterns in North America and western Europe: this is a matter of continued research and there is no agreement yet on the nature of the changes that would be induced for the UK.

8. Science has a role in both informing policy and governance of the Arctic and in improving international relations between countries.

9. Science and technology is central to observing and understanding current and future changes in the Arctic, as well as how changes in the Arctic will affect the rest of the climate system. However, science also has a key role to play in identifying the extent of the economic opportunities in the Arctic. For example, a collaborative project led by the Geological Survey of Canada and involving researchers from

[1] https://royalsociety.org/events/2014/arctic-sea-ice/
[2] https://royalsociety.org/policy/publications/2010/new-frontiers-science-diplomacy/
[3] https://royalsociety.org/policy/projects/resilience-climate-change/

Denmark, Norway, Sweden, Russia and the United States published the first comprehensive atlas of Arctic geology in 2008[4]. Science is also essential for identifying and mitigating the potential risks associated with changes in the Arctic and with developing economic opportunities.

10. Ongoing research into Arctic Ocean systems will be essential to inform management strategies for when the ice thaws and makes this international space more accessible. More research is required into sea-level rises; loss of sea ice; melting permafrost and feedback mechanisms; the location and availability of resources; and the impacts of long-range pollutants. Much of this research will require international collaboration, especially when the harsh conditions of the Arctic necessitate the sharing of costs, logistics, facilities and other capabilities.

11. The UK has a considerable body of researchers active in Arctic science. The Natural Environment Research Council (NERC) maintains an Arctic office, and is currently funding a £15 million Arctic Research Programme (2010-2015) that supports a range of projects. Many of these projects involve logistic or science collaborations with Arctic Rim nations. The UK, through NERC, is a member of the 22-nation International Arctic Science Committee.

**Identifying Impacts from Arctic Change**

12. The rapid changes taking place in the Arctic will have profound effects globally[5]. Identifying the emerging risks and opportunities will require a systems approach; the whole system will need to taken into account. Impacts will need to be considered across both temporal and spatial scales. Sectoral approaches alone are not capable of accounting for the multiple risks and possible opportunities.

13. Collaborative, multidisciplinary studies will be required, as will continued monitoring of the changes in the Arctic and the impact of specific interventions.

**Governance of the Arctic**

14. Within the Arctic, there is no single regulatory regime covering the entire region. Instead, the surrounding land masses of the five coastal states of Canada, Greenland (Denmark), Norway (including Svalbard), Russia and the United States are sovereign territories. The Arctic Ocean is governed by national and international legal regimes, most notably the United Nations Convention on the Law of the Sea (UNCLOS). Common interests in the region are coordinated by the Arctic Council, but its membership is limited to the Arctic States.

15. The centre of the Arctic Ocean, which is now covered by frozen ice, represents a potential starting point for governance discussions which do not threaten the national jurisdictions of the Arctic coastal states, or require an entirely new legal regime. Whilst much of the sea floor may come under national jurisdictions, the overlying water column and sea surface at the centre of the Arctic Ocean is legally distinct, and the UNCLOS already recognises it as undisputed international space.

16. The governance of Antarctica, another international space, sets a precedent for how the soft power of science can help to strike a balance between national and common interests, and could offer lessons for the peaceful governance of other international spaces and transnational resources[6]. Beginning with

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[4] http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=225705

[5] Vaughan, D.G., J.C. Comiso, I. Allison, J. Carrasco, G. Kaser, R. Kwok, P. Mote, T. Murray, F. Paul, J. Ren, E. Rignot, O. Solomina, K. Steffen and T. Zhang, 2013: Observations: Cryosphere. In: Climate Change 2013: The Physical Sci- ence Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[6] Royal Society (2010) New frontiers in science diplomacy: Navigating the changing balance of power, Royal Society Policy document

research collaboration to arrive at common understandings of the science and uncertainties can be diplomatically helpful. The diplomatic potential of research collaboration in international spaces, where political sensitivities are high, should be strengthened.

17. Environmental security discussions focused on international space could provide a cooperative framework through which to address military risks. For example, energy development, fishing, shipping and tourism in the Arctic all require coordinated search and rescue missions for stranded vessels. The thawing of the Arctic Ocean also increases the risk of accidents and the need for emergency responses to ecological disasters. Given that militaries are trained in providing disaster relief and search and rescue, clarifying their role in this context could increase transparency and maintain a dialogue that could eventually allow more sensitive issues to be addressed.

**Adaptation Strategies in the Arctic**

18. The Royal Society's forthcoming report on human resilience to extreme weather addresses the fundamental elements of building resilience and evaluates specific adaptation and disaster risk reduction options. However, due to the project's global scope, we have not gathered evidence to allow us to comment on detailed aspects of adaptation in the Arctic. It also does not address new economic risks and opportunities. A few general lessons can be applied:
    a. Since adaptation is context-specific, local or regional innovations and solutions must be facilitated and community participation encouraged to bring together the users and producers of knowledge. The Arctic is experiencing rapid environmental and social change; dealing with these changes will involve difficult choices, with a variety of different perspectives. It is essential that the variety of voices is heard in the development of strategies for the Arctic.

    b. Adaptive management, a process of iteratively planning, implementing, and modifying strategies for managing resources in the face of uncertainty and change, is a key resilience technique and one that could be usefully applied in the Arctic. By incorporating adaptability into the process uncertainty can be managed.

    c. Evidence is vital in developing effective policies for adapting to climate change. Careful scientific study, modelling, and monitoring can improve understanding of hazards and exposure, and can often provide valuable early warning. Improved monitoring and evaluation of adaptation interventions are necessary to allow options to be assessed consistently to support better decision-making.

    d. Shared action and responsibility is required at multiple levels of society, from the individual or household to the international community. Adapting to change will require the involvement of a range of government agencies, the private sector and civil society. For this network to be effectively managed there needs to be a clear lead agency and core responsibilities need to be unambiguous.

    e. Ecosystems can play an important role in hazard reduction. Ecosystem-based and hybrid approaches to hazard risk reduction should be considered, in addition to more conventional engineering approaches, as they have lower risk of catastrophic failure and provide additional benefits to societies.

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