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A Pre-study Mapping of Research Strategies and Priorities

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Abstract

The report is a pre-mapping study of how the Arctic priorities of states and the activities of the international Arctic scientific organisations have influenced priorities in Arctic research. As main drivers are identified i) states' foreign-policy objectives, for instance defence of the established international legal and political order; ii) states' domestic politics, such as business and community development, including for indigenous peoples, as well as defence of then national Arctic identity; and iii) the interplay between national goals and international agenda setting in the international Arctic research organisations. Main cleavages are to prioritise Arctic research or not; basic vs. applied research; natural vs. non-natural sciences; traditional knowledge vs. academic knowledge; and cleavages within (sub-)disciplines, such as between 'hard' and 'soft' social sciences.

Sammendrag

Rapporten er en forstudie av hvordan staters arktiske prioriteringer og aktivitetene til internasjonale arktiske forskningsorganisasjoner påvirker prioriteringene i arktisk forskning. De viktigste drivkreftene er i) statenes utenrikspolitiske mål, for eksempel å forsvare det etablerte folkerettslige og institusjonelle rammeverket; ii) statenes innenrikspolitiske mål, slik som næringslivs- og samfunnsutvikling, inkludert for urfolk, samt dyrking av statens arktiske identitet; og iii) vekselvirkningen mellom nasjonale mål og prioriteringer gjort av de internasjonale arktiske forskningsinstitusjonene. De viktigste konfliktlinjer er hvorvidt arktisk forskning skal prioriteres eller ikke, grunnforskning vs. anvendt forskning, naturvitenskap vs. andre disipliner, tradisjonell vs. akademisk kunnskap samt skillelinjer mellom (sub-)disipliner, som mellom de 'harde' og 'myke' samfunnsvitenskapene.

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The Fridtjof Nansen Institute is a non-profit, independent research institute focusing on international environmental, energy and resource management. The institute has a multi-disciplinary approach, with main emphasis on political science and international law.

Executive summary

This report has been prepared by the Fridtjof Nansen Institute for the Norwegian Scientific Academy for Polar Research (NVP). It presents the results of a preliminary desk-study of states' Arctic strategies and relevant international organisations for Arctic research. The main objective is to identify questions for further investigation in a later, more comprehensive, research project. The co-authors have had 2.5 person-months at their disposal, shared equally between them.

Bibliometric studies show a steady increase in Arctic research output since the mid-1990s, although not above the general growth in global scientific production. The number of states with scientists who publish in the field of Arctic research has grown significantly, particularly among the Arctic Council observer states. China has shown the strongest relative growth – but this reflects a general increase in Chinese scientific production and is not unique to the Arctic. The field of earth and planetary sciences is by far the largest discipline, and its share is growing. The social sciences and humanities account for approx. 15% of Arctic scientific publications. In this report, we ask whether and how national and international priorities and decision making may have influenced this growth in Arctic research, its thematic and academic profile. As the information available for this pre-study is too rudimentary to establish causal connections, our objective is exploratory, aimed at identifying issues for further investigation.

We can distinguish between two separate sets of national-level drivers here: foreign-policy objectives, and domestic politics and national identities. As to foreign-policy objectives, all national Arctic strategies call for intensified international cooperation, generally by emphasising the important roles of the Arctic Council as well as the UN Law of the Sea Convention (UNCLOS) as the basis for international relations in the Arctic. Hence, international cooperation and defence of the established legal and political order becomes a driver in itself. 'Soft-policy' initiatives of global concern – in particular related to climate change, transboundary pollution and loss of biological diversity – have been a recurrent issue in Arctic policies throughout the post-Cold War period. Security concerns, sometimes subsumed under the term 'geopolitics', have become increasingly visible in Arctic strategies in recent years.

Within domestic politics, the *general* political priorities of states tend to be reflected in their Arctic policies, often determined by their geographical location and physical attributes, as well as the composition of their population. Arctic politics has thus become a new arena for the articulation of state interest and ambitions. Business development is the single most dominant priority area in national Arctic strategies, accompanied by applied research to further this development. Moreover, climate change – whether mitigation, adaptation or research – has become a priority issue in all Arctic strategies, also in domestic politics. To varying extents, states see the development of Arctic communities and indigenous peoples (if they have such on their territory) as part of their Arctic strategies; some also mention research on and with those communities. Arctic politics as an arena for the cultivation of a state's Arctic identity is also evident in i) states where the Arctic has been a traditionally strong component of their national identity, as in Russia; ii) non-Arctic states with a cultural heritage of Arctic expeditions, notably Italy, Spain and the UK; and iii) Arctic states currently undergoing 'identity transformation' from 'northern', or primarily 'polar', to 'Arctic' – such as the Nordic states.

One threefold set of cleavages can be identified in the formulation of Arctic research needs: i) *To prioritise, or not to prioritise*: should research in and on the Arctic be accorded priority over research in and on other regions? States frequently declare that they 'prioritise' Arctic research.,

and there are international institutions that work to further such research. However, the growth in Arctic research output follows the same trajectory as global academic publishing. ii) *Basic vs. applied research*: There is a tendency towards applied research in at least some national Arctic strategies. On the other hand, the international Arctic research organisations are more geared towards basic research. (However, the data reviewed in this report do not show how the distribution is in practice between basic and applied research.) iii) *Natural sciences vs. other sciences*: Arctic research has been dominated by the natural sciences, primarily earth sciences and biology, but the share of the humanities, and the social sciences in particular, has grown in recent years. iv) *Cleavages within disciplines*: Also within a scientific discipline or field, there are cleavages. In social science, for instance, there is generally held to be a continuum from 'softer' disciplines such as ethnography and anthropology to the 'harder' disciplines such as economics. Although the disciplinary focus of Arctic social science research has broadened in recent years, there still appears to be a certain leaning towards 'softer' social sciences. v) *Cleavages within subdisciplines*: Even within subdisciplines, there are cleavages. For example, geopolitics has increasingly become a priority in Arctic research – but it is only one of many approaches to the study of international relations within political science. vi) *Political cleavages* may spill over into research when research priorities are set: a classical cleavage, also in Arctic politics, is that between natural resource exploitation on the one hand and environmental protection on the other.

Some of the preliminary conclusions in this pre-study will need to be further substantiated, better evidenced and tested for validity. In particular: are the drivers of Arctic policies which we identify in national Arctic strategies representative when a wider set of evidence beyond the strategies as such is taken into account (like other policy documents at national level, including policies within different sectors and, not least, actual financing of activities identified in the strategies)? Some important evidence has been missing in the limited set of documents reviewed in this pre-study, leaving several questions as possible priorities for a future, more comprehensive, research project: i) What are the *research* priorities of individual states in the Arctic, and what kind of research is actually *funded*? ii) What are the political practices with regard to research priorities at the international level, within the Arctic Council and the international Arctic scientific organisations? To what extent are research priorities determined at the international level and then implemented at the national level, and to what extent are they determined at the national level and then merely 'reported' to the international level? Exactly what are the mechanisms that transfer and transform ideas and interests between the two political levels?

Preface by the Norwegian Scientific Academy for Polar Research (NVP)

University of the Arctic has commissioned the Norwegian Scientific Academy for Polar Research (NVP) to carry out a desk-study to document the past and present state of formal and informal actors and influences in Arctic science and research. The assignment is entitled 'Arctic Research – Improving Knowledge of Actors and their Influence'. The objective is to review the status of Arctic science and research and the impact of influential actors.

NVP has entered an agreement with the Fridtjof Nansen Institute (FNI) to do the research and studies required for this assignment.

The result of this work is this report *Arctic Research and its Actors A Pre-study Mapping of Research Strategies and Priorities*.

Professor Grete K. Hovelsrud

President for the Norwegian Scientific Academy for Polar Research (NVP)

Contents

Acronyms

AAC	Arctic Athabaskan Council
ACA	Arctic Circle Assembly
ACAP	Arctic Contaminants Action Program
ACIA	Arctic Climate Impact Assessment
ADC	Arctic Data Committee
AEPS	Arctic Environmental Protection Strategy
AFS	Arctic Freshwater Synthesis
AHDR	Arctic Human Development Report
AIA	The Aleut International Association
AMAP	Arctic Monitoring and Assessment Programme working group
ANSARCO	Aleutian Pribilof Islands Association and the Association of the Indigenous Peoples of the North of the Aleut District of the Kamchatka Region of the Russian Federation
AOS	Arctic Observing Summit
ASSW	Arctic Science Summit Week
BEAR:	Barents Euro-Arctic Region
CAFF	Conservation of Flora and Fauna working group
CBSS	Council for the Baltic Sea States
CLRTAP	Convention on Long-range Transboundary Air Pollution
CNARC	Chinese-Nordic Arctic Research Center
EPPR	Emergency Preparedness and Response working group
GCI	Gwich'in Council International
GEUS	Geological Survey of Denmark and Greenland
IARPC	Interagency Arctic Research Policy Committee
IASC	International Arctic Science Committee
IASSA	International Arctic Social Sciences Association
ICARP	International Conference on Arctic Research Planning
ICC	Inuit Circumpolar Council
IPCC	Intergovernmental Panel on Climate Change
MOSAiC	Multidisciplinary Drifting Observatory for the Study of Arctic Climate
PAME	Protection of the Arctic Marine Environment working group
POP	persistent organic pollutant
POLAR	Polar Knowledge Canada
PSR	Polar Silk Road
RAIPON	Russian Association of Indigenous Peoples of the North
RCN	Research Council of Norway
SAO	Senior Arctic Official
SAON	Sustaining Arctic Observing Networks
SLCF	short-lived climate forcers
SDWG	Sustainable Development Working Group
SWIPA	Snow, Water, Ice, and Permafrost in the Arctic
UArctic	University of the Arctic
UNCLOS	United Nations Convention on the Law of the Sea
USARC	U.S. Arctic Research Commission
YOPP	Year of Polar Prediction
YPI	International Polar Year

1. Introduction

1.1 Background and research questions

Since the end of the Cold War, Arctic and non-Arctic states alike have shown increasing interest in the Arctic. New mechanisms for international cooperation in the Arctic have been created, developed and flourished – at least until the Russian invasion of Ukraine in 2022. One main area of international cooperation has been scientific research, conducted under the auspices of both the Arctic Council and the specialised organisations and arrangements established as frameworks and arenas for scientific cooperation in the Arctic. Also at the national level in Arctic and non-Arctic states, research in and on the Arctic has been accorded greater priority over the past three decades.

Several studies have been conducted on the content of Arctic research, focusing on the quantitative and qualitative nature of that research (e.g. numbers of publications within various disciplines and over time) and the type and amounts of funding involved, as well as its impact in academia (e.g. citations) and society (e.g. patents and business development). In this report, we turn our attention to the *drivers* behind the research priorities that have been set. How have these priorities been shaped by policies at the national level in Arctic and non-Arctic states, and at the international level in the Arctic Council and in Arctic scientific cooperation arrangements? Of particular interest is the interface between the national and international levels: to what extent has recent Arctic research been determined by national governments and subsequently filtered into a least common multiple at the international level, and to what extent by the international organisations and subsequently implemented at national level? As in other policy areas with an international component, the actual political outcome (here: research priorities) can be expected to be the result of input from both levels, possibly also of the specific dynamics unfolding at the interface between the two levels. Further, to the extent that actual research is primarily the result of national priorities (and less the outcome of deliberations at the international level), what are the main determinants of these domestic policies? Is Arctic research conducted in order to achieve objectives at the international level – or is it geared mainly towards meeting domestic demands? To what extent are more general ideas and values reflected in research priorities?

'Drivers' are here understood as ideas, interests, structures and processes that further the production of specific political outcomes: in this case, research priorities in and on the Arctic. *Ideas* and *interests* may be both material and non-material, selfish or altruistic. For instance, a driver in the determination of Arctic research priorities may be the prospects of political influence or economic gain for a specific state – or perhaps a clean environment or high level of education within that state – or it can be the promotion of basic research in the international academic community, global awareness of indigenous peoples' rights and reduction in transborder pollution. More general or altruistic values can also be reflected in national priorities, which are not necessarily material. *Structures* and *processes* are the political institutions – formalised into organisations or more loosely formed arrangements, and their associated operating procedures – that shape political outcome. This study aims to offer a preliminary overview of the science-policy landscape and priorities in Arctic research. We ask: *What drives the Arctic research priorities of various states, and how are Arctic research priorities in turn influenced by political processes at the international level?*

1.2 Methods and limitations

Our methodology is qualitative and exploratory, based primarily on document analysis of Arctic strategies and policy documents, both general and scientifically oriented (where available), and other written sources, including secondary literature, such as evaluations. In assessing strategies and policy documents, we look for formally defined priorities, financial priorities (where such information is available) and actual political practice (possible only to a limited extent, given the time and resources available for this project). We seek to determine the specific ideas and interests behind the chosen priorities, and by implication also incentives, limitations and conflicting issue-areas. As various types of material have been available for the states examined here, the discussions of each state are not directly comparable, which underlines the exploratory and preliminary nature of this study. Nor is there space to delve into the methodology behind other studies, such as the brief overview of Arctic research presented in Section 2.2 and the country studies in Section 3.1.

This report is intended as a 'baseline' for subsequent more in-depth research in a more comprehensive research project. Causal relations noted here are indicative at best and will have to be explored in greater detail and far more systematically to provide more conclusive answers to the questions asked. For practical reasons, within the limitations of this pre-study, our focus is on the declared interests of states, in Arctic strategies at national level as well as in the international cooperation arrangements for the Arctic. For simplicity, 'ideas' are not presented as a separate category of drivers in Chapter 4 but incorporated as reflections of interest declared by states at the national or international level. Finally, research priorities are obviously also determined by specific institutions and individuals, but it falls beyond the scope of this study to analyse that.

1.3 Structure of the report

This introductory chapter is followed by a background chapter which provides a brief overview of the major trends in international politics in the Arctic since the end of the Cold War (Section 2.1) and of priorities in Arctic research (numbers and types of publications, e.g. distributed across disciplines) and its impact (Section 2.2). Section 2.1 supplies the wider political context for Arctic research priorities, while Section 2.2 presents our dependent variable: actual Arctic research priorities. The empirical core of the report is Chapter 3, where we describe the Arctic strategies, policies and political outcomes in terms of research priorities and funding (where available) of the eight Arctic states and selected non-Arctic states (Section 3.1), as well as the main priorities and practices of the major international Arctic research-related institutions, such as the Arctic Council, the International Arctic Science Committee (IASC), the International Arctic Social Sciences Association (IASSA) and the University of the Arctic (UArctic) (Section 3.2). Chapter 4 singles out a selection of drivers behind Arctic research priorities: foreign-policy objectives (Section 4.1), domestic policies and national (Arctic) identities (Section 4.2) and the dynamics unfolding at the interface between the national and international levels (Section 4.3) (preliminary findings). We also define a set of political cleavages or lines of (potential) conflict in the determination of Arctic research priorities (Section 4.4) and offer some reflections on the repercussions of Russia's 2022 attack on Ukraine on Arctic research. Chapter 5 sums up the conclusions of the study (Section 5.1) and the main questions to be addressed in a more comprehensive research project on the topics raised here (Section 5.2).

2. Developments in international Arctic politics and research

2.1 The Arctic between Cold Wars: from 'the Age of the Arctic' to 'the Scramble for the Arctic'

International relations in the Arctic from the end of the Cold War to the new tensions following Russia's invasion of Ukraine in February 2022, sometimes referred to as the beginning of a new cold war, can broadly be divided into three periods: i) 'the Age of the Arctic' from the late 1980s; ii) 'the Scramble for the Arctic' from around 2007; and iii) 'the New Cold War' from 2022.

'The Age of the Arctic'[1] refers to the more prominent strategic role accorded to the Arctic in the final years of the Cold War and the ensuing expansion of cooperation among Arctic states. The immediate catalyst was Soviet President Mikhail Gorbachev's invitation to cross-border cooperation, as reflected in his 1987 Murmansk Speech, where he emphasised the need for collaborative action to combat environmental degradation in the Arctic. In 1989, the Communist regimes in Eastern and Central Europe fell, and two years later the Soviet Union itself ceased to exist. The Cold War was over, and European governments were keen to draw the young Russian Federation into new forms of international cooperation. In the European North, the Council for the Baltic Sea States (CBSS) was established in 1992, the Barents Euro-Arctic Region (BEAR) in 1993 and the EU Northern Dimension in 1998. These regional collaborative arrangements spanned several functional fields, with infrastructure, business cooperation and environmental protection at the core. At the circumpolar level, IASC and IAASA were founded in 1990, and in 1991 the Northern Forum was established as a platform for collaboration among regional actors in the Arctic. The same year, the Arctic Environmental Protection Strategy (AEPS) was created; and in 1996 the Ottawa Declaration established the Arctic Council, with the AEPS later subsumed under the new structure.

A decade later, Arctic cooperation – circumpolar or regional – was to some extent considered to be 'a thing of the early 1990s': an immediate post-Cold War initiative that had failed to spark sustainable high-level political interest. However, much changed with the planting of the Russian flag on the seabed at the North Pole in August 2007. That action was performed by a Russian scientific expedition (engaged in collecting data for Russia's submission to the UN Continental Shelf Commission; see below) – but was widely perceived as a Russian demonstration of power in the Arctic. The flag incident happened at the same time as the summer ice-melt in the Arctic Ocean reached ominous proportions, and there was growing interest in the prospects of petroleum development in the Arctic. Scott G. Borgerson captured the atmosphere in his article 'Arctic Meltdown',[2] where he argued: 'there are currently no overarching political or legal structures that can provide for the orderly development of the region'.[3] Russia's flag-planting and Borgerson's article spurred a new wave of high-level political interest in the Arctic – even though the former had in fact not been intended as a Russian 'claim' to the North Pole, and Borgerson's projections were soon refuted by political actors and experts alike. There emerged

[1] O.R. Young (1985), 'The Age of the Arctic', *Foreign Policy* 61: 160–79; G. Osherenko and O.R. Young (1989), *The Age of the Arctic: Hot Conflicts and Cold Realities*, Cambridge: Cambridge University Press.
[2] S.G. Borgerson (2008), 'Arctic Meltdown: The Economic and Security Implications of Global Warming', *Foreign Affairs* 87: 63–77.
[3] Ibid., p. 71.

a global media buzz about a 'scramble for the Arctic', with a marked surge in political interest. In the Arctic Council, high-level participation from the member states gradually increased; the 2011 biannual ministerial meeting in Nuuk was the first to which all eight countries sent their ministers of foreign affairs.

In addition to the Russian flag episode, two substantive issues contributed to this increased political attention. First, the 1982 UN Law of the Sea Convention (UNCLOS) empowers coastal states to determine an outer limit of their continental shelf, if they can document that the area beyond 200nm (within which coastal states always have a right to a continental shelf) is in fact a natural prolongation of the land, i.e. *a shelf.* In order to meet the timelines set by UNCLOS (which were eventually extended), Arctic states from the early 2000s engaged in extensive scientific exploration of the Arctic seabed – which in turn was often interpreted by the media in a 'scramble for the Arctic' context, but actually involved extensive cooperation between the 'competing' states on research infrastructure.

Another contribution to further international interest in the Arctic region was the creation of the Arctic Climate Impact Assessment (ACIA) in 2004. Its report, which was carried by the Arctic Monitoring and Assessment Programme (AMAP) working group of the Arctic Council and written by three hundred scientists, assessed environmental, social, cultural, economic and health impacts and consequences of climatic and environmental changes in the Arctic.[4] By playing into the work of the Intergovernmental Panel on Climate Change (IPCC), the report contributed to accentuating Arctic environmental challenges on the global agenda. This was the first time that a thoroughly researched, independently evaluated and broad assessment had been conducted in the Arctic. It contributed significantly to shaping the global understanding of how the melting of sea ice, thawing of permafrost and sea-level rise would affect areas outside the Arctic region, further creating a broader realisation that the events happening in the Arctic do not stay in the Arctic. Acting as a catalyst for the growing understanding of global anthropogenic climate risks, the ACIA report was included as a source in several policy documents and Arctic strategies, in addition to further sparking the Arctic interest in non-Arctic states affected by sea-level rise and other environmental risks stemming from anthropogenic Arctic issues.

In March 2022, as a response to the Russian invasion of Ukraine, the Western parties temporarily discontinued their cooperation with Russia in BEAR, CBSS, the Nordic Dimension and the Arctic Council.

2.2 Arctic research output: quantities, qualities, impact and funding

In recent years, several studies have examined the quantities, qualities, impact and funding of Arctic research. A pilot study of Arctic research publication trends from 2016,[5] conducted under the UArctic Science & Research Analytics Task Force, found that the global scientific production of Arctic publications had increased significantly in the period 1996–2015 – from less than 5,000 papers per year in the initial years, to almost 11,000 in 2015. However, this increase was not stronger than the general global growth in scientific production, despite the coordinated international campaign to strengthen Arctic research through the organisation of the International Polar Year (IPY) 2007–2008. A new bibliometric study was published in 2023,[6]

[4] AMAP Secretariat (2023), *Arctic Climate Impact Assessment (ACIA)*, Arctic Council, https://acia.amap.no/

[5] Aksnes, D., I. Osipov, O. Moskaleva and L. Kullerud (2016), *Arctic Research Publication Trends: A Pilot Study*, UArctic and the Far Eastern Federal University

[6] Aksnes, D.W., C. Blöcker, C. Colliander and L.M. Nilsson (2023), *Arctic Research Trends: Bibliometrics 2016–2022*, UArctic, Umeå University and Canada Arctic.

under the UArctic Thematic Network on Arctic Research Analytics and Bibliometrics, hosted by Umeå University. The study found that the number of Arctic publications had risen from 9,500 in 2016 to 11,500 in 2021. The absolute figures are not directly comparable, but the study showed an average increase per year of 4%, down slightly from 4.8 in the preceding period. Regardless, the overall picture is of a steady growth in Arctic publication – but still not above the general global publication output.

Both studies found the USA to be the largest contributor to Arctic research in terms of publication output, with Russia as a clear No. 2, followed in the 2016 study by Canada, the UK and Norway, and in the 2023 study by Canada, China and Norway. For all Arctic Council member-states, the proportion of Arctic research of their overall research output had increased from 0.8% in 2001 to almost 1% by 2015. In the 2016 study, the Arctic Council observer states had a lower share of Arctic research compared to the member-states, ranging from 0.21 to 0.28%, but the absolute number of Arctic publications from this group of states had tripled from 2001 to 2015. Moreover, the number of states with scientists publishing within Arctic research had grown significantly. These trends remained relatively stable for the next survey period.

The state with the strongest relative growth over the 10-year period from 2006 to 2015 was China, with 260% growth. However, this growth was not unique for China's *Arctic* research, but reflected a general increase in Chinese scientific production during the period. In the most recent survey period, from 2015 to 2022, China had the highest relative growth (132%) of all states and moved up to the 4th place on the list. Again, the growth was not limited to Arctic research: by 2022, China had become the largest country in the world in terms of publication output. Of the Arctic states, Russia had the greatest growth: 117% in 2006–2015 and 38% in 2016–2022.

Earth sciences and biology were the two major disciplines of Arctic research in both survey periods, in absolute figures and in the relative share of Arctic research within the respective discipline. More specifically, earth and planetary sciences accounted for 24% in the 2016 study and 31% in the 202 study, agricultural and biological sciences for 15% in 2016 and 13% in 2023, environmental sciences for 11% in 2016 and 13% in 2023, medicine for 9% in 2016 and 8% in 2023, engineering for 8% in 2016 and 4% in 2023, social sciences for 7% in 2016 and 9% in 2023, genetics and molecular biology for 4% in 2016 and 2% in 2023, and arts and the humanities for 3% in 2016 and 4% in 2023. In the 2016 survey period, medicine and social sciences grew faster than other disciplines. The main trend in the 2023 study was that the biggest discipline, earth and planetary sciences, grew far more than any other discipline, from 24% to 31%. Other natural sciences showed a small reduction, except environmental sciences, which had slight growth. Social science had a not-insignificant growth, from 7% to 9%, while the humanities grew from 3% to 4%. Thus, the non-natural science share was up from 10% to 14%.

In terms of impact, Arctic research was cited slightly above the average for all publications reviewed in both the 2016 and the 2023 studies. Interestingly, there are sizable differences in citation among states, with research from the Switzerland and the Netherlands most cited (relative to total national output) in the 2016 study, followed by Australia and France – all of these being non-Arctic states. The same picture emerged in the 2023 study, with the Netherlands and Australia on top, followed by the UK. Among the large Arctic research nations, the UK, Germany and the USA ranked highest in the 2023 study. At the other end of the spectrum, Russian research was least-cited in both periods, although this might have to do with less research from Russia being published in English or the other large West European languages. Academic–corporate cooperation, which may be an indicator of the economic

impact of research, is slightly lower for Arctic research than the global average, whereas for the Nordic states it is twice as high, mainly within engineering, medicine and earth and environmental sciences. Similarly, patent-citations per scientific input are also high for the Nordic countries, but generally low for Arctic states compared to the global average.[7]

In both survey periods, the institution with the highest number of Arctic research publications was the Russian Academy of Sciences, followed by the University of Alaska Fairbanks and the University of Iceland in 2016 and the University of Iceland and UiT The Arctic University of Norway in 2023. The institutions with the highest citation impact in the 2016 study were the University of Colorado, the University of Cambridge and the University of Washington, and in the 2023 study the Alfred Wegener Institute, the University of Washington and the French National Centre for Scientific Research. Institutions from the Arctic states rank highest in terms of absolute numbers of publications, while prestigious universities and research institutes in major non-Arctic states such as the UK, France and Germany (in addition to the USA, with its Alaska) score higher on citation impact.

A pilot study on Arctic research funding[8] indicates that Arctic research accounts for approximately 1% of all funded research; that the largest proportion of Arctic research funding goes to earth sciences, in particular oceanography; that the proportion of funding dedicated to Arctic research has remained stable at approx. 1% over time; and that Arctic Council Member states provide around 7% on average of their total research funding to Arctic research, as compared to 0.5% for the Arctic Council observer states.

[7] This was measured only in the 2016 study.

[8] Osipov, I., G. Radford, D.W. Aknes, L. Kullerud and D. Hirshberg (2016), *International Arctic Research: Analyzing Global Funding Trends – A Pilot Report,* Digital Science Report – University of the Arctic. https://doi.org/10.6084/m9.figshare.3811224

3. Arctic strategies, research policies and priorities

3.1 National level

Russia

Russian priorities of the Arctic region have played out in different ways since the dissolution of the Soviet Union. During the 1990s, policy in the Russian Arctic was fragmented, often lacking systematic approaches to decision making.[9] However, this changed during the early 2000s, when the Arctic region was given higher priority on Russia's national and international agendas. Investments in scientific research and knowledge-production were vital in this shift. The role of science in 'taking back' the Arctic could be seen in the 2007 research expedition to the North Pole, consisting of numerous researchers, decision makers, and other key actors, and planting the Russian flag at the pole.[10] The following year, Russia developed its first State Arctic policy, with scientific research high on the agenda.[11] A governmental commission on questions related to the development of the Arctic was established in 2015, where its tasks included issues related to Arctic research.[12] Increased scientific practices and technological growth development in the Arctic region is also among the main goals of the Russian strategy until 2035.[13] Hence, before we examine specific drivers and processes within Arctic research in Russia, it is essential to recognise that *research* has been a driver in itself in Russia's Arctic policy: investments in science have been a central part of the national and international agenda of the Russian Federation in its presence in the Arctic region.

As for issue-specific areas, the human dimension plays a significant part in Russian strategical documents for the development of the Arctic region, through health and social development, and considering regional and socioeconomic aspects.[14] The Russian Association of Indigenous Peoples of the North (RAIPON) holds a significant position in Russia's priorities of the Arctic

[9] Maksakova, M. A. (2023), 'Revisiting the Arctic Strategy of Russia up to 2035', in E.V. Pak, A.I. Krivstov and N.S. Zagrebelnaya (eds) (2023), *Handbook of the Arctic*, London: Palgrave Macmillan.

[10] Tass (2 August 2017) Участники "Арктики-2007" спустя 10 лет рассказали о лежащем на дне океана флаге Петербурга [Participants of "Arktika-2007" after 10 years told about the flag of St. Petersburg lying at the bottom of the ocean], *Tass.ru* https://tass.ru/obschestvo/4457654

[11] Medvedev, D. (2008), "Основы государственной политики Российской Федерации в Арктике на период до 2020 года и дальнейшую перспективу" (утв. Президентом РФ 18.09.2008 N Пр-1969) ["Fundamentals of the state policy of the Russian Federation in the Arctic for the period up to 2020 and beyond" (approved by the President of the Russian Federation on September 18, 2008 N Pr-1969)] https://legalacts.ru/doc/osnovy-gosudarstvennoi-politiki-rossiiskoi-federatsii-v-arktike/

[12] Государственная комиссия по вопросам развития Арктики [The Governmental Commission of the Development of the Arctic region] (2023), О нас - Общие сведения [About us – General information]. https://arctic.gov.ru/about-us-overall/

[13] Kremlin (2023), Внесены изменения в Основы государственной политики в Арктике на период до 2035 года [Amendments have been made to the Fundamentals of State Policy in the Arctic for the period up to 2035]. (21.2.2023).http://kremlin.ru/acts/news/70570?utm_referrer=korabel.ru%2Fnews%2Fcomments%2Fvneseny_izmeneniya_v_osnovy_gosudarstvennoy_politiki_v_arktike.html&fbclid=IwAR3fqEzRAhzpBAVi8qhdYDoiv44GPcqVT5BNaIE2Ju6fo1sSZquKEtttfvI

[14] Kremlin (2020), Указ Президента Российской Федерации от 05.03.2020 г. № 164 - Об Основах государственной политики Российской Федерации в Арктике на период до 2035 года. [Decree of the President of the Russian Federation of March 5, 2020 No. 164 - On the Fundamentals of the State Policy of the Russian Federation in the Arctic for the period up to 2035]. http://www.kremlin.ru/acts/bank/45255/page/1

region and investments in higher education and educational institutions.[15] In addition, the priority areas of Russia's previous two chair periods of the Arctic Council illustrate the Russian scientific ambitions in the region. In the 2021–2023 period, the five main areas were the Arctic population, environmental protection, socioeconomic development and strengthening of the Council.[16] During both chairship periods, particular attention has been paid to the social and human dimensions concerning sustainable development.[17] Key research priorities in Russian contributions to Arctic Council work include better understanding of climate change and ecology through AMAP, the Arctic Contaminants Action Program (ACAP) and the Conservation of Flore and Fauna (CAFF) working groups, particularly in hydrometeorology, identifying and eliminating hot spots, and preserving Arctic biodiversity.[18]

Arctic climate research in Russia has now established a strong foundation. However, earlier Russian scientific traditions regarding climate science did not always view climate change as caused primarily by human activities.[19] This anti-anthropogenic stance, particularly prominent during the final years of the Soviet Union, persisted until Russia ratified the Kyoto Protocol.[20] In recent years, however, Russian science has increasingly aligned itself with the findings of IPCC. Within the Arctic strategy of the Russian Federation, climate change is now recognised as a significant, human-induced threat to the region. Additionally, Russian political approaches to implementing international environmental agreements have been partially influenced by concerns related to economic growth and the strengthening of foreign policy.[21]

Canada

The latest Canadian Arctic and Northern policy framework has been co-developed with territorial governments, northerners, indigenous groups and organisations. This framework emphasises that Canada's international Arctic interests are supported by increasing the participation of northerners in Arctic research activities and in the Arctic Council.[22] Canada's National Inuit Strategy for Research emphasises the equal validity of indigenous and scientific knowledge in decision making in the region. Another core dimension of Canadian foreign policy,

[15] Ibid.

[16] Russian Chairmanship (2021), *Russia's Chairmanship Priorities for the Arctic Council 2021–2023*, https://oaarchive.arctic-council.org/handle/11374/2646. Due to the Russian full-scale war against Ukraine in 2022 and the temporary Arctic Council pause, the Russian chairship could implement their plans put on the national level, which they proceeded to do.

[17] In the most recent chairship period, the focus on indigenous peoples and the digitalisation of remote Arctic settlements have a main agenda-issue. In addition, including youth in the Arctic dialogue is new for Russia's 2021–2023 chairship period.

[18] Historically, many Russian contributions to Arctic Council research involved hydrometeorology, due partly to the work done in Roshydromet. Other key contributions and areas have been associated with access to data on biodiversity, the thawing permafrost, and environmental 'hot spots.'

[19] Soviet climatologists often used paleoclimatic models, leaning on theories of cyclical climatic changes and history repeating itself, making paleoclimatic explanations dominant in Soviet and later Russian science. See K. Doose (2022), 'Modelling the Future: Climate Change Research in Russia during the Late Cold War and beyond, 1970s–2000', *Climatic Change* 171: 6. https://doi.org/10.1007/s10584-022-03315-0; J. Oldfield (2018), 'Imagining Climates Past, Present and Future: Soviet Contributions to the Science of Anthropogenic Climate Change', *Journal of Historical Geography* 60: 41. ISSN 0305-7488. https://doi.org/10.1016/j.jhg.2017.12.004.

[20] A. Gusev, 'Evolution of Russian Climate Policy: From the Kyoto Protocol to the Paris Agreement', *L'Europe en Formation* 380 (2016): 39. https://doi.org/10.3917/eufor.380.0039.; A. Korppoo, J. Karas and M. Grubb, *Russia and the Kyoto Protocol: Opportunities and Challenges* (2006), London: Chatham House.

[21] A. Korppoo, N. Tynkkynen and G. Hønneland, 'Russia and the politics of international environmental regimes: Environmental Encounters or Foreign Policy? (2015), Cheltenham: Edward Elgar.

[22] Government of Canada (2019), *Canada's Arctic and Northern Policy Framework*, ISBN: 978-0-660-33550-6. https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587

and strategic priority areas for the Arctic region, involves strengthening bilateral relations with the USA and investment in developing the North American Arctic.[23] Thus, investment in the development and participation in Arctic research comes as an area of foreign policy in addition to domestic priorities. In 2015, the same years as Canada held a ministerial meeting to mark the end of its Arctic Council chairship period, the departmental corporation of Polar Knowledge Canada was established, after the merging of the Canadian Polar Commission and the Arctic Science and Technology Directorate.[24] Polar Knowledge Canada is a key actor in the development of Canadian Arctic research and in setting the agenda for research priorities.[25] Its goals here revolve around improving knowledge of northern ecosystems, increasing understanding of the connections between community wellness and environmental health, and advancing sustainable technological, infrastructural and energy solutions.[26]

Canada, along with Finland and Russia, was a key contributor to the establishment of the Arctic Council.[27] Canada has chaired the Arctic Council twice, serving as the Council's first chair in 1996, and then again from 2013 to 2015. During the latest chairship period, Canada focused on the people of the North, resource development, safe Arctic shipping, sustainable circumpolar communities and strengthening of the Arctic Council.[28] Canada has further shown its presence in Arctic research by establishing the permanent Arctic Council secretariat of the Sustainable Development Working Group (SDWG) in Ottawa.

Sustainability is a priority and driving issue in Canadian Arctic research.[29] However, indigenous conceptualisations of sustainability emphasise cultural values and practices, in contrast to Western scientific conceptualisations and paradigms.[30] Northern Canadian communities give priority to infrastructure, food security, housing, and waste and water management issues.[31] In the past, relationships between researchers and local communities in the Canadian Arctic were characterised by an uneven balance of power, including colonialist research practices.[32]

[23] Ibid.
[24] Government of Canada (2023), *About Polar Knowledge Canada*, Polar Knowledge Canada, https://www.canada.ca/en/polar-knowledge/behindthescenes.html
[25] Government of Canada (2017), *Polar Knowledge Canada Report 2015–2017*, Polar Knowledge Canada, https://www.canada.ca/en/polar-knowledge/reports/annual-report/2015-2017/annual-report-2015-2017.html
[26] Government of Canada (2020), *Science and Technology Framework 2020–2025*, Polar Knowledge Canada, https://www.canada.ca/content/dam/polar-polaire/documents/pdf/science-technology-framework/science-technology-framework-2020-2025-EN.pdf
[27] English, J. (2013), *Of Ice and Water – Politics, Peoples and the Arctic Council*, Toronto: Allen Lane.
[28] Canadian Chairmanship (2013), *Canada's Chairmanship Program for the Arctic Council 2013-2015*, Arctic Council, https://oaarchive.arctic-council.org/handle/11374/2080
[29] Perrin, A., G. Ljubicic and A. Ogden (2021), 'Northern Research Policy Contributions to Canadian Arctic Sustainability', *Sustainability* 13, https://doi.org/10.3390/su132112035
[30] Kealiikanakaoleohaililani, K. and C.P. Giardina' (2015), 'Embracing the sacred: an indigenous framework for tomorrow's sustainability science', *Sustainability Science* 11: 57–67, https://doi.org/10.1007/s11625-015-0343-3; Sheremata, M. (2018), 'Listening to relational values in the era of rapid environmental change in the Inuit Nunangat', *Environmental Sustainability* 35: 75–81. https://doi.org/10.1016/j.cosust.2018.10.017
[31] Perrin, A., G. Ljubicic, and A. Ogden (2021), 'Northern Research Policy Contributions to Canadian Arctic Sustainability', *Sustainability* 13, https://doi.org/10.3390/su132112035; Government of the Northwest territories (2017), *Knowledge Agenda: Northern Research for Northern Priorities.* Yellowknife: Government of the Northwest Territories
[32] This has played out in different stages of research processes and in systemic attitudes towards indigenous peoples of the Canadian North. Such practices include publishing sensitive information without consultation, not sharing scientific results with local communities, and overlooking traditional knowledge: see P. Pfeier (2018), 'From the credibility gap to capacity building: An Inuit critique of Canadian Arctic research', *Northern Public Affairs*, 6: 29–34; C. Wong, K. Ballegooyen, L. Ignace, M.J. (Gùdia) Johnson and H. Swanson (2020), 'Towards reconciliation: 10 Calls to Action to natural scientists working in Canada*', FACETS.* 5: 769-783, https://doi.org/10.1139/facets-2020-0005; Nadasdy P. (2003), *Hunters and bureaucrats: power, knowledge, and aboriginal-state relations in the*

Currently, reconciliation, co-production and co-management processes between scientific and traditional knowledge practices are core priority areas in knowledge development in the Canadian Arctic, and indigenous knowledge is counted as equal to scientific knowledge in territorial governments.[33] However, there are still recurring dilemmas associated with the use and interpretation of traditional knowledge versus application of results and data from academic research, particularly in issues concerning the management of natural resources for indigenous livelihoods.

The federal government of Canada emphasises the need to bolster research capacity, whereas territorial governments and national indigenous organisations prioritise governance capacity, concerning leadership in research initiatives and pursuing greater autonomy for indigenous groups in decision-making processes.[34] This difference underscores the complexity surrounding capacity development in the context of indigenous research engagement. The federal government's focus on enhancing research capabilities is in line with its efforts to strengthen Canada's scientific presence and expertise in the Arctic and other polar regions. By contrast, territorial governments and indigenous organisations advocate for increased governance capacity to ensure meaningful and inclusive participation in research activities and decision-making processes, with indigenous communities having a more significant role in shaping research agendas and outcomes.

USA

In contrast to Canada, Russia, and Norway, the USA was a latecomer in establishing its Arctic identity, and has only gradually embraced its position as an Arctic nation.[35] The linkage of science and technology with Arctic affairs experienced significant growth throughout the Cold War era, serving as a supplementary framework alongside the region's prevailing military and strategic narratives.[36] Later, the changing discourse on the Arctic in the 1990s, with greater attention to climate change, environmental concerns, and a preference for cooperation over conflict, prompted the USA to prioritise scientific collaboration and invest more extensively in Arctic research. This shift not only solidified the country's Arctic identity but also underscored the significance of international cooperation in tackling the shared challenges faced in the North.[37]

Investments in scientific research are a crucial area in the US national strategy for the Arctic. This is particularly evident regarding the pressing issues of climate change, environmental

southwest Yukon, Vancouver, British Columbia: UBC Press; Ban, N.C., A. Frid, M. Reid et al. (2018), 'Incorporate Indigenous perspectives for impactful research and effective management', *Nat Ecol Evol* 2, 1680–1683 (2018). https://doi.org/10.1038/s41559-018-0706-0

[33] Government of Canada (2019), *Canada's Arctic and Northern Policy Framework*, ISBN: 978-0-660-33550-6, https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587; Perrin et al. (2021*), Northern Research Policy Contributions to Canadian Arctic Sustainability*, Federal Government of Canada, Canadian Arctic and Northern Policy Framework; First Nations Information Governance Centre (2014), *OCAP: Ownership, Control, Access, and Possession – The Path to FN Information Governance. First Nations Information Governance Centre*, Ottawa, https://achh.ca/wp-content/uploads/2018/07/OCAP_FNIGC.pdf

[34] Ibid.

[35] Nilsson, A. (2018), 'The United States and the making of an Arctic nation', *Polar Record*, 54: 95–107. doi:10.1017/S0032247418000219

[36] Heymann, M., H. Knudsen, M.L. Lolck, H. Nielsen, K.H. Nielsen and C.J. Ries (2010), 'Exploring Greenland: Science and Technology in Cold War Settings', *Scientia Canadensis* 33: 11–42, https://doi.org/10.7202/1006149ar

[37] Nilsson, A. (2018), 'The United States and the making of an Arctic nation', *Polar Record*, 54: 95–107. doi:10.1017/S0032247418000219; Nilsson, A.E. and T. Koivurova (2016), 'Transformational Change and Regime Shifts in the Circumpolar Arctic', *Arctic Review on Law and Politics* 7, https://doi.org/10.17585/arctic.v7.532

protection and the importance of international cooperation and governance.[38] Hence, traces of the Cold War, where science and strategy were intertwined, can still be found in current US approaches to Arctic research. The US Arctic Research Commission (USARC) and the Interagency Arctic Research Policy Committee (IARPC) lead this effort. Their primary responsibility is to guide and coordinate research efforts focused on understanding the environmental and societal impacts of climate change in the Arctic.[39] USARC and IARPC produce Arctic research plans and goals reports that guide the prospects and objectives of Arctic research in the USA. One aspect of these plans is their thematic interconnectedness, ensuring overlaps in priority areas to foster a comprehensive approach to addressing Arctic challenges.[40] In the US Arctic strategy, co-management and co-production of knowledge with indigenous groups in Alaska are noted as a priority, but rarely mentioned in scientific work.[41]

For the period 2023–2024, the USARC goals and objectives report outlines five key research areas for expansion: addressing environmental risks and hazards, enhancing community health and well-being, improving infrastructure development, exploring opportunities for Arctic economics and fostering international research cooperation.[42] Similarly, the IARPC research plan for 2022–2026 notes the priority areas of community resilience and health, Arctic systems interactions, sustainable economies and livelihoods, and risk management and hazard mitigation.[43]

In 1998, two years after the establishment of the Arctic Council, the USA held its first chairship period. At this point, the Arctic Council had yet to get the same attention and role it currently has: the areas of focus can be seen in light of the parallel development of the Arctic Council. The possibility of cooperating with Russia on environmental protection and sustainable development in the Arctic had only emerged a few years prior, which was an incentive for work in the Arctic Council. SDWG was also established during this time, with public health intended as a 'high priority' under this programme.[44] Important during the second US chairship period were the focus on the Arctic Ocean, communities, climate and awareness of the region.[45] Currently, the USA is involved in projects under all the Council's working groups, and is particularly active in the projects of CAFF and the Protection of the Marine Environment working

[38] The White House (October 2022), *National Strategy for the Arctic Region*, https://www.whitehouse.gov/wp-content/uploads/2022/10/National-Strategy-for-the-Arctic-Region.pdf

[39] The White House, *National Strategy for the Arctic Region*; U.S. Arctic Research Commission (2023), *About USARC*, https://www.arctic.gov/about-usarc/; National Science Foundation (2023*), Interagency Arctic Research Policy Committee (IARPC)*, https://www.nsf.gov/geo/opp/arctic/iarpc/start.jsp

[40] Woodrow Wilson Center (2023), *Release of the US Arctic Research Commission 2023–2024 Goals Report*, https://www.wilsoncenter.org/event/release-us-arctic-research-commission-2023-2024-goals-report

[41] The White House (2022), *National Strategy for the Arctic Region*.

[42] United States Arctic Research Commission (USARC) (2023), *Report on the Goals and Objectives for Arctic Research 2023-2024 – For the US Arctic research program plan*, https://www.arctic.gov/uploads/assets/arctic-research-2023-2024.pdf

[43] Interagency Arctic Research Policy Committee of the National Science and Technology Council (2021), *Arctic Research Plan 2022-2026*, https://www.iarpccollaborations.org/plan/index.html

[44] U.S Chairmanship (1998), *Memo on U.S. Chairmanship Priorities 1998–2002*, Arctic Council, *https://oaarchive.arctic-council.org/handle/11374/1890*

[45] U.S. Chairmanship of the Arctic Council (2015), *U.S. Chairmanship Brochure 2015-2017*, Arctic Council, *https://oaarchive.arctic-council.org/handle/11374/943*

group (PAME).[46] Alignment with the research priorities set out in federal documents is reflected by the US engagement in Arctic Council work as well.[47]

Iceland

Iceland's geostrategic position as a North Atlantic and Arctic state was initially a core element in shaping its political interests in the Arctic. From the Cold War, when Iceland was a vital element of the NATO military strategy, to the US military withdrawal in 2006, the Arctic identity of Iceland was mainly connected to security issues.[48] Maintaining the relationship with the USA while also nourishing the relationship with the EU was a vital element in Iceland's post-Cold War foreign policy, to maintain the bond between Icelandic geopolitics and NATO interests. After the financial crisis of 2008, the Arctic region as a critical area of foreign policy became a strategy for again drawing attention to Iceland's strategic location.[49] In 2011, a parliamentary resolution on Iceland's Arctic policy was approved to build upon this narrative, citing the issues of climate change, natural resources, continental shelf claims and new shipping routes.[50] In policy on matters concerning the Arctic region, Iceland's identity as an Arctic state is now clear. Indeed, the story of Iceland as the only Arctic state that (according to some definitions) lies entirely within the Arctic confirms this, showing how the Arctic region has significantly grown in importance for Icelandic foreign policy.[51] It is the only Arctic country without an indigenous population, so the co-production of knowledge with indigenous communities ranks lower on the agenda. However, the indigenous 'dimension' is emphasised in Icelandic focus areas in Arctic Council work.[52]

In the past decade, Arctic research in Iceland has experienced notable growth. While a considerable portion of research pertains to Arctic natural science phenomena, there has been a shift towards increased attention to Arctic communities. Moreover, there has been a rise in the involvement of Icelandic scientists in international Arctic research initiatives.[53] Despite the increased attention given to social sciences in Iceland, most of the grants and funds allocated from the Icelandic Research Fund for Arctic research are still given to natural and environmental sciences. In contrast, humanities and social sciences receive the least amount of funding.[54] Research on climate change and environmental protection are high on the

[46] Arctic Council (2021*), AMAROK Update, November 2021 – Details of Arctic Council projects*, https://oaarchive.arctic-council.org/handle/11374/2763

[47] Several US-led Arctic Council projects overlap with thematic areas prioritised in USARC and IARPC research plans: these include work on human health, food security, search and rescue, waste management, arctic shipping, air pollution including short-lived climate forcers, biodiversity, and other areas of environmental protection and sustainable development. A comprehensive list over all Arctic Council projects, their leads and their descriptions can be found in AMAROK (see preceding footnote).

[48] Ingimundarson, V. (2015), 'Framing the national interest: the political uses of the Arctic in Iceland's foreign and domestic policies', *The Polar Journal* 5, https://doi.org/10.1080/2154896X.2015.1025492

[49] Bailes, A.J.K. and Ö.Þ. Rafnsson (2012), 'Iceland and the EU's Common Security and Defence Policy: Challenge or Oppurtunity?' *Icelandic Review of Politics & Administration* 8: 109, http://dx.doi.org/10.13177/irpa.a.2012.8.1.5

[50] Government of Iceland (2011), *A Parliamentary Resolution on Iceland's Arctic Policy*, https://www.government.is/media/utanrikisraduneyti-media/media/nordurlandaskrifstofa/A-Parliamentary-Resolution-on-ICE-Arctic-Policy-approved-by-Althingi.pdf

[51] Ministry for Foreign Affairs, Government of Iceland (2021), *Iceland's Policy on Matters Concerning the Arctic Region, Parliamentary Resolution 25/151*, https://www.government.is/library/01-Ministries/Ministry-for-Foreign-Affairs/PDF-skjol/Arctic%20Policy_WEB.pdf

[52] Ibid.

[53] Sumarliðason, E.Í, S. Villalobos and S. Ólafsdóttir (2020), *Mapping Arctic Research in Iceland. Published by Rannís - Rannsóknamiðstöð Íslands*, ISBN 978-9979-887-05-8 https://www.rannis.is/media/arctic-studies/Mapping-Arctic-Research-in-Iceland-sidur.pdf

[54] Ibid.

agenda, and within these, issues related to the marine environment and marine resources are of particular focus.

During the first Icelandic chairship period of the Arctic Council, priority was accorded to three main pillars: an assessment of human development, the development of telecommunications systems and prioritisation of research on sustainable development in the Arctic.[55] In addition, the Icelandic Ministry for Foreign Affairs created a comprehensive report on the shipping opportunities in the region at this time, emphasising the role of the Northern Sea Route in light of climate change, environmental effects and the importance of transshipment ports, and contextualising this with the historical heritage of Icelanders as sea voyagers.[56] The importance of the marine environment was also highlighted during Iceland's second Arctic Council chairship, as a main priority in addition to green energy solutions, communities of the Arctic and the strengthening of the Arctic Council.[57] Iceland's interest in supporting research on the Arctic marine environment can also be seen in its hosting of the permanent secretariats of the PAME and CAFF working groups. Before Norway was chosen to host the Arctic Council secretariat, Iceland had shown interest in hosting it to further build on the identity of an Arctic nation. In addition, the emphasis on marine protection is evident in Arctic Council projects led by Iceland, which frequently address issues related to marine pollution, biodiversity and environmental protection.[58]

The annual Arctic Circle Assembly (ACA) conference in Reykjavik is one of the ways in which Iceland shows its presence in Arctic research and governance.[59] Organised with the perspective of the Arctic as a global commons, the Arctic Circle acts as a hybrid arena combining policy, science and business.[60] Iceland sees hosting the Arctic Circle Assembly as a means of actively practising Arctic governance. This allows it to facilitate discussions on security matters, set research agendas, promote dialogue and effectively exercise soft power in the region. Although the discourses and agendas set during the Arctic Circle Assembly contribute to including non-Arctic states in the shaping and influencing of research priorities, they are not comparable to the influence of institutional cooperation through the Arctic Council. However, for the non-Arctic states, and the observers on the Council, participation in such conferences opens up further room for action in research agenda setting, and demonstrating presence.

Norway

Norway has a strong identity as a northern, albeit not necessarily *Arctic*, country. Its Arctic policies have been influenced by its heritage as a nation of polar explorers; its status as 'bipolar', as one of the claimant states in the Antarctica as well as in the Arctic; its proximity to Russia, as the only (until recently) NATO state bordering Russia in the High North; Norwegian sovereignty over Svalbard and the disputed status of the waters beyond Svalbard's territorial sea; Norway's

[55] Ministry for Foreign Affairs of Iceland (2004), *Program for the Icelandic Chair of the Arctic Council*, Arctic Council, *https://oaarchive.arctic-council.org/bitstream/handle/11374/1777/EDOCS-3652-v2-ACSAOFI04_Inari_2002_14_Icelandic_Chairmanship_program_2002-2004.pdf?sequence=5&isAllowed=y*

[56] Ministry for Foreign Affairs, Government of Iceland (2006), *North Meets North – Navigation and the Future of the Arctic*, http://library.arcticportal.org/253/1/North_Meets_North_netutg.pdf

[57] *Icelandic Chairmanship (2019), Together towards a sustainable Arctic – Iceland's Arctic Council Chairmanship 2019–2021*, https://oaarchive.arctic-council.org/bitstream/handle/11374/2456/Arctic_Council-Iceland_Chairmanship_2019-2021.pdf?sequence=1&isAllowed=y

[58] Arctic Council (2021), *AMAROK Update*, November 2021, https://oaarchive.arctic-council.org/handle/11374/2763

[59] Government of Iceland (2021), *Iceland's Policy on Matters Concerning the Arctic Region – Parliamentary Resolution 25/151*

[60] Beate Steinveg (2021), 'The role of conferences within Arctic governance', *Polar Geography*, 44: 37–54, DOI: 10.1080/1088937X.2020.1798540

dependence on marine resources; and a dedicated domestic policy to maintain population and a lively economy in the country's northern parts, including, but far from restricted to, the indigenous Sámi population.

It is only in recent years that the term 'Arctic' has come to be applied to Norway's strategies in the North. In the post-Cold War era, the terms 'Barents' and 'High North¨' featured in Norwegian foreign policy in the 1990s and 2000s, respectively. The former was heavily influenced by Norway's sharing a border with Russia and the intention to include Russia in binding international cooperation after the collapse of the Soviet Union. Norway was the initiator of BEAR, which included Sweden, Finland and Russia, as well as other Arctic states as observers. Later, the term the 'High North' was introduced; the first dedicated Northern strategies were produced in 2006,[61] 2009,[62] 2017[63] and 2021 (White Paper)[64]. Research was included in the strategies, but alongside many other thematic areas. The priorities of the 2006 strategy were i) credible, consistent and predictable exercise of Norwegian authority in the High North; ii) knowledge development (including related to petroleum, maritime transport, utilisation and management of marine resources, environmental protection, climate and polar research and research on indigenous peoples); iii) environmental protection; iv) petroleum development; v) safeguarding the livelihoods, traditions and cultures of indigenous peoples; vi) people-to-people cooperation in the High North; and vii) strengthening cooperation with Russia. The 2009 strategy was more practically and domestically oriented. It launched FRAM – the High North Research Centre for Climate and the Environment (the Fram Centre), the establishment of an Arctic earth-observation system on Svalbard, a 'next-generation' radar system, the building of a new ice-class research vessel, and a system for integrated monitoring, emergency response and maritime safety. The 2017 strategy was the first to be termed *Arctic* strategy, with 'between geopolitics and social development' as sub-title. As the title suggests, this is a catch-all strategy, but with international cooperation, business development, knowledge, infrastructure and emergency preparedness and response as priorities. The 2021 White Paper, referred to in English as Norway's Arctic Policy, lists foreign and security policy, climate and environment, social development, value creation and competence development, infrastructure, transport and communications, and civil protection as key areas.

Norwegian Arctic research is financed through two main mechanisms: i) direct financing of state-owned universities and research institutes, notably the Polar Institute; and ii) dedicated funds to Arctic research from various ministries (ranging from financing of basic research provided by the Ministry of Education and Research, to funding of more applied research provided by the sector ministries), generally channelled through the Research Council of Norway (RCN). Priorities on the RCN's High North Strategy from 2019 are geopolitics, climate and environment, knowledge-based trade and industry development, the ocean as a resource, bioeconomy, energy and community development. The Polar Programme of the RCN in operation from 2015 has three thematic priorities, with funding made available through targeted calls for project financing: i) climate and environment; ii) natural resources and industry; and iii) politics and management. In addition, RCN's Global Development and International Relations Portfolio has funds for studies of international relations in the Arctic.

[61] *The Norwegian Government's High North Strategy*, 2006, strategien.pdf (regjeringen.no).
[62] *New Building Blocks in the North: The Next Step in the Government's High North Strategy*, 2009, forside_engelsk.psd (regjeringen.no).
[63] *Norway's Arctic Strategy – between Geopolitics and Social Development*, 2017, Norway's Arctic Strategy – between geopolitics and social development (regjeringen.no).
[64] *The Norwegian Government's Arctic Policy: People, Opportunities and Norwegian Interests in the Arctic*, 2021, The Norwegian Government's Arctic Policy - regjeringen.no.

A comprehensive evaluation in 2018[65] distinguished between High North, Polar (including both the Arctic and the Antarctic) and Svalbard research. The categories of Arctic and High North research are partly overlapping – but, unlike the Arctic, the High North included the three northernmost counties of mainland Norway and only the Norwegian sector of the Barents Sea (including the northern Norwegian Sea). Some 62% of the research effort went to the High North and 38% to the Polar region (of which 7% went to Antarctic research). Of the High North share, 33% went to research on the three northernmost counties, 18% to Svalbard and 21% to the Barents Sea. The largest university in terms of research effort was UiT The Arctic University of Norway (UiT) and the largest institute the Institute of Marine Research. Main disciplines were basic marine biology, fisheries biology and geology. Social sciences had a 10% share, and 8% of the total portfolio concerned indigenous peoples. Of the Polar research, 30% went to Svalbard and 34% to Barents Sea research. The major university was UiT and the most important institute the Polar Institute. Main disciplines were basic marine biology, geology and oceanography and geophysics. Finally, a recent Arctic mega-project has been the Nansen Legacy Project, involving ten research institutions and 280 researchers, students and technicians, aimed at providing integrated scientific knowledge on the changing marine climate and ecosystems in the northern Barents Sea and adjacent Arctic Ocean. Interestingly, the proposed continuation of the Nansen Legacy project from 2025 onwards, the Arctic Ocean of the Future, includes two new disciplines: the law of the sea and geopolitics.[66]

Sweden

Sweden has held the chairship of the Arctic Council only once, from 2011 to 2013. At that time, the chairship projects of Norway, Denmark, and Sweden were coordinated as part of a collective 'umbrella programme' for their successive chairships. The Swedish chairship had its focus on four overarching objectives: environment and climate, the people, the seas and a stronger Arctic Council.[67] In particular, these priorities were manifested through the Swedish contribution to the review of the legal framework for the Arctic marine environment, the creation of the Arctic Ocean Acidification report, the launch of the second Arctic Human Development report and the work on establishing the permanent Arctic Council secretariat in Tromsø, Norway.[68] More recently, Sweden has led several projects of the ACAP working group, as well as work on climate issues, contaminant issues and ecosystem status in the Central Arctic Ocean.[69]

The first Swedish Arctic strategy, published in 2011,[70] had three focus areas: i) climate and environment; ii) economic development; and iii) the human dimension. In the introduction to the strategy, it is noted that climate change is creating new challenges, especially for indigenous peoples, but also new opportunities for Sweden, in shipping, hunting, fishing, trade and energy. Within the first focus area, climate and environment, the main challenges for the region are

[65] D.W. Aksnes and K. Rørstad (2018), *Norwegian Polar Research, High North Research and Research in Svalbard*, Oslo: Nordic Institute for Studies in Innovation, Research and Education.
[66] Framtidens Polhav | UiT.
[67] Swedish Ministry for Foreign Affairs (2011), *Sweden's Chairmanship Programme for the Arctic Council 2011–2013*, Arctic Council, https://oaarchive.arctic-council.org/bitstream/handle/11374/1610/Swedens_chairmanship_programme_for_AC.pdf?sequence=1&isAllowed=y
[68] AMAP (2013), *Arctic Ocean Acidification – AMAP Assessment* https://repository.oceanbestpractices.org/bitstream/handle/11329/1195/AMAP_Assessment_2013_Arctic_Ocean_Acidif.pdf?sequence=1&isAllowed=y; SDWG (2013), *Arctic Human Development Report II : Regional Processes & Global Linkages*, https://oaarchive.arctic-council.org/handle/11374/1653
[69] AMAROK (2021), https://oaarchive.arctic-council.org/items/c4a9705b-8089-4847-8159-3d9340e0456d
[70] swedens-strategy-for-the-arctic-region (government.se)

defined as global warming, transport of pollutants into the Arctic and greater risk of local pollution in connection with increased resource extraction, and loss of biodiversity. In the second area, economic development, the following issues are listed: the work for free trade in the Arctic, traditional Swedish industrial policy interest in the Barents region (minerals, forest and fish) and economic interests in new industries in the wider Arctic (e.g. mining, petroleum, shipping and tourism). In the third focus area, the human dimension, the emphasis is on health, indigenous cultures and industries, and the survival of the Sámi languages. Although research is not singled out as a separate priority, all three focus areas involve research, education or knowledge production; regarding climate and environment: call for more integrated research between natural and social sciences and the humanities; regarding economic development: better integration between research, higher education, politics and society; and regarding the human dimension: transfer of indigenous knowledge and research programme on Sámi society.

A new Swedish strategy for the Arctic region was published in 2020, with six thematic priority areas: i) international collaboration; ii) security and stability; iii) climate and the environment; iv) polar research and environmental monitoring; v) sustainable economic development and business interests; and vi) securing good living conditions. A main development from the first Arctic strategy is that Arctic politics are now set in a security context, as also highlighted by Sweden's Minister of Foreign Affairs when she presented the strategy.[71] She noted that 'new geostrategic realities in the region mean greater challenges and changed circumstances for Swedish Arctic policy (p. 11)'. And further: 'Sweden will continue to closely follow the development of the security situation in the Arctic, including detecting and countering attempts to exert influence in and destabilising the region' (p. 21). The combination of heightened great-power competition and climate changed is described as particularly unfortunate for the region. The new geostrategic situation is summed up in three points. First, there is growing interest in the natural resources of the Arctic, which are becoming more accessible due to regional warming. Second, the Russian military build-up in the region is worrying. And third, so are China's increased global ambitions, as reflected also in the Arctic. While the military dimension of China's actions in the area has been limited this far, it is noted that China is building up naval forces with global reach, including submarines, and that greater attention should be paid to the military cooperation between China and Russia – especially if such cooperation extends to the Arctic. The Swedish government encourages like-minded countries and the EU to cooperate and act together regarding challenges and opportunities resulting from the increase in China's global influence (p. 23).

Another new priority is polar research and environmental monitoring. This section of the strategy is not very specific in terms of research priorities, but emphasises that Sweden will continue to engage in international scientific cooperation, including joint use of infrastructure. Particular mention is made of the icebreaker 'Oden', especially its contribution to joint scientific cruises with other states. In fact, the second strategy is less specific than the first one when it comes to research priorities, and there is no similar call for integration between the natural and social sciences and the humanities.

Denmark

The Kingdom of Denmark is an Arctic state through the two autonomous regions of the Realm: Greenland and the Faroe Islands. Denmark has one of the largest territories in the Arctic, but

[71] Sweden's New Arctic Strategy: Change and Continuity in the Face of Rising Global Uncertainty | The Arctic Institute – Center for Circumpolar Security Studies

the smallest Arctic population. Central to Danish Arctic politics is the ongoing process with setting the outer limits of the continental shelf in the Arctic Ocean.

Denmark's Arctic strategy, published in 2011,[72] consists of four focal points: i) 'a peaceful, secure and safe Arctic', which emphasises UNCLOS as the basis for international cooperation in the Arctic; enhanced maritime safety; and the exercise of sovereignty and surveillance in the Arctic; ii) 'self-sustaining growth and development', covering exploitation of mineral and living resources; renewable energy; stronger integration in international trade; knowledge-based growth and development; and Arctic cooperation on health and social coherence; iii) 'development with respect for the Arctic's vulnerable climate, environment and nature', which includes improving understanding of the consequences of climate change in the Arctic and protection of the Arctic environment and biodiversity; and iv) 'close cooperation with our international partners', calling for closer cooperation with other states on the global, regional and bilateral levels.

During its first and only chairship period of the Arctic Council (2009–2011), Denmark had several key priority areas on its agenda and contributions to Arctic Council work – including peoples of the Arctic, climate change, biodiversity, mapping of Arctic megatrends, continuing the legacy of the International Polar Year and strengthening multilateral cooperation.[73] Coordination and practical matters were executed in close cooperation with the Governments of Greenland and the Faroe Islands, in addition to the Danish chairship period being integrated into the coordinated 'cluster' of the successive Norwegian, Danish, and Swedish chairship periods. The Danish programme included completion of, and contributions to, several assessments and highlight reports, among them the Arctic Marine Shipping Assessment, Arctic Biodiversity Assessment, Human Health Assessment, and Snow, Water, Ice and Permafrost in the Arctic.[74] More recent Arctic Council projects led by Denmark include work related to human health, networks, Arctic environments and biodiversity, persistent organic pollutants (POPs) and the marine environment.[75]

A major research project related to the Arctic has been the Continental Shelf Project of the Kingdom of Denmark, managed by the Geological Survey of Denmark and Greenland (GEUS). This included several scientific cruises to the waters beyond 200 nm of Greenland to collect documentation for the (final) Danish submission to the UN Commission on the Limits of the Continental Shelf in 2014. As noted in Section 2.1, these expeditions often involved cooperation among the Arctic states, even when these were 'competitors' for jurisdiction of the Arctic shelf. Several of the Danish expeditions were based on Canadian logistics, and some were conducted with the Swedish icebreaker 'Oden' or supported by a Russian icebreaker. Notably, in addition to the collection of data relevant to the continental shelf project, emphasis was also placed on scientific output and follow-up research in other fields. Thus, ice cores were collected; ice thickness measured; samples of DNA and bacteria collected; geology, oceanography, plankton ecology studied; and the accumulation of mercury measured. All collection work was conducted in cooperation involving Danish, Greenlandic, Swedish and US

[72] *Denmark, Greenland and the Faroe Islands: Kingdom of Denmark Strategy for the Arctic 2011–2020*, Arctic-strategy.pdf

[73] Danish Chairmanship of the Arctic Council (2009), https://oaarchive.arctic-council.org/bitstream/handle/11374/1565/ACMM06_Tromsoe_2009_Denmark_chairmanship_programme.pdf?sequence=1&isAllowed=y

[74] PAME (2009), *Arctic Marine Shipping Assessment*, https://www.pame.is/projects/arctic-marine-shipping/amsa; CAFF (2013), *Arctic Biodiversity Assessment*, Arctic Council, https://www.caff.is/assessment-series/233-arctic-biodiversity-assessment-2013; Danish Chairmanship of the Arctic Council (2009)

[75] Arctic Council (2021), *AMAROK Update*.

research institutions; it resulted in better knowledge of the Arctic Ocean: its plate tectonics, palaeoclimatology, physical oceanography and ecosystems.

In general, the Danish Arctic strategy calls for increased research efforts to support all key priority areas identified there. As part of the implementation of the general Arctic strategy, the Danish Strategy for Research and Education concerning the Arctic was published in 2016.[76] It states that Arctic research and education efforts must be strengthened in step with changes in climate, technologies and geopolitics. However, the Ministry did not wish to establish a targeted research programme on the Arctic, or new dedicated funds. The 2016 strategy is fairly general, noting key points such as 'research and education in and about the Arctic of high quality and relevance for society', 'Denmark as a strong Arctic player and international collaboration partner' and 'responsible and sustainable social development of the Arctic region'. Its Action Plan calls, among other things, for better integration of Arctic research and education, increased efforts to disseminate Arctic research results and strengthen Arctic research infrastructure.

Finland

Within the Nordic region, Finland's position as an Arctic country is similar to that of Sweden. Neither country borders on the Arctic Ocean, both are members of the EU, and both have indigenous Sámi populations.

Finland has chaired the Arctic Council twice: 2000–2002 and 2017–2019. The Arctic Council has long been a significant symbol for Finland as its predecessor, the Arctic Environmental Protection Strategy (AEPS), was adopted during the Rovaniemi Process. Notable efforts were made during the initial Finnish Arctic Council chairmanship to enhance the role of the Arctic Council as a representative platform for Arctic interests. This entailed involving the European Union as a cooperation partner and engaging with the University of the Arctic and IASC to foster collaborative Arctic research initiatives. Additionally, emphasis was placed on promoting projects for economic and social development. Of particular importance was the commitment to strengthening the regional participation of indigenous peoples.[77] In the second chairship period (2017–2019), Finnish priorities included connectivity within the Arctic region, advancing meteorological and oceanographic cooperation, and the promotion of educational opportunities in the Arctic, in addition to greater focus on efforts in the areas of environment and climate, the seas, the Arctic peoples, and strengthening overall Arctic cooperation.[78]

The Finnish Government has produced a series of Arctic strategies. The 2010 strategy[79] focused on four areas: i) climate change, pollution and biodiversity; ii) economic activities, natural resources, research and know-how; iii) transport and infrastructure (including transport, communications and logistics networks in northern Finland, increasing traffic volumes in northern routes, and safety in shipping), and iv) indigenous peoples (the Sámi). The 2013[80] strategy introduced some reshuffling, making education and research first priority (however, without being much more specific than calling for strengthening of the field and increasing synergies) and in laying out business opportunities in greater detail than in the 2010 strategy

[76] *Strategy for Research and Education Concerning the Arctic*, Danish Ministry of Higher Education and Science, arctic-strategy.pdf (ufm.dk)
[77] Ministry for Foreign Affairs of Finland (2000), *Program for the Finnish Chair of the Arctic Council 2000–2002,* Arctic Council, https://oaarchive.arctic–council.org/handle/11374/1781
[78] Finnish Chairmanship (2017), *Finland's Chairmanship Program for the Arctic Council 2017–2019*, Arctic Council. https://oaarchive.arctic-council.org/handle/11374/2027
[79] *Finland's Strategy for the Arctic Region* (2010), Finland's Strategy for the Arctic Region (arcticportal.org).
[80] *Finland's Strategy for the Arctic Region 2013*, cf80d586-895a-4a32-8582-435f60400fd2 (vnk.fi).

(regarding energy, Arctic maritime industry and shipping, renewable natural resources, mining, clean technology, tourism, traffic and transport systems, and data communications and digital services). The two other focus areas in the 2013 strategy are the environment, and stability (including internal security) and international cooperation. The situation and rights of the indigenous peoples are mentioned, but not as a separate priority or very extensively. Lastly, the 2021 strategy[81] emphasises i) climate-change mitigation and adaptation; ii) local populations (promotion of welfare and the rights of the Sámi as an indigenous people); iii) Arctic expertise (livelihoods and 'top research'); and iv) infrastructure and logistics.

In sum, the three Finnish strategies cover many of the same priority areas that are found in the Arctic strategies of other states, a bit 'unevenly' spread out over time. Business development was particularly dominant in the second strategy and to some extent in the first, whereas climate change topped the priority list (to the extent that the order says something about the strength in prioritisation) in the first and the third strategies. The rights and situation of the Sámi people were a specific priority only in the first strategy, although the Sámi were mentioned in the category of 'inhabitants' in the last strategy. Also, research was a separate priority in the first strategy (focusing on applied research of benefit for business and innovation) and the third strategy (without specification as to what type of research should be prioritised).

Non-Arctic states

Events outside the Arctic affect the Arctic; similarly, what happens in the Arctic does not necessarily apply only there. Recent years have seen the gradual but significant growth in the involvement of non-Arctic states in Arctic affairs. For non-Arctic states, active involvement in scientific work and in the Arctic Council is important for showing and maintaining their presence in the region. Active engagement in research activities not only contributes to expanding academic endeavours but often engages with foreign-policy objectives and shows visibility.

From the creation of the Arctic Council to the present, new states have been added to the list of observers. The first observer states to be included were Germany, the Netherlands, Poland and the United Kingdom, during the Iqaluit ministerial meeting in 1998. They were followed by France in 2000 and Spain in 2006. At the Kiruna ministerial meeting in 2013, the Arctic Council included Asian observer states and involved China, India, Italy, Japan, Singapore and South Korea. Since then, the inclusion of Switzerland as an observer state at the Fairbanks ministerial meeting in 2017 was the last time a new observer state was added. Besides observing Arctic Council work, the primary role of observer states is to contribute to activities within the Council's working groups, in research and finances. However, observer states are not allowed to exceed the financial support given by the Arctic states to project work unless the Senior Arctic Officials decide otherwise.[82] One critical difference between the Arctic and non-Arctic states in their perspectives and outlooks for the region has been described as follows: the non-Arctic states view the Arctic primarily as part of a global system, whereas Arctic states and populations treat it mainly from a regional perspective.

While each observer state has its interests and particular priority areas in the region, some commonalities can be found. The Asian states are all characterised by rapid growth and expansion of research activities and Arctic output; further, they have, like Russia, voiced

[81] *Finland's Strategy for Arctic Policy*, 2021, Finland's Strategy for Arctic Policy (valtioneuvosto.fi).
[82] Arctic Council (2023), *Arctic Council Observers – List of Arctic Council Observers*, https://arctic-council.org/about/observers/

interest in shipping through the Northern Sea Route. In addition, for some, Arctic and Antarctic affairs are closely related in organisational structuring. For Asian countries, a major motivation for contributing to Arctic activities and participating in the Arctic Council is research on climate change and environmental issues. South Korea focuses on maritime issues through the Korean Polar Research Institute and Korea Maritime Institute. Similarly, India displays its research interest through the National Centre for Arctic and Antarctic Ocean Research. Japan, Singapore, and China have shown particular interest in matters related to shipping, in addition to the climate and environmental dimensions. Further, several Asian states have demonstrated their research interest by establishing research stations on Svalbard. China generally presents its ambitions in the Arctic as a 'win–win' situation' of economic and scientific cooperation with the Arctic states – although critics claim that this narrative has been fabricated to facilitate access to shipping routes, Chinese direct foreign investment in energy and mining projects, Polar Silk Road (PSR) infrastructure projects and potentially dual-purpose scientific research.[83]

China has engaged in a massive build-up of competence in international relations and the law of the sea related to the Arctic, not least at academic institutions in Shanghai, such as the Shanghai Institutes of International Studies, Shanghai Ocean University and Tongji University. Cooperation with the various Arctic states has been close in recent years. One example is the Chinese–Nordic Arctic Research Center (CNARC), founded by four Chinese (now eight) and six Nordic (now ten) research institutions in 2013. CNARC coordinates research cooperation in the fields of Arctic climate change and its impacts; Arctic resources, shipping and economic cooperation; and Arctic policymaking and legislation.

Notably, for the major research nations in Asia on polar issues – China, India, Japan and South Korea – research efforts have focused on the Antarctic more than the Arctic.

Similarities in interests and trends can also be found for the European Arctic Council observer states. For instance, Italy, Spain, and the UK connect their cultural heritage as voyagers and explorers to their current Arctic involvement. While the European Union is not yet a full observer member of the Arctic Council after its application in 2013,[84] several EU states with significant contributions to Arctic research are observers (France, Germany, Italy, the Netherlands, Poland, Spain and Switzerland). Research engagement concerning the adverse effects of climate change is a common denominator. Some states, such as the Netherlands, have a particular interest in such issues due to their low-lying coastlines.[85] The findings and results from the ACIA report have helped to boost the further development of Arctic policies and strategies of several states (France not least), by showing how pan-Arctic climate issues have global effects. This influence can be found in the French Arctic research strategy to showcase the necessity of furthering global Arctic research.

Although not having official observer status in the Arctic Council, the European Union has contributed to the work on Enhanced Black Carbon and Methane Emissions Reductions, in connection with its emission inventory information in relation to the Convention on Long-range

[83] G. Gricius, with N. Glesby, R. Guo, and P.W. Lackenbauer (2023), *Academic Research on China's Arctic Interests in English, 2006–2021: Preliminary Quantitative Analysis*, Policy Primer, North American and Arctic Defence Network, p. 1

[84] The EU application to become an observer of the Arctic Council has been opposed by Russia and Canada. Canada opposed this because of the EU Regulation on the ban of seal products, and its effect on Inuit trade, and Russia opposed this because of EU criticism of Russia's assertive attitude towards Ukraine; T. Melchiorre (2022), The European Union and the Arctic: An Inextricable Connubium? *High North News*, https://www.highnorthnews.com/en/european-union-and-arctic-inextricable-connubium

[85] The Arctic Institute (2022), *Netherlands*, https://www.thearcticinstitute.org/country-backgrounders/netherlands/

Transboundary Air Pollution (CLRTAP).[86] Other observer states that have contributed by presenting their national reports on Black Carbon include Germany, Italy, Japan, Netherlands, South Korea, Spain, Switzerland and the United Kingdom.[87] The work on short-lived climate forcers (SLCFs) through the AMAP working group is a general priority area for several observer states and the Arctic nations.[88] Each individual state values and contributes to specific working group programmes and thus engages with different fields. Germany contributes to work in the AMAP and projects in the CAFF working groups. Switzerland is active in the work of AMAP, CAFF, and to some degree, SDWG, as the country has significant experience with conducting ice, permafrost and glacier research in the Swiss Alps. Italy contributes to Arctic Council work primarily through projects in the AMAP working group and the Expert Group on Black Carbon and Methane. France has shown engagement in Arctic monitoring and assessment work, as well as in projects related to biodiversity, migratory birds and sea birds through CAFF. Spain and the Netherlands also engage in project work on circumpolar seabirds, biodiversity and migratory birds in CAFF, as well as the Netherlands, which works with radioactivity in the Arctic (AMAP) and sustainable energy (SDWG).

Since 1998, the United Kingdom has had official observer status on the Arctic Council. Its relative proximity to the Arctic enables closer ties to Arctic affairs compared to many other observer states. In addition, the UK has a long history of Arctic, and polar expeditions and research, which in turn incentivises its current interest in Arctic research. The geographical proximity makes the UK vulnerable to Arctic environmental changes: climate, weather patterns, biodiversity and sea-level rise. The UK's engagement in the Arctic environment could also be seen in its support of the AEPS in 1991, and in being one of the four original observer states on the Council, working primarily through PAME, CAFF and AMAP. Further, the UK had a proactive role in shaping the development of the agreement to prevent unregulated high-seas fisheries in the Central Arctic Ocean.[89]

3.2 International level

The Arctic Council

All Arctic states have acknowledged the Arctic Council as the primary international forum for scientific cooperation when outlining their research priorities for the Arctic. In addition, the processes leading up to the creation of the national Arctic strategies, and the presentations of them, have been linked to Arctic Council work. As an example, the latest Arctic policy of Iceland was revised and finalised in connection with Iceland's leadership period from 2019 to 2021, and presented at the ministerial meeting in Reykjavik on 20 May 2021, and the USA presented its Arctic strategy at the beginning of their second chairship period.[90] Having an arena for a multilateral dialogue beyond states' bilateral relations helps to give the Arctic states the advantage of prioritising the Arctic Council, in addition to the inclusion of non-state actors in

[86] European Union (2017*), National Report by the European Union 2017: Enhanced Black Carbon and Methane Emissions Reductions – Arctic Council Framework for Action*, https://oaarchive.arctic-council.org/bitstream/handle/11374/2441/EGBCM2_2017_National-Report-Observer-States-EU.pdf?sequence=1&isAllowed=y

[87] Arctic Council (2017), *Arctic Council Observer States 2017 National Reports on Enhanced Black Carbon and Methane Emissions Reductions*, https://oaarchive.arctic-council.org/handle/11374/2441

[88] Arctic Council (2023), *Air Pollution, with a focus on Short Lived Climate Forcers: New Data and Information on Emissions Trends*, https://arctic-council.org/projects/air-pollution-with-a-focus-on-short-lived-climate-forcers-slcfs/

[89] Arctic Council (2023), *United Kingdom*, https://arctic-council.org/about/observers/united-kingdom/

[90] Ministry of Foreign Affairs, Iceland

decision-making processes, as the representation and inclusion of indigenous groups in decision making is a critical element in the development of the Arctic region.

There could be several reasons for why the Council has been highlighted as the main collaborative body in the Arctic. Firstly, there are considerations of strategical Realpolitik. By supporting multilateral cooperation mechanisms, the Arctic states can limit the ambitions that non-Arctic states have to expand in the region. Being able to deal with the emergence of any competing regimes in the Arctic, and welcoming the involvement of non-Arctic states in the region through observer status, enables the Arctic states to maintain their influence. Additionally, the Arctic Council contributes to reinforcing the Law of the Sea Convention in the Arctic Ocean, as the recognition of coastal states is necessary to gain observer status. Hence, the support given to the Arctic Council helps to stabilise and reinforce the autonomy of the Arctic states.

In the earlier years of the Arctic Council, priority chairship areas frequently included strengthening the narratives around a more international Arctic region and making the Arctic Council an important component.[91] Since then, most national priorities have included strengthening the Arctic Council on the chairship agenda. Work surrounding the Arctic Climate Impact Assessment (2005), from its inception to dissemination and use, also shaped international priority areas in the Arctic Council.[92] Several Arctic states have underlined their research presence by hosting permanent working group secretariats. The permanent Arctic Council secretariat in Tromsø, Norway, and the secretariat of AMAP, ACAP and the working group for Emergency Preparedness and Response (EPPR) are key aspects of placing Tromsø and Norway as a central arena for decision-making and decision-shaping. Similarly, the working groups of CAFF and PAME in Akureyri (Iceland) and SDWG in Canada reflect Arctic national scientific priorities.

The priority research areas in the Arctic Council are affected by the funding allocated to the Council by its member states. Only permanent member states (the Arctic Eight) may fund Arctic Council projects. Unfortunately, the recent Russia/Ukraine war situation has challenged the conditions for science to be created, used and implemented in the Arctic Council.[93]

The Arctic Council chairmanships are illustrated in Table 1.

[91] R.B. Norland, Senior Arctic Official (1998), *Memo on US Chairmanship priorities*, https://oaarchive.arctic-council.org/bitstream/handle/11374/1890/EDOCS-4176-v1-1998-11-30_Memo_on_US_Chairmanship_priorities.pdf?sequence=1&isAllowed=y; Ministry for Foreign Affairs of Finland (2000), *Program for the Finnish Chair of the Arctic Council 2000–2002*, https://oaarchive.arctic-council.org/bitstream/handle/11374/1781/EDOCS-3706-v1-Program_for_the_Finnish_Chair_of_the_Arctic_Council_2000-2002.pdf?sequence=1&isAllowed=y; Ministry for Foreign Affairs of Iceland (2002), *Program for the Icelandic Chair of the Arctic Council 2002–2004*, Reykjavik, https://oaarchive.arctic-council.org/bitstream/handle/11374/1777/EDOCS-3652-v2-ACSAOFI04_Inari_2002_14_Icelandic_Chairmanship_program_2002–2004.pdf?sequence=5&isAllowed=y

[92] Ministry for Foreign Affairs of Finland (2000), Ministry for Foreign Affairs of Iceland (2002); Government of Norway (2006), *Norwegian Chairmanship Programme*, https://oaarchive.arctic-council.org/handle/11374/2472; The Kingdom of Denmark (2009), *Chairmanship of the Arctic Council 2009–2011*, https://oaarchive.arctic-council.org/handle/11374/1565

[93] S. Andreeva (2023), 'Science at Stake – Russia and the Arctic Council', *Arctic Review on Law and Politics* 14: 112.131. https://doi.org/10.23865/arctic.v14.5455

Table 1 Arctic Council chairmanships

Time period	Chair	Statement / Declaration
1996–1998	Canada	Iqaluit Declaration
1998–2000	USA	Barrow Declaration
2000–2002	Finland	Inari Declaration
2002–2004	Iceland	Reykjavik Declaration
2004–2006	Russian Federation	Salekhard Declaration
2006–2009	Norway	Tromsø Declaration
2009–2011	Kingdom of Denmark	Nuuk Declaration
2011–2013	Sweden	Kiruna Declaration
2013–2015	Canada	Iqaluit Declaration (2015)
2015–2017	USA	Barrow Declaration
2017–2019	Finland	Rovaniemi Statement
2019–2021	Iceland	Reykjavik Declaration (2021)
2021–2023	Russian Federation	Salekhard Statement
2023–2025	Norway	(ongoing)

Permanent Participants

The Aleut International Association (AIA), created by the Aleutian Pribilof Islands Association and the Association of the Indigenous Peoples of the North of the Aleut District of the Kamchatka Region of the Russian Federation (ANSARKO), is a non-profit organisation that represents people of Aleut descent in Russia and the USA.[94] AIA was accorded the status of permanent participant in the Arctic Council in 1998, and currently collaborates with Arctic States, Working Groups, and other Permanent Participants. The fields of interest are ocean-related and related to environmental and social change in the Arctic.

The *Arctic Athabaskan Council* (AAC) represents US and Canadian Athabaskan members. In the Arctic Council, the AAC collaborates with the Arctic Council member states, Working Groups, and Permanent Participants in balancing environmental protection with economic sustainability. Featured projects concern the Salmon Peoples of Arctic Rivers, and the promotion of Arctic resilience.[95]

The *Gwich'in Council International* (GCI) represents the Gwich'in (also known as Kutchin) in the USA and Canada, and works to make the voice of the Gwich'in Nation heard on issues related to sustainable development and environmental protection in the Arctic Council. In the Council, GCI is mainly active in CAFF, EPPR and SDWG.[96]

The *Inuit Circumpolar Council* (ICC) was involved in the Arctic Environmental Protection Strategy (AEPS) before the creation of the Arctic Council in 1996. ICC is one of the original Permanent Participants under the Arctic Council, and participates in meetings of Senior Arctic Officials as well as Ministerial meetings. In the Council, ICC contributes to project work on the meaningful engagement of indigenous peoples and local communities in marine activities, indigenous knowledge exchange, salmon peoples of arctic rivers and indigenous knowledge mobilisation.

[94] Arctic Council (2023), *Aleut International Association*, https://arctic-council.org/about/permanent-participants/aia/
[95] Arctic Council (2023), *Arctic Athabaskan Council* https://arctic-council.org/about/permanent-participants/aac/
[96] Gwich'in Council International (2023), *Welcome to the Gwich'in Council International*, https://gwichincouncil.com/

The *Russian Association of Indigenous Peoples of the North* (RAIPON) represents the 250 000 members of the indigenous peoples in the Russian North. RAIPON works with the State Duma and the Government of the Russian Federation on legislation of Indigenous Peoples' issues. In the Arctic Council, RAIPON has a special interest in social and economic issues, environmental protection, in addition to cultural development and education.

The *Saami Council* represents the Sámi people living in Finland, Norway, the Russian Federation and Sweden. Most Sámi live in Norway, where they have the Sámidiggi as their elected assembly. In the Arctic Council, the Saami Council has a particular interest in the sustainable development and environmental protection of the region and contributes to projects on waste management; gender equality; salmon peoples of Arctic rivers; the economy of the north; indigenous youth, food knowledge and Arctic change; the Kola waste project; and the meaningful engagement of indigenous peoples and local communities in marine activities.

International Arctic research organisations

The International Arctic Science Committee (IASC) was established in 1990 by the eight Arctic states to encourage and facilitate cooperation in the Arctic research community. IASC is engaged in all fields of Arctic research; its work is organised in five Working Groups: the Atmosphere, Cryosphere, Marine, Social & Human and Terrestrial Working Groups. Each Working Group is composed of up to two scientists from each IASC member state. These Working Groups advise the IASC Council, identify and formulate science plans, define and advance research priorities, encourage science-led programme and future generations of Arctic scientists. Although discipline-based, the groups also address cross-cutting science questions by initiating activities which involve at least two working groups. Action Groups are short-term expert groups that provide strategic advice to the IASC Council concerning long-term activities as well as urgent needs. IASC's instruments for supporting science development include workshops, long-term programmes, assessments and science planning activities.

As set out in its Strategic Plan 2018–2023,[97] IASC coordinates reviews of the status of Arctic science, and works to identify research priorities through, for example, its leadership of the International Conference on Arctic Research Planning (ICARP) process that takes place every 10 years (1995, 2005 and 2015). It promotes major international research programmes, such as MOSAiC (the Multidisciplinary Drifting Observatory for the Study of Arctic Climate) and the Year of Polar Prediction (YOPP). It also convenes and co-organises the annual Arctic Science Summit Week (ASSW) with local partners, the biennial Arctic Observing Summit (AOS) with strategic partners, and scientific workshops through its Working Groups. Further, it promotes observations, monitoring, and data management by supporting SAON (Sustaining Arctic Observing Networks) and the ADC (Arctic Data Committee). There is a link with the Arctic Council, as IASC is an accredited Observer and scientific advisor to the Arctic Council and has contributed to activities such as the Arctic Council's Scientific Cooperation Task Force. IASC also provides scientific advice by contributing to syntheses such as the Arctic Freshwater Synthesis (AFS), the Arctic Human Development Report (AHDR), and the Snow, Water, Ice, and Permafrost in the Arctic (SWIPA) report. Finally, it supports young Arctic researchers through the IASC Fellowship Programme and through travel grants.

In 2015, IASC issued 'Integrating Arctic Research – a Roadmap for the Future', the result of the ICARP III bottom–up process involving more than 700 scientists from 27 countries. This roadmap

[97] *Strategic Plan 2018–2023: Enhancing Knowledge and Understanding of the Arctic*, International Arctic Science Committee, StrategicPlan2018_layout_web.pdf (iasc.info).

highlighted three key science priorities: i) the role of the Arctic in the global system; ii) observing and predicting future climate dynamics and ecosystem responses; and iii) understanding the vulnerability and resilience of Arctic environments and societies and supporting sustainable development. In turn, the IASC Strategic Plan for the period 2018–2023 is based on the ICARP III roadmap and defines the directions in which IASC should work during this five-year period. The Plan has three pillars: i) facilitating Arctic research cooperation; ii) promoting engagement; and iii) ensuring knowledge exchange.

The International Arctic Social Science Association (IASSA) was also established in 1990. IASSA defines the 'social sciences' as disciplines relating to behavioural, psychological, cultural, anthropological, archaeological, linguistic, historical, social, legal, economic, environmental and political subjects, as well as health, education, the arts and humanities, and related subjects. Its objectives are i) to promote and stimulate international cooperation and to increase the participation of social scientists in national and international Arctic research; ii) to promote communication and coordination with other research organisations; iii) to promote the active collection, exchange, dissemination, and archiving of scientific information in the Arctic social sciences; iv) to promote mutual respect, communication and collaboration between social scientists and Northern people; and v) to facilitate culturally, developmentally and linguistically appropriate education in the North. The IASSA Council encourages IASSA members to create IASSA Members Working Groups. These are not established by IASSA as such, but by groups of interested IASSA members as informal networks within a thematic field. Currently, there are three Working Groups: the Gender in the Arctic Working Group, the Justice in and for the Arctic Working Group, and the Extractive Industries Working Group.

The University of the Arctic (UArctic) was established by a declaration issued by the Arctic Council in 1998 and officially opened in 2001. It consists of a network of universities, colleges, research institutes and other organisations concerned with education and research in and about the North. Member institutions share resources, facilities and expertise to build post-secondary education programmes that are relevant and accessible to Northern students. The overall goal is to create a strong, sustainable circumpolar region by empowering Northerners and Northern communities through education and shared knowledge. UArctic organises a wide range of Thematic Networks and Institutes, currently 65, within business, politics & law, culture & social sciences, engineering & technology, health & education, humanities & arts, and the natural sciences. UArctic's Strategic Plan 2030[98] defines the following impacts, linked to the UN Sustainable Development Goals: i) bring Northern voices and knowledge to the global stage, increasing understanding and respect towards the region ('working together for the goals'), ii) increase human competence and capacity in the North (economy); iii) improve lives and communities for all Northerners (society); and iv) create a healthy environment that serves the North and the world over generations (biosphere). The specific goals in the strategy concern education (enhance and promote unique and relevant educational opportunities for Northerners through academic collaboration and exchange), knowledge (build, share and apply knowledge through member contributions and collaboration, in research and science as well as indigenous and traditional knowledge), dynamic membership (through higher education institutions and other relevant organisations), relevance (strengthen UArctic's recognition as a regionally and globally leading organisation offering circumpolar higher education) and resources (secure funding and other resources to effectively strengthen capacity and capabilities for the Arctic). In this work, the University of the Arctic engages in various partnerships and agreements. In addition to working in line with the Arctic Council, UArctic cooperates with the Arctic Economic Council, ArcticNet, Arctic Frontiers, APECS, the

[98] *UArctic Strategic Plan 2030*, uarctic_strategic_plan_screen.pdf.

Conference of Parliamentarians of the Arctic Region, IASC, IASSA, the International Centre for Integrated Mountain Development, the International Permafrost Association, the International Union for Circumpolar Health, Northern Forum, Albert II of Monaco Foundation, and UNESCO.

Additionally, the *International Polar Years* have incentivised cooperation and increased the international focus on Arctic research collaboration. The first International Polar Year was organised in 1882/1883, the second 1932/1933, then in 1957/1958 ('the International Geophysical Year'). The most recent International Polar Year was organised in 2007/2008, and at that time the largest campaign exploring the polar regions. A fifth International Polar Year is planned, incentivised by IASC and Scientific Committee on Antarctic Research (SCAR), for 2032/2033. This initiative is supported by the World Meteorological Organisation (WMO), the International Science Council (IAC), Uarctic, IASSA, and the Association of Polar Early Career Scientists (APECS). [99] APECS is an international organisation that promotes and supports early-career researchers and professionals working on polar issues, serving as a platform for networking, collaboration, and information exchange among early-career scientists in the polar regions.[100]

[99] World Meteorological Organization (2022), *Planning for the 5th International Polar Year (IPY) 2032/2033*, https://public.wmo.int/en/media/news/planning-5th-international-polar-year-ipy-2032-33
[100] APECS (2023), *Association of Polar Early Career Scientists*, https://www.apecs.is/

4. Drivers in Arctic research

We stated in Section 1.1 that we aim to preliminarily explore *what drives the Arctic research priorities of different states, and how Arctic research priorities are influenced by political processes at the international level*.

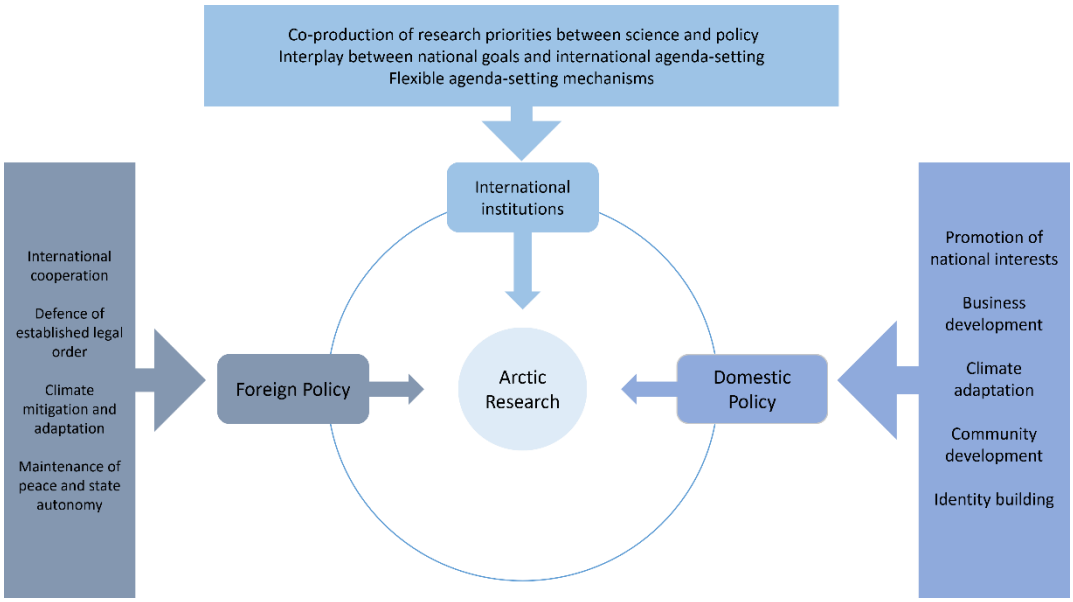
As noted in Section 2.2, the conclusions of bibliometric studies on Arctic research include the following (see Section 5.1 for a more detailed summary):

- There has been a steady annual growth in Arctic research since the mid-1990s, on average 4–5% per year – but this is not above the general growth in global scientific output.
- The USA is by far the largest contributor to Arctic research, with Russia as No. 2.
- The number of states with scientists publishing within Arctic research has grown significantly, particularly for the Arctic Council observer states. China has shown the strongest relative growth, but this reflects a general increase in Chinese scientific production and is not unique to the Arctic.
- Earth and planetary sciences is by far the largest discipline, and its share is growing. The social sciences and humanities account for 10–15 % of Arctic scientific publications.

Therefore we ask whether and how national and international priorities and decision making may have influenced the growth in Arctic research, its thematic and academic profile, and the relative performance in terms of research effort and publication output of the different states or groups of states (such as Arctic Council member and observer states). As the data available for this pre-study are far too rudimentary (especially for the international level) to establish any causal connection, the objective here is mainly exploratory, aimed identifying issues for further investigation.

The main drivers in Arctic research are illustrated in Table 2.

Table 2 Drivers in Arctic research



4.1 Foreign-policy objectives

All states reviewed here have international cooperation among the priorities of their Arctic strategies, also within research. Although this might be interpreted as an 'obligatory' veneer in strategy documents, something that 'needs to be said', it can also be a sincere objective – states are well aware that international cooperation in general reduces the risk of conflict and might increase the quality of research. International cooperation is an altruistic goal, but with clear repercussions also for the national level: there is an element of self-interest here as well. The same is true for climate politics and the combat against transnational pollution, including research. Everyone stands to gain from success in international environmental and climate politics – both humankind and the individual states. Some states have as a declared policy to cooperate and coordinate their Arctic affairs with specific other states, such as Canada with the USA, and Norway with Russia (prior to the war in Ukraine).

Pure self-interest in the form of prospects for national gain in an international zero-sum game is not very evident in the strategies. Economic development is an integral part of most strategies (see next section on domestic objectives), but not framed as part of international politics, i.e. at the expense of other states. Such a 'battle for resources' is central to the classical geopolitical approach to international politics, and also looms large in the 'scramble for the Arctic' discourse mentioned in Section 2.1. In practice, however, the Arctic states cooperate closely, notably on research infrastructure, including in their scientific expeditions to collect evidence for national submissions to the UN Continental Shelf Commission.

In recent years, however, geopolitical and security-related objectives have become more pronounced. The Swedish Arctic strategy from 2022, for example, can be said to have security as its main objective – a remarkable change since the 'soft policy' approach of its 2011 strategy. The Danish 2016 Arctic research strategy calls for the strengthening of Arctic research to reflect developments in, *inter alia*, geopolitics. Norway, for its part, brought 'geopolitics' into the heading of its 2017 strategy, while it was hardly mentioned in the previous strategies. We do not have comprehensive evidence of research priorities in all states, but to take Norway as an example: In the 2019 High North research and innovation strategy of the Research Council of Norway (RCN), geopolitics is mentioned first in the list of prioritised areas. Further, in the proposed continuation of the Nansen Legacy mega-project from 2025, the Arctic Ocean of the Future, geopolitics is included as one of two new disciplines (and the only non-natural sciences), along with the (international) law of the sea.

Russia and China are the two states whose Arctic politics are most often referred to in a geopolitical context, Russia also in a security context. Both have natural resources exploitation as a main objective, which can be interpreted in a geopolitical context, related to the state's *foreign* policy, but also in a more narrow, domestic and economic context. The two considerations clearly overlap, but it is widely held that the economic objective is more important for Russia, whereas the foreign-policy objective is more important for China. This interpretation is supported by the fact that Russia's Arctic research is natural science-driven, and there has been no clear evidence that Russia has significantly built up its research capacity in international relations related to the Arctic. China, by contrast, has undertaken a massive build-up of Arctic competence on international relations and the law of the sea in recent years.[101] As noted in Section 2.2, the observed increase in Chinese Arctic research output

[101] This is, for the purpose of this pre-study (to be further investigated in a potential full research project), based on anecdotal evidence from one of the authors' (Geir Hønneland) long-term participation in international relations and law of the sea cooperation with institutions such as the Polar Research Institute of China, the Shanghai Institutes of International Studies and Shanghai Ocean University.

reflects a general increase in Chinese academic publication which is not unique to the Arctic. If anything, this might indicate that Chinese Arctic research is more driven by research objectives than geopolitical objectives, as commonly assumed.

Based on the above, the following foreign-policy oriented drivers can be identified:

- All national Arctic strategies call for intensified international cooperation, to some degree or another, mostly by emphasising the important role of the Arctic Council, but also – especially for the major coastal states – the role of UNCLOS as the basis for international relations in the Arctic. Hence, *international cooperation and defence of the established legal and political order becomes a driver in itself*.
- 'Soft-policy' initiatives of global concern, in particular in the fields of climate change, transboundary pollution and loss of biological diversity, has been a recurrent issue in states' Arctic policies throughout the post-Cold war period. Hence, *the prevention and handling of the consequences of climate change, transboundary pollution and biodiversity loss is a driver in Arctic policies*.
- Security concerns, sometimes subsumed under the term 'geopolitics', have become increasingly prominent in states' Arctic strategies in recent years. Hence, *maintaining peace state autonomy and resource self-sufficiency in the face of new security threats is increasingly becoming a separate driver*.

4.2 Domestic politics and national identities

There is no clear distinction between international and domestic interests – security can be considered as a foreign-policy interest, but the immediate aim is arguably to secure the *national* interest of the state. Also, the two will often coincide. In this section, we examine how states seek to protect the interests of specific interest groups, such as businesses, research communities or indigenous peoples. We also look at how supporting specific interest groups concerns the national identity of the state. Again, these are more exploratory reflections than documented 'facts' (to the extent an identity is a 'fact'), which should be subject to further investigation in the future.

All national Arctic strategies have some common topics: the call for international collaboration, climate politics and environmental protection, knowledge-production, as well as business development and support for northern communities, including those of indigenous peoples. However, these elements are unequally weighted and specified.

Some characteristics that stand out in the material:

First, and not unexpectedly, the physical location and attributes of states, as well as the composition of their population, are reflected in their priorities in the Arctic. Similarly, priorities dominant in national politics are also reflected in states' Arctic strategies. One obvious example is the difference between coastal and 'non-coastal' states – or, more correctly, coastal states with long or short coastlines, as none of the Arctic states are landlocked (although one observer state is: Switzerland). Maritime interests permeate the political priorities of Denmark, Iceland and Norway, as reflected in their Arctic strategies' emphasis on marine sciences and the maritime industry, including marine resource extraction and maritime transport. Also for the Asian observer states, shipping and maritime affairs rank high on the agenda. These interests may be somewhat subdued in the Nordic strategies (perhaps with Denmark as an exception), 'hidden' among many other priorities. But the actual

funding of research in Norway, for example, shows how marine sciences dominate research efforts in practice. It is expected, but not documented in this study, that similar lines will be found in other Arctic states. Likewise, there are differences in the priority accorded to indigenous peoples' issues. At one end of the spectrum, there is Iceland, with no indigenous population. At the other end, we have Canada, with large indigenous groups and a colonial past which it is working to rectify – here indigenous peoples' rights permeate Arctic politics both substantively (strengthening such rights) and procedurally (incorporating indigenous knowledge in decision making). In-between, there are the Nordic states, Russia and the USA, where indigenous issues are on the agenda, but not quite as high as in Canada.

Second, business development in the Arctic stands out as the single most dominant common priority in all states' Arctic strategies – concerning traditional extractive industries such as mining and petroleum and more future-oriented ones like the development of renewable energy technology, which is sometimes linked to the need for applied research to support this development.

Third, climate change is another common denominator for all the Arctic strategies – whether with a focus on mitigation, on adaptation (which is more nationally oriented and gradually more emphasised as the consequences of climate change become increasingly evident) or research (less clearly emphasised in the strategies than mitigation and adaptation).

Fourth, development of Arctic communities, including those of indigenous peoples, is a declared aim of most Arctic strategies, but not all. (All states have this included at some stage, but not necessarily in each iteration of their Arctic strategy.) The extent and form of this priority varies significantly, with Canada in the lead in its ambitions both substantively and procedurally (support to and inclusion of indigenous peoples). Some countries also have *research* on and with indigenous peoples on the agenda, such as Canada and Sweden. (Research on and with indigenous people is also conducted in other states, but this is less pronounced in their national Arctic strategies.) Human welfare and socioeconomic development are particularly important in Russia, with its (relatively speaking) large Arctic population. Whereas the development of Northern businesses and communities could be seen as one and the same thing, we view them as two distinct objectives: firstly, because they are so clearly separated from each other in the Arctic strategies, and secondly because they are not actually always overlapping. Support to businesses might primarily benefit interests located outside the Arctic, typically big mining and petroleum companies. This reminds us that the national Arctic strategies are just that: they are *national*, not *local*.

Fifth, and less tangible, is Arctic politics as an arena for the cultivation of the national identity as something 'Arctic'. Nowhere is this more evident than in Russia, where the Arctic has something of a mythical status in the national identity. As one author of this report concluded in writing about Russian Arctic identity: '[For the Russians], the Arctic is more Russian than Russia itself.'[102] This implies that 'anything Arctic' might ignite, at some level and in some form, sentiments of national pride and of belonging together with many Russians (of course not with all, and to varying extents). A second state with a clear self-image as 'Arctic' is arguably Canada. By contrast, for the Nordic states (with the exception of Greenland), this is more of a 'foreign' label that they have increasingly come to use of themselves in recent years. Norway,

[102] The context of this quote is as follows: '[The Arctic] is a new political and spiritual continent, a promised land, Russia's cosmic destiny. Russia is the land with no limit, territorially or temporally. It stretches infinitely, it lasts eternally. The Russian landscape is wide, and so is the Russian soul – full of passion, generosity and recklessness. Russia is the ultimate expression of openness: openness of space and openness of heart – 'soil and soul'. The Arctic is all that; the Arctic is more Russian than Russia itself.' (G. Hønneland*, Russia and the Arctic*, London: Bloomsbury, p. 176)

for example, has a clear national identity as 'northern', but 'the Arctic' has traditionally been seen as referring to territories outside Norway, in other sectors of the Arctic, or and at least north of mainland Norway. Moreover, 'polar' is frequently used to refer to Norway's 'proud past' in the Arctic – Fridtjof Nansen is a 'polar hero', not an 'Arctic hero'. So when the term 'Arctic' came into more frequent use in Norwegian politics about a decade ago, also referring to politics in mainland Norway, some people would smile and say 'so now I've suddenly become an inhabitant of the Arctic'. Finally, even non-Arctic states may have elements of the Arctic in their national identity – states such as Italy, Spain and the UK connect their cultural heritage as voyagers and explorers to their current Arctic involvement.

Hence, Arctic politics as an arena for the cultivation of a state's Arctic identity can be reflected in i) states with the Arctic as a traditionally strong component in their national identity, notably Russia; ii) non-Arctic states with a cultural heritage of Arctic expeditions, notably Italy, Spain and the UK; and iii) Arctic states now undergoing 'identity transformation' from 'northern', or primarily 'polar', to 'Arctic', such as the Nordic states.

On the basis of this, the following domestic drivers can be identified:

- A state's *general* political priorities are reflected in its Arctic policies. Arctic politics becomes a new arena for the articulation of state interest and ambitions, whether foreign-policy or domestically oriented. Hence, *the opportunity to use Arctic policies as a channel for the promotion of general national interests becomes a driver in itself.*
- Business development comes across as the most dominant priority area in national Arctic strategies, accompanied by applied research to further this development. Hence, *business development is a driver in states' Arctic policies, including applied research to support such development*.
- Climate change – whether mitigation, adaptation or research – is a priority in all Arctic strategies. Hence, *climate concerns at the national level are a driver in Arctic policies (in addition to concerns over climate change at the global level: see above)*.
- To varying extents, all states have the development of Arctic communities and indigenous peoples (if they have such on their territory) as part of their Arctic strategy. Some also include research on those communities and peoples in their strategies. Hence, *development of Arctic communities, including those of indigenous peoples, is a driver in Arctic policies*.
- Arctic politics is an arena for the cultivation of states' Arctic identities – whether confirming and reproducing a traditional Arctic identity, or establishing or 'branding' a new identity as 'Arctic'. Although less explicitly formulated in the strategies, *the cultivation of national identity is a driver in Arctic policies.*

4.3 Arctic institutions and the interplay between national and international policies

The existence of such 'drivers' gives rise to several questions. How do international institutions filter national priorities into pan-Arctic research priorities? Are the pan-Arctic research priorities only a mirror that reflects national aspirations, a minimum common denominator – or do the Arctic institutions independently formulate and create research priorities that result in national implementation? This question may be a potent area for further research.

With the Arctic Council, priority areas in chairship periods of each member state frequently align with the national goals outlined in the Arctic strategies. For instance, Russia's periods in the chair focused on the development and visions for the Northern Sea Route, whereas the

Canadian leadership periods emphasised the inclusion and prioritisation of indigenous groups. Both have been focal points in the countries' national strategies. National goals may interact with the help of the Arctic Council as an international institution, through linking the processes of creation and dissemination of Arctic strategies with events such as ministerial meetings and chairmanship handovers.

However, the influence of the Arctic Council also affects national research priorities as well as common overarching goals and visions. The Arctic Council strategic plan 2021–2030, presented at the 12th ministerial meeting in Reykjavik in May 2021, can serve as an example of how the shared visions of the member states for the Arctic culminate in case and area-specific research priorities.[103] Here, the shared strategic goals are co-created with member states, participating actors and working groups. They are intended to reflect shared values and joint inspirations of the Arctic states and Permanent Participants. Additionally, as the strengthening of Arctic institutions is noted in the Arctic policy documents in all member states, these priorities contribute to policy formation in and of themselves, as the core function of the Arctic Council is to be a decision-shaping rather than a decision-making actor.[104] However, this interplay between science and policy does not seem to be linear, but is characterised by interaction and co-production. Particularly in the Arctic Council, scientific work in working groups is intertwined with decision making in ministerial meetings and dialogues with Senior Arctic Officials (SAOs). Therefore, the relationship between science and policy in this case has several intertwined characteristics. This perspective differs from views that see research priorities as created in international spaces, and then later implemented nationally, or the idea of international scientific cooperation in Arctic institutions as being merely a result and reflection of domestic politics.

International Arctic research organisations such as IASC, IASSA and UArctic have become forceful actors in defining research priorities in the Arctic. Individual researchers and other representatives of research organisations from all states involved in Arctic research meet, discuss and agree on research priorities, which are then reported back to institutions and research authorities in their respective states. Temporary and researcher-initiated working and action groups are a flexible and adaptive mechanism for rapid response to urgent research needs. Of the more comprehensive endeavours, the IPY deserves particular mention (in 2007–2008 and the next planned for 2032–2033); likewise the ICARP process, which takes place every 10 years.

More information is needed to identify the more specific mechanisms whereby inputs from the national level are filtered at the international level, and vice versa – see Section 5.2 on further research needs.

4.4 Major cleavages

By 'cleavage', we do not necessarily mean an actual conflict line, but more principal dilemmas that have emerged or are likely to emerge. Drawing on the discussion above, we indicate a few such cleavages and reflect briefly on how they have been tackled.

[103] Arctic Council Secretariat (2021), *Arctic Council Strategic Plan 2021–2030*, Arctic Council, Reykjavik, https://oaarchive.arctic-council.org/bitstream/handle/11374/2601/ac-strategic-plan%20web.pdf?sequence=8&isAllowed=y

[104] S.V. Rottem (2019), *The Arctic Council: Between Environmental Protection and Geopolitics*, London: Palgrave Macmillan.

- *To prioritise or not to prioritise*: Should research in and on the Arctic be accorded priority over research in and on other regions? States often declare that they 'prioritise' Arctic research (see Sections 4.1 and 4.2), and there are international institutions that work to further such research (see Section 4.3). Studies show that there has been a steady increase in Arctic publication output over the last decades, but not larger than the growth in scientific output in general. One way to interpret this is that the stated priority may have prevented Arctic research from falling behind; another that the stated priority simply has had no effect at all – the increase would have come in any event). Interestingly, we sometimes find the same dynamics at work at the national level. Chinese research on the Arctic has increased more than that of any other state in recent decades, but the trend is the same in other areas and fields as well – China has simply become the most productive scientific producer in the world, and this is reflected also in Arctic research.
- *Basic vs. applied research*: A familiar cleavage in research politics is the prioritisation of basic vs. applied research. In at least some national Arctic strategies we find a leaning towards applied research. On the other hand, the international Arctic research organisations are clearly geared towards basic research. The data reviewed in this report do not provide any evidence on how the distribution is in practice between basic and applied research. It should also be noted that the difference between the two is not altogether clear – basic research can provide insights of great importance to applied work, and vice versa.
- *Natural vs. non-natural sciences*: Arctic research has been dominated by the natural sciences, primarily earth sciences and biology. Social sciences and the humanities now account for close to 15% of Arctic research output, and their share has increased markedly in recent years, at least according to available data on Arctic research output. In fact, in practice there is no inherent conflict between the disciplines, except perhaps when it comes to research funding. There might also be gains in integrative, or interdisciplinary, research – a point noted in the Arctic strategies of some states.
- *Cleavages within disciplines*: Also within a scientific discipline or field, there are differences. Within social sciences, for instance, there is generally believed to be a continuum from 'softer' disciplines such as ethnography and anthropology to the 'harder' disciplines such as economics, although this is an oversimplification. Traditionally, the 'softer' social sciences have been defined as *the* social sciences in Arctic research – whether traditional studies of indigenous peoples' situation, or 'modern' analysis of climate change adaptation in Arctic communities. Although the disciplinary focus of Arctic social science research has broadened in recent years, there still appears to be a certain leaning towards 'softer' social sciences such as anthropology and ethnography in the established Arctic social science forums.
- *Cleavages within subdisciplines*: Even within subdisciplines, there are differences. Take international relations (IR), a subdiscipline of political science, as an example. Basically, there are three main overarching approaches to the study of international relations: i) realism, which takes as its point of departure that military and/or economic power defines the relations between states; ii) liberalism or institutionalism, which underscores the complex web of relations between states in a multitude of thematic fields, and international institutions – which are believed to influence political outcome in addition to, and sometimes more than, the military or economic power games; and iii) constructivism, which is concerned with ideas, representations, discourse, narrative and identities in international relations. In some Arctic strategies, 'geopolitics' is becoming a buzzword: it is also a declared research priority in the High

North strategy of the Research Council of Norway ('compensated' for by the liberalist/institutionalist premises of the programme plan of the Council's Polar Programme's international relations section). Geopolitics as a field of study is arguably situated in the Realism school of thought in International Relations (IR), so a marked prioritisation of this field might come at the expense of research within other subdisciplines in IR, or even within political science or social sciences as such. (This is just an example, and for the record we are not arguing against the geopolitical approach.)

- *Choice of research topics*: Political cleavages may spill over into research when research priorities are set – a classical cleavage, observed also in Arctic politics, is that between natural resource exploitation on the one hand and environmental protection on the other.

The major cleavages are summed up in Table 3.

Table 3 Major cleavages in Arctic research

Case	*Cleavage*	
Arctic research	Prioritise	Not prioritise
Research design	Basic research	Applied research
Disciplines	Natural sciences	Non-natural sciences
Sub-disciplines	'Hard' social sciences	'Soft' social sciences
Topics	Growth related (Business/industry)	Conservation related (environmental protection, community-friendly)
Cooperation with Russia post-2022	Continue	Discontinue

4.5 Repercussions after the Russian war against Ukraine

The discontinuation of international research cooperation with Russia may severely hamper the development of future Arctic science.[105] Maintaining cross-border researcher networks with Russian researchers, translating scientific results into policy, and ensuring the independence of science from policy have proven increasingly challenging due to the war.[106] Maintaining researcher-to-researcher dialogue has been a crucial aspect shaping the premises of international Arctic climate science since the mid-1990s. However, after the Russian invaded Ukraine in February 2022, these dialogues encountered significant challenges that could affect the nature of discourses, priorities, and trajectories within Arctic research. Consequently, the foundational drivers and core assumptions on which the cooperation has been created may be significantly altered in the long term. The extent to which the current geopolitical tensions will impact the resilience of international cooperation and science diplomacy remains uncertain. However, this resilience is subject to various incentivising and limiting drivers. Some limitations include the weakening of established Arctic scientific forums, difficulties in sharing and

[105] 'Seven Ways the War in Ukraine is Changing Global Science', *Nature* 607 (2022): 440. https://doi.org/10.1038/d41586-022-01960-0; Koivurova, T. and A. Shibata (2023), 'After Russia's invasion of Ukraine in 2022: Can we still cooperate with Russia in the Arctic?' *Polar Record* 59, htttps://doi.org/10.1017/S0032247423000049; 'For the Climate's Sake, Keep Arctic Communication Open', *Nature* 607 (2022): 422. https://doi.org/10.1038/d41586-022-01956-w

[106] S. Andreeva (2023), 'Science at Stake – Russia and the Arctic Council', *Arctic Review on Law and Politics* 14: 112.131. https://doi.org/10.23865/arctic.v14.5455

accessing pan-Arctic data, and a decline in researcher-to-researcher dialogue. On the other hand, various incentive drivers may reinforce and foster resilience. The symbolic value of international cooperation in addressing issues of climate change and environmental protection, in addition to the perception of the Arctic as a low-tension region, and the active involvement of local communities and non-state actors in Arctic research, may play a pivotal role in nurturing resilience and reinforcing the sense of shared responsibility in collectively addressing Arctic challenges.

Maintaining dialogue between individual researchers across the pan-Arctic region may be a theoretical possibility,[107] but practical challenges arise in the processes of 'disentangling' individual connections from institutional affiliations.[108] There is a risk of weakening researcher networks that have taken a long time to establish and have been crucial for co-producing the established practices and priority areas in Arctic research. Issues of data access further complicate research efforts, as challenges mount in gathering data on thawing permafrost, biodiversity, and environmental monitoring from Russian territory. Reliance on remote sensing as an alternative still has limitations, as the measurements accessed in ground-level monitoring cannot be replaced entirely by satellite imagery. In practice, this affects what can be researched and where: several projects originally intended for Siberia have been moved to the North American Arctic.[109] Moreover, the potential weakening of established Arctic scientific forums, exemplified by the pauses in the work of the Arctic Council and BEAR in 2022, has prompted discussions about the future of international scientific cooperation with Russia in the Arctic. Shortly after the Arctic Council 'pause' was declared, some of the public Arctic dialogue shifted towards questioning the survival of the forum itself, and the possibility of Northern cooperation excluding Russia, to the point of reducing the possible future Arctic Council cooperation to the 'Arctic Seven'. However, these discussions did not represent processes in the Council. They quickly disappeared after the ministerial meeting in Salekhard, Russia, where the chairship was handed over to Norway. All the same, these limitations raise questions about the potential fragmentation of future Arctic research.

Several restrictions have been imposed on Arctic research; some constants remain as incentives for cooperation to prevail. One of these constants is the increasing severity of climatic changes and environmental challenges. The Arctic is warming four times faster than the rest of the world, which is significantly faster than previously anticipated,[110] and human-induced threats to biodiversity require scientific action. Secondly, the ripple effects after Gorbachev's famous Murmansk speech in 1987 and the idea of the Arctic as a region of peace and diplomacy, or, high north and low tension, are not entirely obliterated. In the Strategic Goals of the Arctic Council from 2021 to 2030, the long-term goals of conserving Arctic ecosystems and recognising the value of Arctic environments are not only priorities of the Arctic Council but incentives for scientific cooperation between Arctic countries. Thirdly, the unique inclusion of indigenous communities and non-state actors in decision-shaping processes in the Arctic Council serves as pillars based on premises of cooperation. However, this is often not a 'sunshine story'. Finding balances between indigenous traditional knowledge and knowledge emerging from science has not always been easy. Therefore, having the Arctic Council as an arena for cooperation and finding these balances can serve as an incentive for

[107] B. Plackett (2022), 'The Future of Research Collaborations Involving Russia', *Nature*, https://doi.org/10.1038/d41586-022-00761-9

[108] S. Andreeva (2023), 'Science at Stake – Russia and the Arctic Council', *Arctic Review on Law and Politics* 14: 112.131. https://doi.org/10.23865/arctic.v14.5455

[109] *Nature* (2022), 'Seven ways the war in Ukraine is changing global science'

[110] M. Rantanen et al. (2022), 'The Arctic has warmed nearly four times faster than the globe since 1979', *Nature* 168 https://doi.org/10.1038/s43247-022-00498-3

further international cooperation. In addition, the measures implemented by Scandinavian and North American Arctic states as a result of the Russian war against Ukraine have deliberatively included windows of opportunity for future cooperation, with room for manoeuvre for restoration of previous activities.[111]

[111] An example of this can be seen in the accentuated pleonasm of the *temporary pause* when referring to the state of the Arctic Council as of March 2022. By making sure that the careful approach to the break in international cooperation with Russia is understood, the Western Arctic states create an opening for possible future reconciliation.

5. Conclusions and further research

5.1 Conclusions

International politics in the Arctic:

- The post-Cold War era has seen two periods of intensified international cooperation in the Arctic: i) 'the Age of the Arctic' following the end of the Cold War, where a main aim was to include the new Russia in binding international cooperation: the creation of the Arctic Council and various regional cooperation mechanisms in the Arctic was the result of this development, as was the establishment of scientific organisations such as IASC and IASSA; and ii) 'the Scramble for the Arctic' following the Russian flag-planting at the North Pole in 2007, the ongoing delimitation of the outer limits of the continental shelf, and increased attention to Arctic warming – pushing international relations in the Arctic from low to high politics.
- The Russian invasion of Ukraine in February 2022 put a halt to multilateral cooperation in the Arctic involving Russia.

Arctic research:

- Bibliometric studies conducted in 2016 and 2023 show that global scientific production of Arctic publications increased significantly in the period 1996–2022, although not more than the general global growth in academic publications. The USA was by far the largest contributor, with Russia as a good number 2, followed by Canada and the UK in the 2016 survey, and by Canada and China in the 2023 survey. The number of states with scientists publishing within Arctic research grew significantly, and the increase was particularly high for the Arctic Council observer states. The state with the strongest relative growth throughout the period was China, reflecting a general increase in Chinese scientific production during the period, not solely for Arctic research. Of the Arctic states, Russia had the largest growth.
- Earth sciences and biology were clearly the two largest disciplines of Arctic research. Earth and planetary sciences is by far the largest discipline, and it was also the discipline with the highest growth from 2016 to 2023. The total share of the social sciences and the humanities increased from 10% in the 2016 study to 14% in the 2023 study. Arctic research was slightly above the average for all publications. Research from non-Arctic states such as Australia, the Netherlands and Switzerland had the highest relative citation impact; Russian research is least cited. Academic-corporate cooperation and patent-citations per scientific input is lower for Arctic research than the global average, but is significantly higher for the Nordic states.

National priorities:

- *Russia*: Scientific research as such is highly prioritised in Russian Arctic policy. Russia is home to half of the world's Arctic population, and the human dimension (including health and social issues) looms large in the country's Arctic priorities, as does regional and socioeconomic development of the Arctic. A third pillar is environmental protection, including, to an increasing extent, climate politics. Key research areas are hydrometeorology, the identification and elimination of environmental hot spots, and the preservation of biological diversity in the Arctic.

- *Canada*: Canadian Arctic strategies stand out for their extensive involvement of indigenous groups and Northern territorial governments and organisations. Increasing Northerners' participation in Arctic research is a goal in itself, as is co-production of knowledge between traditional and Western scientific practices – indigenous knowledge is accounted equal to scientific knowledge in territorial governments. Specific priorities include Arctic ecosystems, the interconnection between community welfare and environmental health, and advancing sustainable technological, infrastructure and energy solutions.
- *USA*: The Arctic policies of the USA have traditionally been dominated by military and strategic considerations, but there was a change in the 1990s towards environmental considerations and prioritising international cooperation over conflict, which placed science higher on the agenda. Recent priority areas include environmental risk management and hazard mitigation, sustainable economies and livelihoods, community resilience and health, and infrastructure development.
- *Iceland*: Iceland's Arctic identity is related to its strategic location and dependence on the ocean. It is also the only Arctic state which (by some definitions) lies entirely in the Arctic, and the only one without an indigenous population. The natural sciences have dominated Icelandic Arctic research, but there is increasing attention to Arctic communities. Specific research priorities include marine environment and resources, shipping opportunities, telecommunications, sustainable development and the human dimension/communities.
- *Norway*: Norwegian research priorities in the Arctic are influenced primarily by Norway's status as coastal state with vast ocean areas under its jurisdiction; its sovereignty over Svalbard; its neighbourhood with Russia; and its dedicated policy aimed at maintaining vibrant communities in the North. Research efforts are concentrated on the Barents Sea, Svalbard and the northernmost counties. Main disciplines are basic marine biology, fisheries biology, oceanography, geology and geophysics. The social sciences are also important, especially international relations and resource management in the Arctic.
- *Sweden*: Sweden's first Arctic strategy, from 2011, had three key areas: climate and environment; economic development; and the human dimension. Research was not singled out as a separate priority, but all three focus areas had a section on either research, education or knowledge production. The need for integrative research between the national and social sciences and the humanities was emphasised. Sweden's second Arctic strategy, from 2020, included security and research as two new focus areas. Among the (not very specific) research priorities is the need for international cooperation, e.g. on infrastructure.
- *Denmark*: Denmark's 2011 Arctic strategy emphasises UNCLOS as the basis for international cooperation in the Arctic. It has a general focus on marine affairs, including maritime safety, exploitation of marine resources and the exercise of sovereignty and surveillance. Also noted are self-sustained growth and development; health and social coherence; understanding of the consequences of climate change in the Arctic, also for the indigenous peoples; and protection of the Arctic environment. Denmark's 2016 strategy on Arctic research states that Arctic research and education efforts must be strengthened in step with changes in climate, technologies and geopolitics.
- *Finland*: Business development is a common thread in Finland's three Arctic strategies. The second one is most explicit, listing various fields where Northern businesses should be expanded, including with the help of applied research. Another priority is

climate-change mitigation and adaptation, while the rights and living conditions of the Sámi indigenous people are listed as separate priority areas in the first and third strategies. Other focus areas are stability, internal security and infrastructure. It is not specified which scientific fields should be prioritised, beyond applied research associated with business development, especially for the maritime sector.

- *Non-Arctic states:* For non-Arctic states, involvement in scientific work and in the Arctic Council as observers is a way to show and maintain presence in the region. Whereas the Arctic states view the region from a regional perspective, the non-Arctic states see it primarily as part of the global system. All observer states have climate change high on their agendas, and all engage actively in the Arctic Council working groups and in research in and on the Arctic. The Asian countries tend to prioritise shipping, also through the Northern Sea Route, and other maritime affairs. The European countries tend to focus more on climate and environmental research, depending on their special interests and expertise. For example, the Netherlands, with its low-lying coastlines, is particularly interested in climate-related research, and Switzerland has special expertise in conducting ice, permafrost and glacier research in the Alps.

Priorities at international level:

- *The Arctic Council*: Arctic climate, resilient ecosystems, marine environment, sustainable social and economic development, and strengthening of the Arctic Council
- *Pan-Arctic research organisations*:
    - IASC: atmosphere, cryosphere, marine, social & human and terrestrial working groups
    - IASSA: social sciences as disciplines relating to behavioural, psychological, cultural, anthropological, archaeological, linguistic, historical, social, legal, economic, environmental, and political subjects, as well as health, education, the arts and humanities and related subjects
    - UArctic: business, politics & law, culture & social sciences, engineering & technology, health & education, humanities & arts, and natural sciences

Main drivers:

- Foreign policy objectives:
    - international cooperation and defence of the established legal and political order
    - prevention and handling of the consequences of climate change (mitigation and adaptation), transboundary pollution and biodiversity loss
    - maintaining peace and state autonomy in the face of new security threats
- Domestic politics and national identities:
    - the opportunity to use Arctic policies as a channel for the promotion of general national interests
    - business development, including applied research to support such development.
    - climate concerns at the national level (mainly adaptation)
    - community development, including for indigenous peoples
    - Arctic politics as an arena for the cultivation of states' Arctic identities
- Arctic institutions and interplay between national and international levels:
    - co-production of research priorities between science and policy
    - interplay between national goals and international agenda-setting

    - flexible and adaptive mechanisms for agenda setting in the Arctic research organisations
- Cleavages:
    - to prioritise Arctic research, or not
    - basic vs. applied research
    - natural or non-natural sciences
    - traditional knowledge vs. academic knowledge
    - cleavages within (sub-)disciplines, e.g. between 'hard' or 'soft' social sciences, or between subdisciplines within the study of international relations (of which geopolitics is one)
    - choice of topics, e.g. business/industry- or environmental/community-friendly
- There is a danger that the discontinuation in research cooperation between Russia and the other Arctic states following the Russian attack on Ukraine in 2022 will seriously harm Arctic research – for instance, the gathering and sharing of data, and the interpretation of the findings.

5.2 Further research needs

Some of the preliminary conclusions in this pre-study must be further substantiated, better evidenced and tested for validity. In particular:

- Are the drivers of Arctic policies identified in the national Arctic strategies representative when a wider set of evidence (beyond the strategies) is taken into account – e.g., other policy documents at national level, including policies within different sectors and, not least, actual financing of activities identified in the strategies?

The limited set of documents reviewed for this pre-study leaves some of the most important questions largely unanswered. These two questions should be prioritised in a more comprehensive research project:

- What are the actual *research* priorities of individual states in the Arctic, and what kind of research is actually *funded*?
- What are the actual political practices with regard to research priorities at the international level, within the Arctic Council and the international Arctic scientific organisations? To what extent are research priorities determined at the international level and then implemented at the national level, and to what extent are they determined at national level and then merely 'reported' to the international level? If the reality is somewhere in between, what are the mechanisms that transfer and transform ideas and interests between the two political levels?

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