2017 North Pacific Arctic Conference Proceedings

The Arctic in World Affairs

A North Pacific Dialogue on Building Capacity for a Sustainable Arctic in a Changing Global Order

Edited by

Robert W. Corell, Jong Deog Kim

Yoon Hyung Kim, Oran R. Young

KMI KOREA MARITIME INSTITUTE

EAST-WEST CENTER

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KMI/EWC SERIES ON THE ARCTIC IN WORLD AFFAIRS

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The second volume, *A North Pacific Dialogue on Arctic Marine Issues*, from the 2012 conference, was edited by Oran R. Young, Jong Deog Kim, and Yoon Hyung Kim.

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The sixth volume, *A North Pacific Dialogue on Arctic Futures: Emerging Issues and Policy Responses*, from the 2016 conference, was edited by Robert W. Corell, Jong Deog Kim, Yoon Hyung Kim, and Oran R. Young.

The volume, *A North Pacific Dialogue on Building Capacity for a Sustainable Arctic in a Changing Global Order*, from the 2017 conference, was edited by Robert W. Corell, Jong Deog Kim, Yoon Hyung Kim, and Oran R. Young.

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Preface

The North Pacific Arctic Conference (NPAC), now in its seventh year, provides a mechanism for encouraging off-the-record engagement among members of the scientific and practitioner communities regarding Arctic issues of mutual interest to leading North Pacific Arctic states (Canada, Russia, and the United States) and non-Arctic Asian states (China, Japan, and Korea). It aims to promote improved understanding of policy issues and options among these six states in the Arctic Council and in other settings. All six states are members of the G-20; together they account for more than 50% of the world's greenhouse gas emissions as well as a large share of global commerce.

Specifically, NPAC endeavors to identify emerging policy-relevant Arctic issues, to explore innovative ways to address them, to improve the dialogue between practitioners (including government officials, industry executives, indigenous leaders, and civil society leaders) and analysts (including scientists, engineers, and other experts), and to develop new strategies for communicating the findings of research to a variety of audiences.

The Arctic has generated a complex set of political, economic and scientific dynamics linking actors within and outside the region. The Circumpolar North is emerging as a changing but distinct region embedded in an increasingly globalized world. It is an area of growing complexity in which numerous forces interact to produce changes that are often nonlinear and sometimes abrupt. In response, we have come to realize that improved engagement between science and policy is needed to build capacity for Arctic sustainability in a changing global order.

Policymaking occurs in multiple arenas and at various levels of social organization. Science comes in a variety of forms. If we want to reach well-grounded conclusions about responsible economic development in the Arctic region, for example, we must integrate knowledge about the location and extent of its resources, the means of extracting them, global economic conditions controlling demand and supply, and the governance arrangements applicable to the activities of the key players. If we want to understand how communities adapt to the impacts of climate change, we must consider issues relating to health, education, and welfare and include the insights of traditional or indigenous knowledge as well as western scientific knowledge. If we want to think about the future of commercial shipping in the Arctic, we need to consider activities occurring at the level of the International Maritime Organization, the Arctic Council, the government of Russia, the government of China, and even local governments in places like the Bering Strait region.

To this end, the 2017 North Pacific Arctic Conference on "Building Capacity for a Sustainable Arctic in a Changing Global Order," organized by the East-West Center and the Korea Maritime Institute, convened in Honolulu, Hawai'i in August 2017. The conference provided an opportunity for expert presentations and informal dialogue among knowledgeable individuals on emerging Arctic issues and policy responses. We were particularly pleased to have significant presence from government policymakers and young analysts as well as indigenous leaders.

The conference highlighted Finland's Arctic Council chairmanship program and the emerging Arctic policies of North Pacific countries, together with research perspectives exploring how analysis can provide policy-relevant understanding and assess ways to adapt to the changing dynamics of our ecological, political, technological and social systems. The conference also included dialogues between science and policy on responsible economic development in the Arctic, sustainable Arctic communities, and the development of emerging maritime industries. The contributions included in this book are revised versions of presentations prepared for discussion at the conference.

We would like to thank the following: Dr. Yoon Hyung Kim, Chair of the NPAC Steering Committee, professor emeritus at the Hankuk University of Foreign Studies and senior fellow at the East-West Center; Dr. Robert W. Corell, Principal, Global Environment and Technology Foundation and its Center for Energy and Climate Solutions, United States and Professor, University of the Arctic, Norway; Dr. Jong Deog Kim, research fellow at the Korea Maritime Institute, Republic of Korea; and Dr. Oran R. Young, professor emeritus at the Bren School of Environmental Science and Management, University of California, Santa Barbara for coordinating the conference and preparing this volume for publication.

We also thank the members of the NPAC Steering Commitment for the continued work on behalf of the NPAC Program. Most importantly, we wish to thank the program panelists for their papers, the commentators, and all the other participants involved in contributing to the success of this conference. We extend our appreciation to Daniel Glick, our copyeditor, for his excellent contribution in preparing the text for publication. We are

grateful to Dr. Charles Morrison and Dr. Nancy Lewis at the East-West Center for their support of the NPAC program. Our sincere gratitude goes to Jaymen Laupola and the other staff members at the East-West Center for their expert management to host the conference at the East-West Center in Honolulu, Hawaii.

Chang-ho Yang	Richard R. Vuylsteke
President	President
Korea Maritime Institute	East-West Center

OVERVIEW

Overview: Building Capacity for a Sustainable Arctic in a Changing Global Order[1]

Yoon Hyung Kim, Oran R. Young, Robert W. Corell, and Jong Deog Kim

INTRODUCTION

The conventional relationship between science and policy—or more broadly between analysis and practice—is inadequate to meet new challenges arising in an increasingly complex, dynamic, and interconnected world. The Arctic in particular has become part of a complex set of political, economic and scientific dynamics linking actors within and outside the region. The Arctic is emerging as a changing but distinct region in an increasingly globalized world. The changing Arctic is an emerging issue on global political and economic agendas.

Arctic analysts habitually engage in curiosity-driven research, publish their results in professional journals, and expect practitioners to grasp the implications of their findings without clear guidance. For their part, practitioners (including business leaders, indigenous leaders, environmentalists, and government officials) deal with issues arising from political processes, consider options promoted by influential interest groups, and arrive at decisions through the exercise of influence in settings ranging from legislatures to administrative agencies, courts, and even public demonstrations.

These differences are intensified by disparities in the timeframes that drive the efforts of analysts and practitioners and in the incentives of members of the two communities. Practitioners are sensitive to electoral cycles; their first priority is to get reelected or to have their mandates renewed every two or four years. They seek solutions to policy problems that can attract the support of winning coalitions. Scientists, by contrast, often wrestle with analytic puzzles for long periods of time; they seek to make breakthroughs that will secure their reputations as Nobel Prize winners or similar accolades in other fields. Not surprisingly, under the circumstances, analysts and practitioners often march to different drummers and fail to understand the practices and mores typical of each other's communities.

Whatever the consequences of the resultant disconnect in the past, it has become a serious liability in an age dominated by the globalization of economic and political systems, the impact of global environmental concerns such as climate change, and the acceleration of technological developments. Nowhere is this more apparent than in the effort to come to terms with issues now arising in the Arctic.

Efforts to respond to this problem have emerged in many quarters and given rise to a range of concepts featuring ideas like the co-production of knowledge and science diplomacy. These efforts also have fueled the creation of boundary organizations, such as the U.S. Department of Agriculture's Cooperative Extension Service and the CGIAR's Global Agricultural Research Partnership.

At the same time, the core concern has become increasingly clear. We need to strengthen two-way and continuous communication among analysts and practitioners about a range of topics, from the identification and framing of key issues to the adoption, implementation, and evaluation of policies chosen to address these issues. Scientists must engage more directly with policymakers in framing topics for research that are responsive to policy concerns. They must also enhance the process of communicating their findings in a manner that shows clearly what their implications are for issues on the policy agenda. Concurrently, policymakers must engage with scientists to understand the sorts of questions that are amenable to scientific enquiry and how to interpret and implement scientific findings with respect to specific policy issues. Overall, we need to encourage the development of an ethic of mutual respect and partnership, without losing track of the distinctive roles that analysts and practitioners play in society.

Three linked features of the world we now inhabit amplify the importance of improving the engagement between members of these two communities.

The first feature is heightened connectivity. Events occurring in one location (e.g. the melting of sea ice in the Arctic) are often results of distant drivers (e.g. emissions of greenhouse gases in the mid-latitudes). The impacts of climate change on Arctic communities are determined to a sizable degree by a range of other factors involving the health, education, welfare, and overall social cohesion of individual communities.

The second feature is the prominence of messy nonlinear changes.

These involve tipping points, trigger mechanisms, and cascades of change following seemingly minor disturbances and leading to emergent situations that are difficult to anticipate, hard to analyze rigorously, and frequently take us by surprise. We may already have passed the point of no return regarding the disintegration of the Greenland ice sheet, for example, although the global impacts of this nonlinear event will not become apparent for some time.

The third feature, related to connectivity and nonlinearity, involves the impossibility of eliminating major uncertainties. Science is a powerful tool that can produce answers to many questions. But the most sophisticated science in the world cannot yield confident predictions regarding certain issues, such as when the Arctic Ocean will become ice free in the summer months or whether thawing permafrost will release significant quantities of methane during the coming years. Policymakers and their advisors must accept the necessity of making hard choices under conditions of uncertainty, and devise methods for identifying unanticipated consequences of their choices and adjusting them as needed in an agile manner.

How can practitioners and analysts collaborate to address Arctic issues arising in this setting? One useful procedure centers on the development of simulations employing models and related tools to explore how (sometimes slight) variations in initial conditions affect the behavior of complex systems. Good simulations can help to identify particularly sensitive links in complex systems that need to be considered as a matter of priority in thinking about policy choices. Another procedure features the use of scenarios to encourage disciplined thinking about plausible future developments. Scenarios are not predictive. Good scenarios are plausible, future-oriented, and provocative enough to force users to abandon thinking rooted in business as usual assumptions without being so far-fetched that it is difficult to take them seriously. There is also much to be said for engaging in rigorous post-mortems focusing on both success stories and case studies of failed policies in the interests of promoting learning in real time. The goal of such exercises is not to identify simple formulas that will ensure success under a wide range of circumstances, but rather to generate insights regarding critical stages in the policy process where things typically go right or wrong.

One important inference to be drawn from these observations is that we need to rethink our traditional approaches to communicating the findings of research to practitioners and to the attentive public. Practitioners seek knowledge that will help them to advance their own goals; they typically respond to uncertainty by embracing narratives that seem to lend coherence to their arguments, and their thinking does not progress in a manner that conforms to simplistic models of rational choice. For their part, analysts are often too absorbed in their own work to think systematically about the circumstances practitioners confront in their efforts to address policy challenges; they frequently assume that it is not their job to help practitioners to think through the implications of their findings. In an era in which many sources of authority are eroding and participants in policy processes talk seriously about post-factual discourse, the need for new communications strategies is urgent.

What are the implications of these observations for the contribution of the North Pacific Arctic Conference (NPAC) 2017 and beyond? We can apply this perspective on improved engagement between analysis and practice to a wide range of substantive topics. Policymaking occurs in multiple arenas and at various levels of social organization. Science comes in a variety of forms. If we want to reach well-grounded conclusions about responsible economic development in northern (Arctic) regions, for example, we must integrate knowledge about the location and extent of the resources, the means of extracting them, global economic conditions controlling demand and supply, and the governance arrangements applicable to the activities of the key players. If we want to understand how communities adapt to the impacts of climate change, we must consider issues relating to health, education and welfare and include the insights of traditional or indigenous knowledge as well as Western scientific knowledge. If we want to think about the future of commercial shipping in the Arctic, we need to consider activities occurring at the level of the International Maritime Organization, the Arctic Council, the government of Russia, the government of China, and even local governments in places such as the Bering Strait region.

NPAC 2017 prioritized efforts to improve science-policy engagement as a key to building capacity for a sustainable Arctic in a changing global order. This proceedings volume is designed to encourage dialogue between and among analysts and practitioners and to improve our ability to communicate key insights to a range of audiences. In the final analysis, it is the job of decision makers in both the public sector and the private sector to make choices among the available options, despite the presence of considerable uncertainty about the probable consequences of all the major options. But they deserve to be provided with clear guidance regarding the options before them, the best knowledge available about both the short-term and long-term consequences of individual options, and with explicit indications regarding the nature of the uncertainties associated with their choices.

This volume comprises five substantive parts. Part I consists of six Arctic policy perspectives highlighting Finland's Arctic Council chairmanship program and the emerging Arctic policies of four North Pacific countries together with four research perspectives exploring how analysis can provide policy-relevant understanding and assess ways to adapt to the changing dynamics of our ecological, political, technological and social systems. Part II contains six different perspectives from the industry community, three Arctic states, a non-Arctic state, and a young analyst on responsible economic development in the Arctic. Part III presents five different perspectives from indigenous communities on sustainable Arctic communities. Part IV includes six interdisciplinary perspectives from the academic community, the industry community, an Arctic state, two non-Arctic states, and a young analyst on challenges and opportunities relating to the development of emerging maritime industries in the Arctic. The five perspectives in Part V highlight key insights from the academic community, two non-Arctic countries, an Arctic Center researcher, and a young analyst regarding how to enhance the dialogue between practitioners and analysts. A brief conclusion identifies future directions in the ongoing North Pacific dialogue on the Arctic in world affairs.

PART I: THE ROLE OF THE ARCTIC IN A CHANGING GLOBAL ORDER

Part I seeks to identify emerging policy issues, explore options for responding to them, assess the implications for institutions/governance systems and implementation strategies, and evaluate opportunities for relevant research. This part consists of two facilitated dialogues: one on national Arctic policy challenges and the other on research opportunities pertaining to key policy challenges.

National Arctic Policy Challenges

Finland's Chairmanship Program

Timo Koivurova begins Part I with a description of the program for

Finland's chairmanship of the Arctic Council during 2017-2019. Finland consults widely to develop its chairmanship program. This allows a widely agreed-upon range of issues to emerge in the program. Climate change, meteorology, education and connectivity are the main themes. Crosscutting issues include the Paris Agreement and the UN Sustainable Development Goals. Some of the projects, such as education, are seen as areas of particular Finnish expertise internationally. Finland has been a leader in the establishment of the University of the Arctic. Teaching is perceived in Finland as an important profession. More accurate climate change information has also been identified as a key theme. This is why meteorology is chosen, and the intention is to work with the World Meteorological Organization. Regarding connectivity, basic infrastructure is a necessary lifeline in the Arctic. This theme ties into the past work of the Task Force on Telecommunications and the emerging work in the Arctic Economic Council (AEC). A fourth area of priority added at the end of the consultation process covers environmental protection activities.

Finland first consulted the United States, the outgoing chair. The Paris Agreement places a lot of emphasis on adaptation, and much of the work of the AC relates to this process. The UN's Sustainable Development Goals need to be advanced in the AC but there has been no work yet to connect this effort functionally to the UN's work. Politically, Finland is committed to work on the application of the SDGs in the Arctic. Finland is one of the first to start implementing the SDGs.

The Finnish program is designed to strengthen the AC as a body. Ocean and sea issues get more influence these days. The AEC and the Finnish Meteorological Institute are seen as important bodies as is the University of the Arctic. From the perspective of a small state, global regulatory developments are important (Paris and SDGs) because all states must confront these issues.

China

In presenting China's key Arctic policy changes, Ambassador Gao Feng notes that the Arctic environment is experiencing rapid change, with sea ice decreasing. Also new Arctic economic opportunities are emerging. These have gone beyond national and regional importance to become global issues. China will be releasing a white paper on Arctic policy in the next few months. China considers itself an important stakeholder in the Arctic and, as a near-Arctic state, is greatly affected by Arctic change.

Respect, cooperation, a win-win approach and sustainability are China's guiding principles. This is seen through UNCLOS, respect for law, respect for Indigenous Peoples, and respect for the collective interests of the global community in the Arctic. Cooperation is multidimensional, including NGOs, the private sector, Arctic and non-Arctic states in all sectors. There is no limit on the scope for cooperation. A win-win approach means a commitment to mutual benefit, and general benefit for all stakeholders. This approach also includes coordination of cultural, economic and environmental matters to promote sustainability and co-existence with nature. Environmental protection requires rational use of resources, and rules-based systems are the key to meet these objectives.

Ambassador Gao briefly outlines the challenges China is now facing in the Arctic. China wants to deepen its understanding of the Arctic. It has acceded to the Spitsbergen Treaty of 1920, but it is a relative latecomer to Arctic activities. In the 1990s, it began to work toward catching up. Domestic mechanisms for Arctic affairs need to be better coordinated within China. He notes, for example, that his role was created only last year. A coordination function is established through the Ministry of Foreign Affairs. This mechanism is now functioning well but improvements could be made in relation to information sharing internally and building connections internationally. China wants to engage with Arctic states, non-Arctic states and other global institutions as it develops and implements its Arctic policy.

Korea

Ambassador Young-Jun Kim provides a perspective on Korea's Arctic policy and activities. Korea's engagement in the Arctic region dates back to the 1990s. In 1993, Korea first conducted a basic survey in the Arctic.

Some of the important milestones in Korea's activities in the Arctic are as follows:

- Korea joins the International Arctic Science Committee (IASC) in 2002; the Dasan Arctic science station is established in Svalbard in 2002.
- The Korea Polar Research Institute (KOPRI) is established in 2004.
- Korea builds its first ice-breaking research vessel *Araon* in 2009.
- Korea joins the Arctic Council as a permanent observer along with China and Japan in May 2013. In that same year, Korea establishes

its official policy on the Arctic by adopting the Arctic Policy Master Plan in December 2013.

Korea's Arctic Master Plan is its first integrated Arctic policy, coordinated by multiple governmental agencies rather than a single unified national strategy. The overarching vision of the Master Plan is to contribute to a sustainable future for the Arctic by enhancing cooperation with the Arctic states and relevant international organizations in the areas of science, technology and economy, especially by participating in the Arctic Council and its working Groups.

Korea's policy has four goals: strengthening international cooperation; enhancing scientific research activities; exploring new business opportunities in the Arctic; and securing institutional foundations.

Korea is now preparing its second Arctic Policy Master Plan for the next five years, from 2018 through 2022. In order to enhance the capability of its research on the Arctic, Korea plans to build a second ice-breaking research vessel. Construction of the vessel is planned to begin next year and will be in service by 2022. Korean experts, mostly members of the Korea Arctic Experts Network, have attended around 30 meetings of the subsidiary bodies of the Arctic Council in the past two years. In view of the significant potential of observers to contribute to the Arctic, Korea has taken the initiative to convene the Trilateral High-Level Dialogue on the Arctic among Korea, China and Japan. Korea attended the fourth Meeting of the Observer States in the Arctic Council in Warsaw, Poland in April 2016.

The Korea Polar Research Institute (KOPRI) is the leading agency for Korea's national polar program. KOPRI has been conducting research, utilizing platforms such as the Dasan Arctic Research Station in Svalbard and the icebreaker research vessel *Araon*. KOPRI is actively engaged in scientific cooperation with Arctic states, and also in international scientific collaborations through the International Arctic Science Committee (IASC) and the Pacific Arctic Group (PAG).

Korea has been engaging in Arctic business mostly in the fields of shipping (e.g. The Polar Code) and shipbuilding (e.g. icebreaking LNG carriers). Korea has been participating in negotiations to prevent unregulated commercial fishing in the high seas area of the Central Arctic Ocean. KMI organizes the Korea Arctic Academy, a 10-day exchange program between Arctic and Korean youth, every year. Korea organized the Arctic Partnership Week, a series of seminars, events, and exhibitions related to the Arctic, encompassing a wide range of topics such as policy, science, shipping, and culture, in December last year. Korea is a member of the North Pacific Arctic Research Community (NPARC), a network of around 20 universities and research institutes of China, Japan and Korea.

United States

Brooks Yeager describes U.S. Arctic policy since the Cold War and contemplates what comes next. He notes that the new American administration has not yet articulated its policy and strategy for the Arctic. Therefore, Yeager takes a retrospective approach to look at the fundamental interests that drive U.S. policy, and which explain the historical stability of U.S. policy through multiple administrations of both parties. The internal political dynamic of Arctic policy in the U.S. arises from federal and state relations, with indigenous views also being a factor.

Yeager provides some personal background regarding his education about Arctic and policy issues as a representative of conservation NGOs, and as an appointee in both the Department of Interior and Department of State in the Clinton Administration. Over the last 50 years, there has been an evolution of U.S. policy on the Arctic. Until about 1971, the main factor was national security considerations. This has changed somewhat and there are now more complex concerns, including:

- Environmental concerns such as the ones that gave rise to the Arctic Environmental Protection Strategy (AEPS) in 1991 with its focus on contaminants. This is a major contributor to the U.S. position on the Persistent Organic Pollutants (POPs) treaty.
- Evolution of environmental issues toward Arctic wildlife, such as polar bears, and toward humans living in the Arctic, including the connection between human and wildlife health and concerns arising from this. Again this was one of the motivators for the POPS treaty.
- The perception that the Arctic is no longer a remote area and that it is getting drawn into the global economy.
- The overall impact of climate change on the other environmental changes.
- A realization that there is great connectivity in relation to all Arctic issues across boundaries, which require a coordinated approach.

The internal dynamic between Alaska and Washington is significant because of state powers and the removed position of Alaska from the rest of the United States. This is an issue across partisan lines and is created by competing state and federal interests. Indigenous rights are a factor in this dynamic, and federal policy alone is not determinative. National security is still a central issue, given the closed Arctic sea, competing ownership claims, the proximity of Russia, the homeland concept, and the welfare of communities.

The U.S. was, at first, a reluctant partner in the original AC creation in 1996. Alaska did not want an international multilateral approach to governing the Arctic. But as the U.S. has gained experience in the Council, it has become much more comfortable and now regards the AC as a critical institution for cooperation among the eight Arctic nations, as illustrated by its ambitious approach to the U.S. Arctic Council chairmanship 2015-2017.

Canada

David VanderZwaag presents a brief perspective on Canada's Arctic policy. In December 2016 Prime Minister Trudeau and President Obama issued a joint statement calling for a more collaborative approach to developing Arctic policy. Canada is working on a new Arctic Policy Framework that may be based on some recommendations and consultations conducted by former Arctic Ambassador Mary Simon. There is no set date for completion of this policy and the process has been a bit opaque.

Mary Simon issued a report recently that speaks of a new Arctic leadership approach. We do not know yet how the government will respond to this approach. One recommendation is to establish a university in the Canadian Arctic. Several preexisting pieces constitute the current Canadian Arctic policy landscape: a) in 2009 Canada adopted a northern strategy that is still in place; b) Arctic patrol boats are being built; c) an Arctic foreign policy statement was issued in 2010.

Several policy areas are currently under development:

- Marine Protected Areas Policy: Canada has committed to protecting five percent of marine waters by 2017 and 10 percent by 2020, including Lancaster Sound. Amendments to the Oceans Act are being pursued to speed up the process of creating MPAs.
- Climate Change Policy: The Trudeau government is very supportive of initiatives on climate change, unlike the government of former Prime

Minister Harper. Canada has been implementing its commitments under the Paris Agreement.

- Oil and Gas Policy: Canada has imposed a five-year moratorium on further Arctic offshore oil and gas licensing.
- Arctic Shipping Policy: Canada is working to develop northern shipping corridors and bolster the aids along these routes. Draft regulations to implement the Polar Shipping Code have been prepared. A $1.5 billion ocean protection plan has been announced but its impact on the Arctic is not totally clear. Community response boats are promised for use in Arctic communities. Vessel routing schemes will be examined to address concerns of some communities.
- Legislative and Regulatory Policy: Canada is hoping to strengthen environmental legislation, revamp the National Energy Board, and so on.
- Fisheries Policy: A 2014 agreement was reached with Inuvialuit for an integrated fisheries management framework to prevent commercial fisheries in the Beaufort Sea region until there is adequate scientific information to support it. Preferences for Inuit fishing are included. Canada is participating in the central Arctic Ocean initiative on fisheries

Russia

Tatiana Mitrova notes that officials from the government of Russia were going to participate in what?, but following the U.S. sanctions bill, they pulled out along with the corporate leaders from Russia. Mitrova is an economist and her views are personal. She points out that there is a strong desire in Russia to promote the economic development of the Arctic, but the financial resources to do that seem to be dwindling. The Arctic coast is Russia's longest border so national security concerns are still very important, and there is a military dimension to Russian activities in the region. With low oil prices and financial sanctions, it is very difficult to operate in the Arctic because of the expense. This combination presents a challenging situation, but Russia will continue to develop the Arctic. Lack of financing will likely mean some investment shortfalls in safety, security, environmental standards, etc. There is some ongoing dialogue with Norway and within the AC. It is important to keep this open as opportunities for dialogue disappear elsewhere. There is some concern that Russia is moving back to a Cold War agenda, and we must avoid conflict in the Arctic zone because Russia does not have many places to go to replace the Arctic's economic potential.

Research Opportunities Pertaining to Key Policy Challenges

In response to the question about the rate of policy growth to address the speed of change in the Arctic, Fran Ulmer notes that it is not clear that any country is keeping pace. Under President Barack Obama, the pace was accelerated for interagency coordination, policy development, funding and scope of research. Obama's visit to Alaska in 2015 focused on the climate change agenda and was followed by the 2016 White House Arctic Science Ministerial that encouraged more meaningful international collaboration for monitoring, observing, and data sharing. A ministerial statement was adopted to continue the effort, and Finland, Germany and the EU will host the next Arctic Science Ministerial in Berlin in 2018.

Ulmer references a number of documents. Each country provided a two-page summary of their current Arctic science work for the White House conference. This gives a snapshot of the research programs of 25 countries that participated. A United States Arctic Research Commission (USARC) document sets out the US research priorities for the future. A five-year Arctic science plan outlines the coordinated efforts of federal agencies in areas of overlapping jurisdictions.

Early engagement in Arctic policy by the United States was episodic, driven primarily by external, international forces that triggered intermittent attention. In the 1960's, significant research in the Arctic region was initiated in order to better understand the polar environment. During this same period, the federal government built communication installations across the American Arctic to assist with defense intelligence, search and rescue, and general communication. After Alaska Statehood in 1959, Alaskans sought to select lands from the federal government's holdings that could provide sufficient economic development opportunities to support a growing population. By contrast, policies being adopted by federal agencies managing federal lands either aligned or conflicted with the growing interest of state leaders in significant opportunities in the Arctic. The North Slope turned out to be the site of the largest oil field ever discovered in North America. Federal policies regarding land management and resource development on federal lands to the east and west of Prudhoe Bay have varied, based on the philosophy of different administrations and congressional leadership.

- ANWR: the Arctic National Wildlife Refuge was created first by executive action and later codified by Congress because of the important biological, ecological and cultural resources of the area.
- NPRA: the National Petroleum Reserve Alaska was created, as the name implies, as an area for potential oil development for the federal government to manage and control.
- ANCSA: the Alaska Native Claims Settlement Act of 1971 resolved land claims of the Alaska Native peoples by creating regional and village corporations which hold land in trust for their members that may be developed or protected as determined by the boards of those corporations.
- ANILCA: the Alaska National Interest Lands and Conservation Act of 1980 was the most controversial of all of these examples. The push and pull between state and federal interests, between conservation and development interests, between local and global concerns provided ample opportunity for politicians, businesses, non-profit organizations, scientists, local leaders and editorial writers to offer hundreds of different approaches to resolving the disputes.
- In 1984, Congress attempted to focus federal Arctic research efforts by passing the Arctic Research and Policy Act (ARPA), which created both the Arctic Research Commission and the Interagency Arctic Research and Policy Committee (IARPC). IARPC was the mechanism to coordinate the research efforts of the federal agencies by developing a research plan and providing a mechanism for coordination.

These initiatives can be characterized as significant policy but are not integrated into any broad theme, goals or vision of what the country either expected or demanded from the region. No administration, federal or state, developed a comprehensive policy describing the roles and responsibilities, goals, objectives, or guidance for public policy, or a clear articulation of the necessary research to support decisions under those policies.

Today, a growing awareness of the rapid changes happening in the region has generated global interest in the Arctic. The two principal drivers of this change are climate change and global demand for resources. Nations started developing and adopting national policies and strategies to more comprehensively articulate their national objectives and the methods to achieve them. An interagency team prepared a U.S. Arctic Policy (https://fas.org/irp/offdocs/nspd/nspd-66.htm), adopted in 2009 followed by a strategy and implementation plan.

Leaders of several nations, particularly Norway, Finland and Russia, focused on the need to think holistically, in addition to nationally, about effectively managing a multinational region united by the Arctic Ocean and its adjacent seas. Creation of the Arctic Council was an important turning point. The level of U.S. attention to the Arctic increased dramatically. Why? In addition to the factors mentioned previously, the political environment was more favorable. Leadership from the Alaska congressional delegation helped. They advocated for research funding and cooperation, for the appointment of an Arctic ambassador, and for programs that focused on unique aspects of life in the Arctic.

At the state level, the Alaska legislature created the Alaska Arctic Policy Commission (AAPC) to develop and propose Arctic policies, which it did in 2014. Several members of the White House staff and cabinet were knowledgeable about the Arctic and understood the need to use science as a building block, politically and diplomatically.

The level of engagement in the region can be illustrated by the following chronology of federal leadership:

- In 2013, the National Strategy for the Arctic Region (NSAR) is released by the White House. In 2014, the implementation plan for the NSAR is released by the White House. In 2015 President Obama issued Executive Order 13689, creating the Arctic Executive Steering Committee (designating the President's Science Advisor John Holdren as Chair, and Deputy Homeland Security Advisor Amy Pope as Vice Chair). Mark Brzezinski, former U.S. Ambassador to Sweden, is subsequently appointed as executive director. Also in 2015, President Obama traveled to Alaska and hosted a meeting entitled, "Global Leadership in the Arctic: Cooperation, Innovation, Engagement and Resilience (GLACIER)," for foreign ministers and government leaders, discussing climate change in the region.
- In 2016, the White House hosted the inaugural Arctic Science Ministerial, convening ministers from 25 nations to discuss increasing collaboration and investment in science and research.
- New strategies emerged that recognized the importance of increased

observing, monitoring and research to further their missions.

- The three lines of effort in the Administration's National Strategy for the Arctic Region Strategy are announced:
  - Advance United States security interests
  - Pursue responsible Arctic region stewardship
  - Strengthen international cooperation

One of the most significant legacies of the U.S. chairmanship will be the formal adoption of the legally binding "Agreement on Enhancing International Arctic Science Cooperation" during the May 2017 Arctic Council Ministerial meeting. The Interagency Arctic Research Policy Committee has prepared and finalized the Five Year Arctic Research Program Plan. It was released in November 2016. The predominant theme in the plan is the rapidly changing Arctic: trying to understand the shifting boundaries and characteristics of water, ice, flora, fauna, people, and institutions. Observing, monitoring and documenting the changes that have occurred are central to the plan. It is unclear how the Trump Administration may change existing policies, goals, objectives and procedures on the Arctic.

Turning to social science perspectives on Arctic research, partnerships, organizations, and interregional collaboration, Peter Sköld observes that policy-based decisions need a constantly improved, relevant and updated knowledge basis. There is an increasing research production that can be utilized in guiding policy decisions and informing the general public. From a social science perspective, it is important to have a holistic approach to Arctic science, and to ask questions concerning relevance, impact, power dimensions, planning processes, representation and how research-partner relations might be developed.

There is a growing effort in the Circumpolar North to find better ways to have Arctic science interact with, and focus on, issues that are important in the public eye as well as to ensure that the insights generated in science are put to better use. In the Arctic it is important to understand the impacts of the research itself and of the results of the research, as well as the impact of communicating research results. There is a need for improved assessments of research impacts or research consequences on local communities and on global systems. Arctic cooperation and collaboration have been key strategies for the international Arctic research community.

Social science is an evolving actor in the research arena in the

Arctic. Policymakers have a limited ability to digest the knowledge and information given to them by science. Communication is a key word for researchers. There is also a need for guidelines for research that are known to individual researchers. There is a need to develop a joint Arctic agenda that ties many interests and stakeholders together.

Timo Koivurova provides an example of a clear science-policy interface project: how science can influence the way Finland's Chairmanship of the Arctic Council is advanced. This initiative, funded by the Prime Minister's office, covers projects where there is a direct and immediate link between science and policy. An interdisciplinary group led by the Arctic Centre in Rovaniemi is involved. The project started one year before the Finnish AC Chairmanship began and will end in 2019. There is a steering committee of most ministries that also includes border patrols and the Coast Guard. A long background report was released at the beginning of the project. Four briefings were done before the start of the chairmanship on the UN Sustainable Development Goals, strengthening climate work in international Climate Change forums, articulating an Arctic Europe concept, and reviewing Arctic regulatory issues.

Since May 2017, the project consortium has been assisting the Finnish foreign ministry in its task of leading the work on a long-term strategy for the Arctic Council. A team of researchers is assisting in the process of developing a long-term strategy for the AC.

Open Discussions

A number of additional issues emerged in the course of the general discussion on various national Arctic policy challenges. Q&A during the discussions included:

Q1: How does the lack of an Arctic coastline and EU membership influence Finland's approach to its chairmanship?

A1: On the coastal issue, a lot of the program is still involved with topics relating to oceans. Finland shares such interests given its Baltic connections and its industry and icebreaking history.

A2: As a EU member, Finland is aware of and interested in many Arctic issues, including transportation. Europe is connected to Russia and Asia and there is new interest in building a railway to the Barents Sea (from Rovaniemi to Kirkenes) that would connect to the

Northern Sea Route system.

Q2: Resource extraction from Asian and Russian perspectives seems to be the main focus. What about the indigenous and environmental issues?

A1: Offshore and other projects in Russia are largely on hold because of falling oil and gas prices. Gas might have some potential as a bunker fuel. Some renewable energy options might take hold. There is not a comprehensive policy on environmental protection in Russia and practical factors might come to bear on issues of affordability.

A2: China's investments in Yamal and in the Arctic must be developed with the government and governed by the legal environment of the state and local governments.

A3: Several representatives of Indigenous Peoples shared their important perspectives on resource extraction, environmental degradation, and other related issues in what they refer to as their *Nunat*, or homeland, which stretches across the Arctic and encompasses multiple countries.

Q3: Is the pace of policymaking sufficient to address the speed of change in the Arctic?

A1: Policymaking under U.S. Presidents Clinton and Bush was carried out in five- to ten-year time frames. These seemed to reflect trends at the time. The policy might be articulated in a more timely manner now, but not be implemented very quickly.

A2: Finland has been pushing for a final decision on the status of the EU as an Observer, but Finland wants to be the strongest EU actor.

Some additional points made during the research perspective discussions included:

- Science should be about the study of change. The U.S. government is moving away from funding basic research. International affairs therefore will no longer be the domain of foreign ministries but rather will become the responsibility of "science diplomats" who look at longer-term timeframes that are now critical to humanity. Climate change does not operate on political cycles but across decades and centuries. The only people looking at change issues 100 years out are the scientists, and they are therefore responsible for much of the international diplomacy on these issues.

- We often hear about science being used as a policy instrument or tool. However, science is also a way to inform policy formation and provide decision support.
- There is a need for mechanisms to connect policy and science. Legal frameworks are often a way to establish how all the players will work together.
- Science builds knowledge but politicians are responsive to interest groups and often allocate resources based not on science but on narrow interests. Voters have a role in this. Evidence-based policy sounds good but many politicians do not operate on this principle.
- From inside the Arctic, climate change is not always the priority for Arctic research and it is not the only important issue. The development of the region is more important to people who live there. This is difficult for many politicians to understand. So finding ways to engage local and regional people in research needs to provide benefits for both sides.
- We can distinguish between social and natural science. Decision makers want simple, easy answers, but that is rarely possible in the social sciences.
- Media is a big factor in all of these matters but there was no time to cover it in the discussions.

PART II: RESPONSIBLE ECONOMIC DEVELOPMENT IN THE ARCTIC

Part II considers innovation in strategies for responsible development of the Arctic's natural resources. The challenge is to extract resources, including fish and minerals as well as hydrocarbons, and to transport them to southern markets in a manner that minimizes disruptive impacts on both biophysical and human systems. This section addresses major development projects, such as the Sabetta project on Russia's Yamal Peninsula, seeking to distill lessons of general interest from an analysis of a contemporary experience. It also seeks to identify themes and topics that could be analyzed systematically, with the prospect of producing results that provide a basis for enhancing the responsibility of resource development in the Arctic. It also examines issues that could potentially underpin the formulation of a code of conduct or the distillation of a set of best practices to guide the activities of both private and public actors in this domain. In Part II, five experts present perspectives relating to responsible economic development in the Arctic.

Tero Vauraste, chair of the Arctic Economic Council, speaks of trade barriers and long-term sustainable economic development in the Arctic. He argues that we should develop trade that produces added value in the Arctic and avoids a one-way flow of the value chain out of the Arctic to the south. He notes that trade barriers pose threats to the Arctic. He proposes an ethical business code for the Arctic, such as the WTO/WEU/AEC joint initiative relating to an Arctic Investment Protocol. An Arctic business and ethical code is needed. He raises the question of whether we are witnessing a shift from advancing free trade towards more protectionist policies. There are mixed signals, e.g. TTIP vs. C/EU. Current international developments are alarming for the Arctic. The Arctic is not isolated; in fact, non-Arctic countries are becoming increasingly aware of the Arctic world. Investment opportunities, including public-private partnerships, are important for non-Arctic countries.

Turning to stewardship/success stories of innovative strategies, Vauraste notes that the Arctic 100 expedition, in which a Finnish icebreaker traversed the Northwest Passage, suggests that such expeditions will likely be able to transit the passage in record times. He notes that there will be an increased focus on international collaboration. He recommends that the participants track developments on Arctia's Blog on Facebook. There will be increased cooperation with Canadian players, often using shared resources cooperatively.

Victor Santos-Pedro introduces a success story of responsible economic development in the Arctic:

- The Baffin fisheries coalition, where local actors have come together to produce tangible results, including the establishment of Nunavut, the newest, largest, and northernmost territory of Canada. It separated officially from the Northwest Territories on April 1, 1999, via the Nunavut Act and the Nunavut Land Claims Agreement Act.
- Starting in 2000, a sense of self-sufficiency developed, and in 2011 local people engaged in a set of processes that provide them with important skills.
- He notes that for every success there are half a dozen failures.

- Santos-Pedro outlines a short summary of emergency preparedness and response.
- Story of the *Exxon Valdez*, where the accident occurred because they were trying to avoid ice and were not well prepared.
- *Deepwater Horizon*, where it became evident there is a need for new approaches to reduce risk as much as possible.
- Canadian framework for sustainable development.
- He indicates a need for a framework with more advanced implementation. He also notes that regulations are too often nested in silos that make it difficult to launch a project. There is a need to promote basic infrastructure and make this a key priority. He makes clear, as others have, that consultation with local people is essential.
- Looking at development from another perspective. There is a need to emphasize local needs vs. the perspectives of project proponents. Santos-Pedro notes that we need new tools, including a better understanding of the human dimension, such as behavioral economics. Solutions must be cost effective. Novel approaches to consultation/partnership should be encouraged and advanced. He offers a story about the price of lettuce, where a direct route to a village in the Arctic may be far more expensive than a longer and far more indirect route. The costs are foundationally important in analyzing the ways and means to move goods and cargo to and within the Arctic.

Tatiana Mitrova begins with a Russian perspective on responsible economic development in the Arctic by suggesting a major theme for Russia: "*Strong ambitions for Arctic development coupled with full recognition that development is constrained by limited resources*." The economic importance of the Arctic to Russia is striking. While the Arctic provides 15-20 percent of the Russian Federation's GDP, it has only 2.5 percent of the Russian population.

There are many barriers to successful economic development:

- Changes in global economic environment/postponement of many offshore projects.
- 80 percent of investment should and is very likely to come from the private sector, as all the other possible governmental incentives have already been tried and not succeeded.

- There have been a number of major projects that were all started before 2014.

So, what is to be done now? Mitrova notes a strategy of selecting Arctic support zones, such as cherry-picking eight locations along the coast that are socio-economically attractive. She stresses, too, that both security and economic factors will need to be addressed so that:

- Domestic politics are involved.
- Initiatives integrate public-private partnerships, creating attractive package deals.
- The role of the state in creating infrastructure is recognized (e.g. Sabetta, the port and LNG plant under construction on the Yamal Peninsula, may be a success story).

Mitova emphasizes long-term prospects and stewardship:

- It is hard to maintain a productive dialogue during times of political problems.
- Perhaps the best we can do is to prevent any harm being done.
- More receptivity to ideas from the research community is needed but there are difficulties in engaging with researchers.
- Much depends on how ideas are presented

In presenting a non-Arctic country's perspective, Sung Jin Kim focuses on the challenges facing efforts to promote responsible economic development in the Arctic. Regarding Arctic shipping challenges, Kim remarks that there are emerging opportunities that may save time and distance for high-tech shipbuilding, more often with terminal and destinational shipping rather than full transits across the Arctic Ocean. There are serious challenges with weather-related challenges, as there is inadequate infrastructure to support accurate and reliable weather forecasting.

On the natural resource development challenges, Kim advocates that there are opportunities, based on alternative strategies and diversification. He further argues that there are serious challenges arising, including the need for initial investments, changes in the world markets, and the realities of geopolitics.

The market-based realities of high investment need to be addressed more realistically, including the challenges of working in the fragile Arctic environment. There is a need for developing and implementing guidelines for responsible development. There are some promising new efforts and trends, such as the Arctic Investment Protocol, now adopted by Arctic Economic Council, and the evolution of principles of sound investment, increased recognition of the importance of building socio-economic resilience, respect, environmental protection, adequate and effective business models that can integrate all kinds of knowledge, and fostering pan-Arctic collaboration. He asks, *"How do the Arctic and non-Arctic nations implement principles that are needed for increased international cooperation?"* He further suggests that there is a critical need for a new Arctic Code for responsible economic development.

Kim outlines Korea's involvement in responsible economic development. He suggests that Korea is focusing on smart development, addressing both environmental issues and effective socio-economic approaches, such as E-navigation systems, "Prompt Port Facilities," Green technology tailored for solutions, and employing strategic mobility to move to locations where the need is most apparent and opportunities most favorable.

As a view from a young analyst, Meredith Jennings suggests that there is an opportunity to focus on the Russian Arctic as a case study, where there has been progress but where there is a need for more scientific observations and more coordinated approaches to collaborations. She notes that she is about to begin a National Academy of Sciences post-doctoral fellowship, funded by the settlement of the *Deepwater Horizon* accident, where she can explore some of these ideas, challenges and opportunities.

General Discussion

A number of additional issues emerged in the course of the general discussion:

- There are serious challenges of creating added value in the context of "responsible economic development," or as some called it "sustainable economic development.".
- Too often the role of ecosystem services/natural capital is not included in calculating value. So how can we incorporate these values in the positive value chain?

- If no business case can be identified, there will be no business.
- The importance of public-private partnerships cannot be over emphasized.
- We should share resources in dealing with infrastructure needs in the Arctic.
- There are good reasons for developing new U.S. icebreaker capabilities, but there are different models for doing so.
- We have a challenge of operating across generations; one strategy is to prioritize Arctic regional investment initiatives that focus on the role of research coordination networks focused on regional investment initiatives and strategies.
- It is increasingly clear that criteria for judging sound projects remain uncertain and that some investments being discussed are economically unsustainable (e.g. four Inuit groups in Canada have not been able to find common cause due to different strategies, preferences and local conditions).
- Political economy is key: economics may be international, but politics drive implementation at the national and local levels
- There is a debate concerning the deployment of private investment funds for infrastructure development, as this will require dealing with the political-economic environment, including unexpected shifts in public policy.
- Stewardship is not just conservation that takes care of biophysical systems or natural wealth, but requires long-term socio-economic well-being.
- The question is raised: Are there opportunities for Arctic development within the global economy that realistically produce benefits at local scales?
- The triad of resources/labor/capital has not adequately integrated or addressed labor issues in the Arctic.
- Perspectives involving the outside looking in and the inside looking out might help frame the solution-space. In the absence of both perspectives, many look to the Arctic as a source of support for the outside world, while others are more interested in sustainable development for the Arctic itself. In short, can we be thinking about how the Arctic can help the world while at the same time achieving sustainable results for the Arctic itself? There are both normative and empirical issues that are important.

- One continuing theme that often reappeared is the issue of stewardship: how to balance environmental protection and human well being with economic success. This is an urgent issue given that it has been posited that there will be upward of $1 trillion in investments in the Arctic made over the coming decade or two. A further complication is high unemployment in much of the Arctic and the need to prepare people with needed and appropriate skills.
- Fostering national Arctic policies that are clear and take into account various interests is likely to be a major challenge in the coming decades, given that there are major gaps in existing policy priorities among both Arctic and non-Arctic nations as policymakers have to balance different and competing interests that will drive responsible economic development.

Recurrent Themes

The following themes emerged as focal points in the discussion and can help to provide guidance in thinking about the meaning of responsible economic development in the Arctic:

- We need to develop clear criteria for investment decisions/selection of projects: How do we value natural capital or ecosystem services that may not be captured in ordinary market prices? How do we decide between calculations of efficiency and considerations of sovereignty/security/national presence (e.g. the icebreaker debate)? What happens when political considerations trump economics?
- Responsible development is a matter of time horizons as well as taking into account non-market values: What are the appropriate time horizons in thinking about responsible or sustainable development? Should we be thinking about decades to centuries or even longer?
- Policymaking is ultimately about accommodating competing interests and not just a matter of rational choice. Policymakers are generally looking for acceptable compromises rather than logical arguments about sustainable or responsible development.
- We need to think in terms of political economy where economic considerations and political considerations may pull in different directions. For example, Russia faces political pressures to push ahead with Arctic development, even when current economics are

not encouraging. The Alaska government is so dependent on revenue derived from hydrocarbons that it pushes for development whether or not it is responsible in some larger sense.

- It is worth considering whether there is an appropriate level of planning to guide responsible development in the Arctic: Soviet-style central planning does not make sense. But the U.S. tendency to reject planning altogether may not be sensible either. Is there a middle ground regarding the role of the state in guiding Arctic development?
- There is a difference between "outside in" perspectives and "inside out" perspectives: Is the question a matter of what the outside world can gain from developing Arctic resources? Or are we concerned with how economic development can serve the needs of the Arctic and its residents? Can we balance the two sets of perspectives in pursuing sustainable development?
- Stewardship is an appealing concept: But what does it mean in an Arctic setting? It is more than simply a matter of conservation. Perhaps it involves special responsibilities on the part of human actors in situations in which anthropogenic forces have become the dominant drivers.
- There may be similarities between the Arctic and other parts of the world. Southeast Asia may provide perspectives to consider regarding issues of responsible development, especially when it comes to avoiding situations in which peripheral areas become resource colonies.

PART III: SUSTAINABLE ARCTIC COMMUNITIES

Throughout the Arctic, communities are struggling to maintain their distinctive ways of life and unique cultures in the face of rapid, interactive, and often disruptive changes. Among these are the impacts of climate change, the rise of mixed economies, demographic shifts, health crises, and developing tensions between traditional and western modes of governance. There are deep differences even within individual communities about how to respond to these challenges, and the experiences of communities in devising ways to cope with these forces of change differ dramatically. Some communities have devised strategies that yield sustainable outcomes; others have spiraled into deeper and deeper troubles. Part III explores both the threats facing Arctic communities and the options available to them as they endeavor to make progress toward sustainable futures. The contributors also seek to identify opportunities for the conduct of research that could improve outcomes in this realm.

Five panelists address aspects of sustainable Arctic communities. From the Arctic perspective, Herb Nakimayak hypothesizes that building sustainable Arctic communities begins with self-determination. He then explains that there is a need to view Arctic sustainable development from the inside out, specifically understanding the Arctic and development as the Inuit see it. Ensuring healthy and sustainable Inuit communities must begin with recognition of Inuit self-determination, sovereignty and other human rights. Environmental change in the Arctic is outpacing nature's ability to adapt. The Government of Canada has come to share the critical need for an indigenous rights perspective as exemplified by the signing of an Inuit-Crown Partnership declaration in early 2017. The declaration promises to promote reconciliation between the federal government and Indigenous Peoples and to generate healthy and prosperous communities.

Nakimayak argues that there is a need for greater inclusion of Inuit perspectives in the process of choosing Arctic research priorities. Inuit are advocating for an Inuit-led body for international health research assessment. The Inuit Circumpolar Council was actively involved in negotiating the Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury. As an observer to the UN Framework Convention on Climate Change, the ICC has advocated vociferously for mitigation, monitoring and adaptation responses to climate change. Inuit wish to reframe thinking about sustainable economic growth. They want to promote innovative solutions, such as renewable energy development, broadband infrastructure expansion, social financing, and ways to maximize benefits from the burgeoning Arctic tourism industry.

From the Arctic environmental perspective, Kevin Harun observes that indigenous peoples have been practicing sustainability for centuries. Subsistence living is sustainable. However, Arctic sustainability is not possible without addressing climate change. From this perspective, we cannot afford to develop Arctic oil and gas resources. Although transition time will be needed, we need to envision a fossil fuel-free Arctic. Further actions are needed through the International Maritime Organization, such as mitigating the threats and impacts of heavy fuel oil, curbing black carbon emissions, and further addressing ship-based greenhouse gas emissions.

Adaptations at the local level are also needed, especially transitioning to alternative energy sources.

According to Harun, indigenous organizations have not been represented at the IMO. Pacific Environment is collaborating with indigenous leaders in Canada, Russia and Alaska to chart a path toward indigenous participation in IMO decision making, possibly through indigenous observer status. A new Arctic economic paradigm is needed. Subsistence practices and traditional knowledge must be promoted and supported. Renewable energy and energy efficiency measures, such as LED lighting, must be pursued. Smaller economic ventures with small footprints are key, such as eco-tourism operations. Great potential exists to further develop northern horticulture, for example, growing herbs and vegetables in greenhouses. The definition of infrastructure needs to be broadened to include education, training and broadband connectivity.

As key elements for framing sustainable and resilient communities, Denise Michels identifies strong leadership at the community level followed by legal frameworks supportive of local decision making, and then clear and consistent consultation practices and processes.

According to Michels, consultation practices vary in Alaska. The U.S. Coast Guard and the Federal Bureau of Investigation have established a Tribal Liaison position in Alaska. The Marine Mammal Commission collaborates in publishing the Handbook on Model Alaska Native Consultation Procedures. Unfortunately, consultation policies and practices at the State of Alaska level vary at the whim of the incumbent Governor.

Michels proposes that building trust with communities is critical and can be promoted in various ways, such as including community representatives on task forces and in policy development processes. Inuit participation at the international level varies. The Inuit Circumpolar Council (ICC) is a Permanent Participant in the Arctic Council and ICC-Alaska is thereby closely linked with Council projects and activities. A recent disappointment is the publication of a UNESCO/IUCN report identifying natural marine heritage sites in the Arctic Ocean. The report was prepared without any consultations with hub communities in the Arctic region.

Michels suggests that Inuit participation at the international level may be enhanced in two ways. The U.S. State Department may appoint an Arctic Ambassador to consult and report to Indigenous Peoples on international issues. The State Department can also establish a clear consultation process.

Michels explains that communities in rural Alaska have mixed economies, and businesses and corporations can create policies and procedures to support a subsistence culture along with work. Examples include giving time off from work for subsistence hunting, fishing and food gathering and working with local hunters and leaders in developing measures to avoid conflicts with traditional practices and the subsistence resource base. Michels also emphasizes that the high suicide rate among Alaska Natives remains a serious issue that needs continued attention. The Sustainable Development Working Group of the Arctic Council should continue the mental well-being initiative known as “Rising Sun” that was initiated under the U.S. Arctic Council Chairmanship.

Finally, Michels recommends that a great opportunity for outsiders to become more involved in supporting sustainable Arctic communities is through the UN’s 2030 Agenda for Sustainable Development. The Sustainable Development goals need to be applied in the Arctic.

From a social scientific perspective, Gail Fondahl argues that equity issues are critical in assessing how sustainability is experienced and supported in the Arctic. Gendered, generational, cultural and other differences must be considered. Resilience efforts have to be organized from the bottom up. She maintains that equitable distribution of benefits and negative impacts of Arctic development need to be closely examined, remaining a major research priority. Compensation payments to communities from industrial projects in the Arctic need to be assessed for their impacts on subsistence lifestyles. The roles of laws and decision-making processes in fostering or restraining local sustainability also need to be explored.

Fondahl stresses that there is a need to broaden consultation beyond individual projects and to ensure participation on the part of a diversity of stakeholders. For example, broad consultation and representation should be followed in wider policy contexts, such as development of an Arctic ethical business code. She also argues that Arctic learning networks are a key to future sustainability. Experiences and best practices need to be shared in such areas as addressing alcohol abuse, suicide prevention, and encouraging mixed economies. In identifying best practices, communities and researchers must be sensitive to differences within communities and the question of best practices for whom.

From the Russian Far East perspective, Eduard Zdor asserts that major challenges to the sustainability of Chukotka communities include a lack of private ownership of land and losses of traditional language and identity. Melting sea ice and shifts in the availability of wildlife to hunters are growing problems. Climate change is also contributing to high mortality among walruses, unknown seal diseases, and smelly whales.

Zdor notes that a typical Arctic village consists of two categories of inhabitants. There are those who depend on traditional subsistence such as marine mammal hunting and reindeer herding and those who provide services to communities such as schooling and medical assistance. He adds that new technologies have contributed to the loss of traditional knowledge. For example, when eighteen-foot aluminum boats with motors of more than 100 horsepower appeared in the early 2000s along with high-tech positioning equipment, dependence on traditional knowledge and skills decreased. Respect for elders is also reduced. The result is a sharp contrast with traditional practices of living in harmony with the environment, herding reindeer, and harvesting marine mammals to satisfy local needs.

Open Discussion

An open discussion involving all conference participants ensued that produced a number of insights regarding the key questions addressed in Part III.

Regarding ingredients for success in achieving sustainable communities, most participants agreed on a range of factors including the following:

- A cluster involving the recognition of the rights of indigenous peoples, self-determination, and acknowledgement that the voices of Arctic residents need to be heard and respected.
- Strong and dedicated leadership, especially at the local level.
- The cultivation of open communication and trust, particularly in interactions between local residents and outside actors such as regional and national governments.
- Flexibility in economic activities (e.g. employment practices that allow individuals to engage in traditional subsistence activities).
- Focusing energy and resources on practical measures that can serve local needs.

Scientists have a tendency to identify specific variables in addressing such questions and to ask how much of the variance can be attributed to the effects of individual variables. But it may be that outcomes in specific communities are products of complex clusters of factors interacting with one another. If this is the case, we may not be able to come up with simple generalizations regarding the determinants of sustainability that would apply across a range of cases. Rather, we may need to construct narratives explaining outcomes in individual communities in which the various elements are familiar but they interact in complex ways to account for what happens in specific cases.

While the previous session on responsible economic development and this session may seem to reflect disparate perspectives on Arctic development, it is evident that there is a need for robust, active community consultation and participation in order to make economic projects sustainable. Success for both sides lies in the development of a two-way street along which outside companies become sensitive to community needs and local residents develop an ability to work together with outsiders.

Other insights emerging from the discussion:

- Shifting ground—It may be that the ground regarding community sustainability is shifting in ways that make previous practices or strategies less useful. This is most dramatically the case regarding biophysical forces like climate change where the circumstances facing Arctic communities may change radically over the next 10-20 years. But it is also true in other areas such as decision processes. Arctic communities may be compelled increasingly to pursue their interests through western processes that involve ways of framing questions and decision procedures that are alien to their cultures. The trick will be to find processes that satisfy indigenous and western procedures at the same time.
- Priorities—While adaptation to climate change is an obvious priority for many communities, it is far from the only priority concern. Many communities must confront immediate priorities relating to such matters as food security, suicide prevention, and other health issues that take precedence over adaptation to climate change.
- Cultural vitality—Maintaining cultural vitality (including language retention) is an important precondition for achieving sustainability in Arctic communities.
- Tradeoffs—Research suggests that the most effective way to address health issues (e.g. raising life expectancy) in Arctic communities is to

promote assimilation. But this leads to cultural erosion and may be costly in terms of other values. How should communities respond to issues of this sort involving difficult tradeoffs?

- Opportunities—There may be roles for local communities in the implementation of international agreements, such as the Arctic search and rescue agreement and the oil spill preparedness and response agreement. This could provide a rationale for improving infrastructure in some communities.
- Learning processes—One key to success is to promote mutual learning processes in which outside actors (e.g. corporations) and local organizations engage in good-faith efforts to adjust their expectations and practices in ways that improve the outcomes for all concerned on a step-by-step basis. Though controversial, some thought that the experience of Shell Oil in learning to partner with local communities in northern Alaska provides a good example.
- Preservation of identity—Does the preservation of identity depend on the retention of traditional lifestyles and cultural practices? What is the effect of the loss of language among members of younger generations? If a cultural group remains legally distinct, does it matter whether its members maintain traditional lifestyles?
- Economic opportunities—Are there some types of industries that might lend themselves to being pursued in remote locations without undermining distinct cultures at the local level? For example, many communities in India have achieved success with high tech activities that do not require moving to large urban settings. Are there analogs that might be suitable for the Arctic?
- Social indicators—It would help to devise a system of social indicators useful in tracking progress toward sustainability at the community level in the Arctic. But participants noted that the experience of the Arctic Social Indicators Project illustrates the difficulty in developing appropriate and especially quantifiable indicators.
- Role of the Arctic Council—A discussion of the role of the Council suggested that this body can highlight the concerns of Arctic communities by preparing reports (e.g. the Arctic Resilience Report) and analyzing the consequences of policy developments (e.g. a ban on heavy fuel oil in the Arctic) for the well being of Arctic communities.

PART IV: ARCTIC CHALLENGES AND OPPORTUNITIES FOR GLOBAL MARITIME INDUSTRIES

Over the last decade, many have commented on the great potential for Arctic shipping. No doubt the changing ice situation coupled with active encouragement from Russia, the country with the longest Arctic coast, spurred interest and attracted attention. Whereas a decade ago there was relatively limited international experience regarding maritime activities in the Arctic, today both commercial actors and analysts are engaged in detailed studies based on fresh data. It is therefore pertinent to revisit the outlook for Arctic shipping, based on the know-how and expertise developed by stakeholders and taking into account a major institutional development: implementation of the Polar Code.

In Part IV, six experts present their diverse perspectives on the development of the Northern Sea Route. Lawson Brigham argues that Arctic shipping now is about destinational shipping, independently operating carriers, and tourist traffic—not container ships. Icebreaking assistance is still needed in some instances, but the convoy system is a relic of the past. He stresses that it is important to counter the impression some have that shipping developments are mainly dependent on the changing ice situation. Global economic development and the demand and price for raw materials must be treated as major factors. Moreover, in understanding Arctic shipping vs. other shipping corridors, the critical issue is speed not distance. Lawson and others in this section note that even with steadily diminishing seasonal sea-ice cover, Arctic sea ice is likely to be more mobile, and navigation conditions may not always be less difficult than in the past.

In his review of Russian policies and developments in the Russian Arctic, Andrei Zagorski directs attention to the considerable gap between aspirations and policy declarations on the one hand and actual investments on the other. Whereas international transit still looms large in official statements, it is destinational shipping in the Kara Basin that is developing in reality. Developments certainly entail international use, but not international transit. For example, five Chinese ships brought equipment and materials to the port of Sabetta on the Yamal peninsula in 2016, but they did not carry out full transits of the Northern Sea Route. All major investments are connected to development in the Kara Basin, and further investments there in ports and a rail extension remain in the Russian State investment program for the Arctic. But overall the program has been reduced from 210 billion rubles ($3.6 billion) to just 51 billion ($0.9 billion). This means that plans for construction of a new series of super-icebreakers ("Lider") intended to facilitate year-round shipping in the eastern part of NSR are frozen. Reported delays in the construction of the Arktika series of three new nuclear icebreakers primarily intended to assist transportation of hydrocarbons from onshore projects in the Kara Basin seem to be caused by capacity problems at the shipyard and suppliers of components and not by financial constraints. Even with the successful completion of this series of icebreakers, there will hardly be any spare icebreaking capacity to escort transits. There are no cuts in military spending in the Arctic.

Frank Gonynor presents a perspective from insurance companies and classification societies. Naval insurance usually separates H&M (Hull and Machinery) and P&I (Protection and Indemnity) insurance. Classification societies are an important partner for both types of insurance. There is a common misperception that the insurance industry is out to prevent development of new, untested shipping routes. That is not the case. The industry sees its role as facilitating commerce, not preventing it. But there must always be a balance between safety concerns and new commercial opportunities.

In the Arctic, unlike other areas of insurance, there is little prior experience that can be used to assess risk, so the industry must learn before an accident happens. The Polar Code will be a great tool helping the industry to evaluate risk for various vessels. However, the industry needs more information to evaluate risk in order to get the premiums right. One big risk factor is the lack of salvaging capacity; another is unreliable weather forecasts.

The 2013 accident with the mobile offshore drilling platform *Kulluk* in Alaska illustrates an important point: You cannot totally eliminate risk. In this case study, no money had been spared in planning the moving of the platform, and there were plenty of redundancies. Whereas traditionally an important risk reduction strategy in the Arctic has been to avoid the ice, the cruise industry has another interest: they want to go near the ice, which is what the passengers have paid to see. The cruise of the *Crystal Serenity* through the North West Passage in August 2017 illustrates this point.

In the further development of conditions that may increase international shipping using the Northern Sea Route, the Russian government will be the primary actor. Insurance and classification societies have secondary roles.

Sung Woo Lee presents perspectives on how new logistical chains could be developed with the use of new advanced technologies, including those associated with the so-called 4th Industrial Revolution. There is a growing realization that international transits on the NSR will not develop as quickly as many Korean analysts had expected. But increased transport into the NSR area is occurring; shipments have gone to western Siberia. But we should also explore opportunities in eastern Siberia and Russia's Far East. Key factors here are new technologies for port infrastructure, including ports that can be moved to different locations on the big Russian rivers; automation that will reduce the need for manpower and that can also overcome some of the challenges associated with work in a harsh climate; and multi-modal voyages and new logistics networks combining several modes of transportation to bring raw materials out from the interior.

Natsuhiko Otsuka argues that the Japanese government is just catching up regarding the development of Arctic shipping. Development of practical ideas in this domain is left to the private sector. The local government of Hokkaido, however, is proposing a future perspective. The Japanese shipping companies meanwhile are currently only interested in destinational shipping. In principle, cargo owners can be interested in international transit if price and punctuality are addressed in an acceptable way. The port sector (in Hokkaido) is looking at possibilities to develop a direct trunk line to Europe

Providing the view of a young analyst, Mia Bennett takes an historical perspective, arguing that the recent excitement about Arctic shipping starting in approximately 2007 is not the first time Arctic shipping has been regarded as just around the corner. Now it seems that international transits are going down again. There is, however, a question that has not been asked in relation to international shipping in the Arctic: Can international transit shipping benefit local communities? The answer is probably no. Destinational shipping is different. It can create more jobs in ports as well as in the extractive industries. But there is a third form of Arctic shipping that has received little attention: intra-Arctic shipping between Arctic communities. Both in Russia and Canada the state is retreating from supplying Arctic settlements and there is little corporate interest in such operations. How can corporate interest in intra-Arctic shipping be encouraged? One answer may be the establishment of indigenous corporations. Another idea is to utilize cruises (with small cruise boats) to transport cargo to settlements, along the lines of the Norwegian Coastal Express (Hurtigruten).

Four Focal Points Emerging from Open Discussion

1. What are the most important factors influencing commercial interest in Arctic shipping: freight markets, perception of ice developments, security concerns? Are these perspectives changing?

The main drivers will be natural resource development rather than a market for containers. The ice cover is shrinking and may disappear completely during the summer season in a few decades, but ice will remain a big obstacle during parts of the year. Even with less ice cover, pack ice or drifting ice may constitute a big problem in some areas. There are also other negative climate developments: ice storms and erosion of coastline. Still, Russia does not develop policies based on expectations regarding improved ice conditions. For potential international users of Arctic shipping routes, improved ice conditions constitute a "teaser," attracting interest without being a decisive factor. An improved investment climate in Russia and positive economic growth rates there would likely spur increased use of the NSR. Arctic ports prioritize the function of moving goods. After that, tourism could be a growth area. Security problems along other shipping routes are for the time being not a major argument in favor of Arctic shipping. Correct risk assessments are key for commercial actors' interest in Arctic shipping. Shipping companies are focusing on low risk; cargo owners need improved risk information.

2. What will be the effect of implementation of the Polar Code on state regulators, shipping companies, and ship builders? Are there obstacles to successful implementation?

The code is uniform and non-discriminatory. Under Arctic port state control, individual ports will need to work rigorously. The Russian registry has participated fully in developing the Polar Code and has provided guidance. Polar Certificates will be included in NSR requirements in addition to rather than instead of Russian regulations. There is a question, however, regarding how strict the fulfillment of regulations will be, both by Russian authorities and users, based on the record. Only five percent of vessels sailing in the NSR area will fall under the provisions of the code. The Polar Code is seen as critical for the insurance industry. It will rely on certificates and manuals in assessments of ship capabilities. The Polar Code brings certainty for ship builders. The human dimension is the weakest link in the code featuring training of mariners. Most accidents are caused by human error. We also need to know that crews can implement the manuals in practice.

3. What are the requirements for development of extractive industries in eastern Siberia and Russia's Far East that will affect maritime logistics?

Commercial interest depends on stakeholders. Companies engaged in extractive industries see marine transport as optimal, though subsidies are needed. There is a need to develop new port technologies. New technologies require fewer workers. Natural resources are spread out over big areas. Movable ports may offer a solution. Permafrost melting will change technology requirements. But it was pointed out that other transportation alternatives (e.g. a railway connection to China) may become attractive. It was also noted that the development and implementation of new groundbreaking technologies constitutes a long-term challenge, whereas the demand for some of the raw materials located in the region may change or disappear completely.

4. Do we see a continued Russian interest in making the Northern Sea Route attractive for international users or is there a tendency toward more security-focused, inward looking Russian policies?

There is continuing rhetoric regarding the potential for international transits from the top Russian leadership. But other actors are more modest in their claims, and there is little commercial interest in transits. Many realize that more use requires more subsidies. The Russian military is against fully opening the NSR. At the same time, international participation is required to develop Russia's Arctic zone.

Conclusions

First, Arctic natural resource development will be the primary driver of near-term, if not longer-term, Arctic marine operations.

Second, the lack of marine infrastructure is an inhibitor of future Arctic marine transport, especially in the form of ports, salvage infrastructure, robust communications, observing systems, hydrographic charting, and more. Ice will remain a challenge, even during short periods of the year where sea-ice cover has diminished or disappeared

Third, the Polar Code is important as a source of predictability for all actors involved in Arctic shipping.

Fourth, most new icebreaking cargo carriers are designed to operate independently in ice without icebreaker support. The capabilities of these advanced carriers may limit the number of icebreakers required along the NSR and other Arctic marine routes. Nevertheless, with the development of resource projects in eastern Siberia, the Russian icebreaker fleet will be more or less fully employed.

Fifth, due to financial constraints Russia is cutting back on investments in the Arctic and is unlikely to sustain the level of subsidization required by commercial actors.

PART V: ENHANCING THE DIALOGUE BETWEEN PRACTITIONERS AND ANALYSTS

Part V of this volume comprises five perspectives that address fundamental issues regarding the science/policy interface that affect relations between practitioners and analysts who are concerned with key policy challenges in the Arctic, the most effective ways to communicate scientific findings to various audiences including the public, and research opportunities that can strengthen the dialogue between policymakers and analysts.

From the Korean perspective, Jong Deog Kim and Jeehye Kim focus on the Arctic Council as a forum for dialogue. There are six working groups within the Arctic Council. The authors argue that many of the 75 projects being carried out by these working groups require direct participation and support of scientists, even though 26 expert groups are functioning as part of the projects. In particular, the authors suggest that projects of the Arctic Contaminants Action Program (ACAP), theArctic Monitoring and Assessment Programme (AMAP), and the Working Group on the Conservation of Arctic Flora and Fauna (CAFF) need to be linked to scientific research. The authors also recommend that connections between the political agenda of the Arctic Council and national Arctic science research agendas need to be reinforced.

Yang Jian focuses on the programs of a new center in China: the China-Nordic Arctic Research Center (CNARC). He notes that in December 2013, after China was granted observer status in the Arctic Council, CANRC was established through joint efforts by Nordic and Chinese research institutes. Since then, the center has evolved from a nascent enterprise into a functioning entity that will eventually develop into a full-fledged platform for academic exchanges between China and the Nordic countries. The development of CNARC has drawn attention from other Arctic and non-Arctic states, marking a highlight of international cooperation on Arctic issues since 2013. Yang Jian comments on CNARC from the perspective of the science/policy relationship. He notes that it is in China's interest to work toward engaging China more fully in Arctic governance based on enhanced cooperation.

Paul Berkman strongly encourages the idea of creating evidence-based strategies for more informed decision making to achieve Arctic sustainability. He suggests that informed decision making for Arctic sustainability requires balancing among competing perspectives that can give meaning to science diplomacy. But science diplomacy must be based in an inclusive strategy, making science a tool of diplomacy. This strategy begins with questions, followed by data and evidence, with options presented to support informed decisionmaking. Berkman notes with emphasis that we live in a globally interconnected civilization; there is a need to balance *security time scales and sustainability time scales. In short, we live in the global commons*!

Malgorzata Smieszek addresses the issue of bridging science and policy in the Arctic Council in a time of increasing political stakes. She suggests that there is an urgent, recognized need to bridge the gap between science and policy, enhancing the use of scientific knowledge as a basis for decision making. Science is held to be an essential component in addressing global challenges like climate change and achieving sustainable development in such forms as the UN's Sustainable Development Goals. Science and research play a major role in mitigation and adaptation to rapidly changing environmental conditions; the scientific community is being called upon to provide evidence and advice to policymakers across a wide range of issues. Yet science and policy constitute two distinct systems of behavior whose goals are ultimately different. Whereas the purpose of research is to produce knowledge, the purpose of policymaking is to produce authoritative decisions on behalf of a society or a group. Smieszek further suggests that we need to move from the use of the simple word "science" to phrases like science information or scientific insights, as it is essential that we do not impose our scientific perceptions on the identification of social needs. We need to ascertain the interests and needs of the audience in order to develop knowledge that is socially relevant.

Providing the view of a young analyst, Zhimin Mao begins by noting and acknowledging that there are serious uncertainties concerning the Arctic, especially since the Arctic region is undergoing an unprecedented transition period. The climate is changing rapidly, with rising temperatures leading to retreating sea ice and changes in weather patterns. For a long time, this vast region was isolated from events occurring in other parts of the world, with minimal commercial and political connections. However, changes in climate and ecosystems have spurred increased attention from the international community regarding economic potential in the Arctic. Rising temperatures and declining sea ice can increase competition for natural resources and create interest in new shipping routes. Inevitably, we expect to see far reaching political developments happening in the region. Complicating the situation are numerous uncertainties. There is a range of possible projections for the Arctic's future environmental conditions and accessibility of its natural resources. Mao describes the way the International Institute for Applied Systems Analysis developed an air pollution science-to-policy methodology that incorporates a transparent process and modeling system (the Regional Air Pollution Information and Simulation or RAINS model) that enables scientists to work with the policymaking communities. She notes the need to scale the model to the negotiating needs. A global scale may be adequate where a finer scale might be more detail than is needed. She suggests that we use scenarios as they provide a range of options, building confidence among policymakers.

Six Central Themes

Efforts to strengthen evidence-based policymaking should be driven by understanding users' needs not by scientific research priorities. These needs are not always known in advance; they should be identified collaboratively and iteratively in ongoing two-way communication between knowledge producers and decision makers. This suggests a suite of focused themes:

- Give priority to processes that engage practitioners and analysts. To get the right products, start with a well thought out process. Decision making/policy support in the science-policy process is not merely about producing the right kinds of information products.

- Link information producers and users. The science-policy processes require networks and institutions that link information producers and users. The cultures and incentives of science and practice are different for good reason, and those differences need to be respected if a productive and durable relationship is to be built. Some ways to accomplish this rely on networks and intermediaries, such as boundary mechanisms or boundary organizations.
- Enhance connections across disciplines and organizations. Science-policy processes will increasingly need to account for the multidisciplinary and interactive character of knowledge needed for evidence-based policymaking.
- Establish stable processes. The science-policy dialogue will need stable support, both institutionally and materially. This is likely to be achieved through more formal institutional arrangements. Stable systems are able to achieve greater viability, longevity, and effectiveness.
- Design the process so that it explicitly includes learning. The science-policy dialogue should be structured for flexibility, transparency, and adaptability; it should include explicit ways and means to enhance learning from the process. One learning mechanism is described as "Deliberation with Analysis," an iterative process that begins with the participants in decision making working together to define objectives and other parameters, then working with experts to generate and interpret decision-relevant information, and then revisiting the objectives and choices based on that information. An example involves analyzing in real time the consequences of a candidate decision, such as a negotiated strategy for reducing GHG emissions. Through analyses and model runs, participants can see the implications of a candidate emission reduction strategy during the negotiating process. Based on this learning process, a more acceptable candidate emission strategy can be designed.
- Develop strategies for identifying research gaps and needs. Research needed to enhance the science-to-policy process should be driven by users' needs. In other words, it should be demand-based science or what some call use-driven science, balanced by scientific research that emerges from the science community as supply-driven science.

NEXT STEPS FOR NPAC

Going forward, a new series of North Pacific Arctic Conferences (2018-2020) will seek to stimulate innovative thinking about Arctic issues within a global context and to explore the foundations for a sustainable Arctic future. The overarching theme for this new series is *The Arctic in an Age of Global Change*.

The Arctic is emerging as a distinct region within an increasingly globalized system that is rapidly changing environmentally and technologically in ways that have profound implications for the future of the Arctic as well as for the Earth system as a whole. The impacts of climate change are unfolding more rapidly in the Arctic than in any other part of the Earth system, and these impacts are triggering feedback processes that are accelerating climate change. A prominent example is the melting of sea ice, which reveals more open water that absorbs more solar radiation, setting in motion a positive feedback loop that accelerates the dynamics and rate of climate change.

Global geopolitical and geo-economic developments are also tightening the connections between the global system and the Arctic. The era of American hegemony is giving way to a new form of multi-polarity. Asian states are increasingly interested in opportunities in the Arctic, partly triggered by the receding ice. At the same time, these states are taking initiatives in international governance, including in the Arctic. China in particular is emerging as an increasingly prominent player on the global stage. As the country with the longest Arctic coastline and most extensive Arctic maritime zones, Russia will always play a crucial role. Russia's enhanced orientation toward partnerships with China may have profound consequences for Arctic development.

It is perhaps premature to label the 21st century the Pacific Era. But there is no doubt that the center of gravity in world affairs is shifting from an Atlantic focus to a Pacific focus. This will increase the prominence of NPAC as an informal forum in which knowledgeable individuals from the major Pacific Rim states and from both the public sector and the private sector can engage in wide-ranging and innovative discussions regarding Arctic issues seen through a Pacific lens.

Within this framework, NPAC 2018 will focus on *Arctic 2030 – Pathways to the Future*. The intent of this framing is to focus attention on emerging Arctic issues and to think creatively but rigorously about likely trajectories of these issues during the intermediate future. The choice of 2030 as a target for this conference reflects several considerations. This date takes us far enough into the future to encourage innovative thinking, without going beyond the bounds of what can be analyzed in a systematic way. In addition, 2030 has emerged as an important date in the work of both the Arctic Council and the United Nations. The Arctic Council has selected 2030 as the target date for its ongoing process of strategic planning. The implementation period for the UN's Sustainable Development Goals (SDGs) runs through 2030, and the UN has launched what has become known as *Agenda 2030 for Sustainable Development*.

Notes

1. Many of the following points are based on Session Chairs' Reports from the 2017 North Pacific Arctic Conference prepared by Charles Morrison, Bernard Funston, Robert W. Corell, Oran Young, David VanderZwaag, Yoon H. Kim, and Arild Moe.

PART I

THE ROLE OF THE ARCTIC IN A CHANGING GLOBAL ORDER

Finland's Chairmanship Program for the Arctic: Setting Priorities

Timo Koivurova

The main task in my presentation is to examine how and why Finland chose certain priorities for its Arctic Council chairmanship program 2017-2019. Before I discuss why certain elements dominate the program, it is important to understand what it means to be chair of the Arctic Council.

The chairmanship of any intergovernmental forum or organization is a role that is identified and defined by that specific international institution. Hence, the chair is expected to advance the goals, values and objectives of that intergovernmental institution, rather than using the chairmanship to advance its own interests.[1] This is important to realize if one wants to understand why the Finnish chairmanship opted for certain priorities. Drafting a chairmanship program differs from the process of producing a national Arctic strategy, which defines the main interests of a particular state with regard to the Arctic.

Some economic actors in Finland criticized the program as insufficient to advance national business interests. This was due to misunderstandings on the part of some companies and interest-based organizations, since the chairmanship of the Arctic Council is not really supposed to advance the economic exploitation of the Arctic. Instead, the forum exists in order to advance environmental protection and sustainable development in the region. The Arctic Economic Council (AEC) is an independent (and indirectly connected) international organization that exists to advance business interests in the region.[2] It may be that some Finnish companies thought at the beginning of the program's preparation that this is a process similar to the one that produced the latest full version of the Finnish Arctic strategy in 2013. That process emphasized ways to advance the business interests of Finnish companies in the Arctic in general. It seems that these misunderstandings were solved when the AEC and the Arctic officials started discussions, which were seen as fruitful by both sides and led also to better understanding of what can be attained both with the AC chairmanship and the AEC chairmanship. The foreign ministry's Arctic officials perceive that Finland's chairmanship priorities also advance business interests, albeit indirectly. For instance, better connectivity and meteorological information provide information infrastructure for companies to function, not simply in the Finnish north, but in the entire Arctic region.

Even if the chair leads the Council during its two-year term, this does not mean that it will lead all the Council's work. There needs to be one person, the chair of Senior Arctic Officials (SAOs), who must be aware of what happens in all components of the Council. Finland's responsibilities include organizing (together with the Arctic Council Secretariat) the meetings of SAO's, meetings of the Sustainable Development Working Group, and, obviously, the final ministerial meeting that serves as the culmination of the chairmanship.

The chair is expected to oversee many issues in its chairmanship period. For instance, the chair is in charge of disseminating information and participating in relevant international seminars, conferences, and meetings of other intergovernmental organizations. Important duties include maintaining contact with the observers and representing the Arctic Council in other forums. Good chairmanship is not only about following the procedural rules, but also includes ensuring compromise and steering countries toward consensus and away from tensions and disruptive issues, which could bring multilateral cooperation to a halt.

With this background, we know that Finland, like any state preparing for its AC chairmanship, needed to define its priorities in a way that would serve the values, goals and objectives of the Arctic Council, while remaining acceptable to the other seven Arctic states and permanent participants.

Finland has organized its priorities around four individual goals (environmental protection, connectivity, meteorological cooperation, and education), as well as two crosscutting priorities (implementation of the Paris Agreement and advancing the UN Sustainable Development Goals in the Arctic Council). In addition, the document outlines areas of work of the Arctic Council (environment and climate, seas, people, and strengthening the AC) that Finland will continue to advance. Hence, Finland as a chair lists all the relevant actions that it needs to continue as the chair of the Council, which are based on projects that have been instituted prior to its chairmanship.

HOW FINLAND PREPARED FOR THE CHAIRMANSHIP

Our foreign ministry's Arctic officials commenced this process in 2015, and there were many discussions in Finland and abroad well before the first presentation of the program at the October 2016 SAO meeting. Following the good practice established by the previous chairs, Finland consulted with all the other member states about its proposed priorities. Finland also organized a joint meeting with the permanent participants, which apparently was the first time that all the permanent participants were able to comment on the incoming chairmanship priorities. The Finnish Sami parliament was also consulted, even though that body does not have a seat in the Arctic Council. This demonstrates how carefully Arctic officials in the foreign ministry wanted to have the country's priorities discussed and agreed upon well ahead of the start of the Finnish chairmanship.

FINLAND'S PRIORITIES

Finland's priorities stem from those expertise areas of the country where it has already gained world-class status.

The education priority focuses on creating a network of experts to improve the capacities of teachers who are committed to educating the younger generation in the Arctic region. It is widely agreed in Finland that an emphasis on qualified, respected teachers is one main reason for the strong status of country's education system. Finland also took a strong role in giving birth to the University of the Arctic. The circumpolar coordination office of the UArctic was established in 1999 as part of the University of Lapland, and in 2001 the official launch of the UArctic took place in Rovaniemi. Together with the UArctic, the Chair's aim is to create a network of educators, with a goal to develop new methods (such as how to use the potential of digitization for education in the Arctic) and best practices to assist Arctic teachers (early-childhood, primary and lower secondary education).

Meteorological research has a strong standing in Finland, with the Finnish Meteorological Institute as the leading institution. Foreign ministry officials perceived that cooperation in meteorological and oceanographic fields has much to contribute to understanding of the Arctic, given that better ice monitoring and weather services are needed, and that air and ocean observation networks need to be strengthened. Importantly, better meteorological and oceanographic cooperation will assist in attaining more accurate climate science results. With this in mind, Finland proposed that cooperation among the Arctic states also include "collaboration with the World Meteorological Organization." When the chairmanship program was being prepared, WMO had already filed its application to become an observer in the AC, which was accepted during the Fairbanks ministerial meeting in 2017. Discussions with the leadership of the meteorological institute and the foreign ministry influenced how this priority area emerged.

Finland has a strong high-tech track record, so connectivity was seen quite early on as one primary focus area. In the minds of the Arctic officials preparing the program, the work already done by the Task Force on Telecommunications Infrastructure in the Arctic (TFTIA) was critical, since it was easier to focus on connectivity in general in the Arctic given the existing work the task force had already completed. Also important were discussions with the leadership of the Arctic Economic Council, as the Council was better able to incorporate the strategy work that the AEC had completed in this field as well. Foreign ministry officials said that discussions with the AEC and its leadership were important in finding a way to bring together these two organizations and their work, in what Finland saw as important priority areas. The focus of this priority area is to create well-functioning communication networks and services, including basic infrastructure such as satellite connections, mobile communication systems, low-bandwidth transmission, and sea cables. These are seen as lifelines for human activities in the Arctic, given the region's sparse population and the long distances between communities. The program recognizes that broadband access facilitates e-learning, enables the development of digital health and social services, and allows connectivity to media.

Finland has also a strong environmental protection system and the country has participated in global environmental protection efforts actively (primarily as a member state of the EU). When the chairmanship program was in its infancy, Arctic officials were thinking that Finland would also have three priority areas, similar to the period of the U.S. chairmanship. At first, environmental protection was seen as too obviously represented by the work of the Arctic Council, especially its work on climate change, which was being followed closely by Ministry of the Environment officials. However, after meeting with leadership of the ministry, it was decided that environmental protection still needed to be a priority area, in addition to being addressed in many other program areas. This late addition as a priority area is visible in the fairly meager content reflecting this priority, mainly emphasizing that the Arctic Council should continue its focus on "biodiversity conservation and pollution prevention, as well as mitigation and adaptation to climate change." Still, there are two issues that remain stand-alone goals for environmental protection. Finland wants to place more emphasis on communicating the recommendations that accompany assessments of the Arctic Council, as well as the results of its assessments, in global forums. Another proposal, even if quite abstract, is to expand the exchange of information on best practices and emerging technologies that promote sustainable and responsible development in the Arctic.

CROSSCUTTING PRIORITIES

One of the major issues for the foreign ministry, when they commenced drafting the program, was to consult with officials from the United States. The U.S. position has been highly visible, if occasionally inconsistent, with regard to climate change. The momentum leading to the adoption of the Paris Agreement was a major impetus of the U.S. chairmanship, and Finland followed suit in adopting it as one of its crosscutting priorities to remain true to the Council's policy of continuity. It is interesting to note that just before the Fairbanks ministerial, the new U.S. Trump administration challenged the adoption of the declaration, and especially references to the Paris Agreement and the SDG's. Yet diplomats of the other Arctic countries were able to convince Secretary of State Rex Tillerson of the importance of having these issues included in the declaration. As such, the declaration was accepted with reference to the Paris Agreement, even if Secretary Tillerson did note in the final session that the current administration had not yet taken a final stance as to whether they would remain a Party to the Paris Agreement.

With regard to adaptation to climate change consequences, the Paris Agreement deviates from previous decisions and instruments adopted in the global climate regime in that it no longer focuses primarily on developing states, but instead covers all states. Since climate change adaptation is more relevant in the Arctic Council (even if there is also some work being done on mitigation, such as the program aimed at reducing black carbon and methane), it is highly likely that the adaptation work in the Arctic Council will be strengthened and will also receive more prominent visibility in the global climate change agenda.

From the earliest stages of preparing the Program, Arctic officials considered how the Finnish chairmanship might advance the UN SDG's for 2030 in the work of the Council. Even if the AC has focused on sustainable development from the beginning, no chair has ever tried to link closely with the UN's sustainable development work, with one small exception (Finland as a chair gave a presentation on the work of the Arctic Council at the UN's 2002 Johannesburg Summit). Clearly, the UN SDG agenda is highly relevant in the Arctic. However, it was by no means clear that UN SDG work should be introduced to the work of the AC, since sustainable development issues in the Arctic had been dealt with outside the UN framework. Why, then, did Finland include this priority in its chairmanship program? Finland has, together with other Nordic states, invested substantially in putting the UN SDG's into practice, and the country has progressed well with its national implementation of the SDG's.[3] Hence, there is lot of expertise and political will in the country for broadening the work on the SDG's in other cooperative forums as well. Also, Finland was the first member state of the AC to confront the SDG's that had been adopted by the UN General Assembly in September 2015. The SDG's were also negotiated to be a significant part of the SDWG Strategic Framework (2017-2030) during the same years when Finns were preparing their chairmanship program.

CONCLUDING REMARKS

When we try to find reasons why certain priorities emerged for the Finnish chairmanship program, it is of utmost importance to perceive the chairmanship as part of the Arctic Council's history and ethic, a body where a country is expected to serve the goals of the institution. As we have concluded in our earlier work, the current Finnish chairmanship differs from the time when Finland first chaired the AC from 2000-2002.[4] Today, the program is much more ambitious and broader in scope. The reason for this is not that Finland somehow wanted to invest more in the Arctic Council chairmanship now than during its 2000-2002 tenure, but rather that the Arctic Council itself has become a much more ambitious governance institution with broader activity areas. This is especially clear in the way that oceans and seas are now addressed in the program. In the previous chairmanship program, oceans were not addressed as a separate consideration. Now the program contains a sizeable section on sea-related policies. This is mostly due to the fact that the Arctic Council's work nowadays contains so many projects addressing the Arctic Ocean and its adjacent seas.

Finnish ministry officials said that an important inspiration for prioritizing its program came from those institutions that had a deep understanding of what the Arctic Council chairmanship entails, and were committed to making a positive influence on it. For instance, discussions with the leadership of the AEC and the meteorological institute were clearly important in influencing the fairly strong role of the AEC in the Finnish program as well as the meteorological cooperation priority area. Ministry officials also felt that maintaining connections to the science community were important, including contacts with the UAarctic, participation in scientific symposia, and the work that the Arctic Centre consortium has made (which I will discuss in my presentation on scientific opportunities).

Finland's approach to drafting its chairmanship program can be understood in light of what we expect normally of a small state that relies heavily on international institutions and international law. Finland wants its program to make the Arctic Council stronger in many ways.[5] The country also places substantial emphasis on global regulatory developments that have been nurtured under the United Nations, such as the Paris Agreement and the SDG's. On the other hand, it is also the case that any country assuming the chairmanship of the AC needs to pay attention to global and international normative developments. This is due to the fact that as a regional intergovernmental forum, with environmental protection and sustainable development as main parts of its mandate, the Council by necessity deals with global and regional normative developments.

Notes

1. This is at least so in principle. While national interests often loom in the background, the chair's priorities also serve to consolidate that nation's Arctic expertise.
2. For instance, Canadian chairmanship was more business-oriented, but this business orientation was manifested in facilitating the establishment of the AEC. It would be difficult to imagine how the Finnish chairmanship could actually be more business-oriented, especially that digitalization is one of the priorities, which directly links up with the main focus of the current AEC work.
3. See the country ranking at https://www.bertelsmann-stiftung.de/en/topics/aktuelle-meldungen/2016/juli/countries-need-to-act-urgently-to-achieve-the-un-sustainable-development-goals/.
4. Timo Koivurova and Malgorzata Smieszek, *From the Rovaniemi Process to Exploring Common Solutions: Finland's Priorities in the Changing Arctic*, at http://www.worldpolicy.org/blog/2017/06/08/rovaniemi-process-exploring-common-solutions-finland%E2%80%99s-priorities-changing-arctic.
5. For instance, cooperation between outgoing and incoming chairmanship, stronger co-operation with independent organizations that have been established directly or indirectly by the action of the AC (in particular the AEC, but also UArctic, and less so the Arctic Coast Guard Forum and the Arctic Offshore Regulators Forum) and long-term strategy for the Arctic Council. Finland also places strong emphasis on the work with the observers, and has already presented the program to vast amount of observers.

China's Key Arctic Policy Challenges

Gao Feng

First of all, I would like to express my heartfelt appreciation to the East-West Center and the Korea Maritime Institute for inviting me to the 2017 NPAC Conference. It is an excellent opportunity to share views and practices involving Arctic issues of mutual interest with policy makers and experts from the North Pacific Region. This is my first NPAC meeting. I am grateful for to the presentations and discussions, which I believe will inspire us with useful suggestions and ideas for our common goal: a brighter future in the Arctic.

Today, as an Arctic policy practitioner, I would like to share some of my personal observations regarding China's key Arctic policy challenges.

The Arctic environment is now experiencing rapid changes. During the past 30 years, the Arctic has witnessed rapid temperature rise and continued decreases of sea ice cover. Together with those observed changes, we have also seen new economic opportunities to both the Arctic and the world. Arctic issues have expanded beyond national and regional scope, increasing the region's global significance and now affecting the interests of non-Arctic states and the international community as a whole.

To date, China hasn't publicized its Arctic policy. However, during our participation in Arctic affairs over many years, we have always identified ourselves as both an important stakeholder in the Arctic and a "near-Arctic state" that is affected on many levels by Arctic policy. Over the years, we have built on four basic principles to guide our attitude and activities in the Arctic: respect, cooperation, win-win and sustainability.

"Respect" is a concept that involves mutual engagement. Guided by international law as reflected in the United Nations Charter, Law of the Sea Convention, and other relevant international norms, the sovereignty, sovereign rights and jurisdiction of the Arctic states, as well as the traditions and culture of Arctic Indigenous People, should be respected. Similarly, the legitimate rights and freedoms of non-Arctic countries and the collective interests of the international community should also be respected.

"Cooperation" is meant to build a multi-tiered, full-dimensional, and wide-ranging cooperative relationship in Arctic affairs at global, regional and national levels. These goals should be achieved through bilateral and multilateral channels, involving all actors, including both Arctic and non-Arctic states, international organizations, private sector actors and other relevant stakeholders. The goals should include all possible areas where cooperation is needed, such as climate change, scientific research, environmental protection, shipping, resource development and people-to-people exchanges.

"Win-win" is meant to pursue mutual benefit among different stakeholders in the Arctic so as to achieve harmonization across all relevant fields. A win-win result should be a general benefit and well-being obtained by all participants and stakeholders, including Arctic residents and indigenous communities. A win-win result is also aimed at achieving coordinated development in various areas, including the coordination of conservation of the natural world and social development in the Arctic.

"Sustainability" is meant to achieve sustainability in the Arctic with respect to conservation of the natural environment, as well as all types of uses and human activities. Our goal is to realize a peaceful and lasting coexistence between man and nature, preserve the ecological environment, our economies and social life, strike a balance between utilization and protection of the Arctic, and to achieve inter-generational equity between this and future generations.

Under the guidance of these four principles, China takes science as the priority of our engagement in the Arctic. Scientific activities include focusing on environmental protection, advocating rational use, upholding rule-based governance, and promoting international cooperation, peace and stability in the Arctic. Through four interconnected steps—understanding, protecting, using and managing the Arctic—China hopes to achieve sustainable development in the Arctic and contribute to the common interest of the international community.

Currently, our major Arctic policy challenges are the following:

Firstly, our understanding of the Arctic needs to be deepened. China is still in the process of formulating its Arctic policy. China acceded to the Svalbard Treaty in 1925. Nevertheless, because of World War II and other factors, China's involvement in Arctic activities has only gradually gained its depth and breadth since the 1990s. Generally speaking, China's understanding of the Arctic has just started. We still need to do much more research and exploration in order to further deepen our understanding and help formulate future policies.

Secondly, our domestic mechanisms with regards to Arctic affairs need to be better coordinated. Lacking a single agency that has the authority to handle all Arctic issues, many different governmental departments and research institutes are involved in one or more aspects of the Arctic. In 2011, approved by the State Council, an inter-agency coordination mechanism for Arctic affairs was established, headed by the Ministry of Foreign Affairs and including 19 other governmental agencies that cover all aspects of the Arctic. Up to now this mechanism is functioning very well. However, much is still to be done to improve it, especially regarding our internal information sharing and coordination of different activities.

Thirdly, our international cooperation relating to the Arctic is to be enhanced. China is a non-Arctic state, and our participation in Arctic affairs will be more difficult without cooperation from the Arctic states and other non-Arctic countries, or without engaging in relevant global mechanisms. The degree of this international cooperation will directly affect implementation of China's Arctic policy.

China has always been an active participant, facilitator and contributor in Arctic affairs. China has long been dedicated to enriching the global knowledge of the Arctic, to upholding the principle that Arctic activities should be carried out in accordance with international law, and to strengthening mutual exchanges and cooperation across various fields with many countries and international organizations. China has also widely participated in the rulemaking and institution building in relation to the Arctic. China is now formulating its own Arctic policy, a process that includes both internal and external factors and challenges.

On the one hand, China will continue to build up our own capacity in Arctic affairs, making every effort to address the four challenges mentioned above. On the other hand, China is firmly committed to promoting international cooperation with all stakeholders in addressing the trans-regional challenges brought by Arctic changes, seizing emerging opportunities, and contributing our wisdom and strength to the development of the Arctic.

Korea's Arctic Policy and Activities

Young-jun Kim

INTRODUCTION

Korea's engagement in the Arctic region dates back to 1991, when Korea first conducted a basic Arctic survey. Some of the important milestones in Korea's Arctic activities include the following: Korea joined the International Arctic Science Committee (IASC) in 2002; the Dasan Arctic science station was established in Svalbard in 2002; the Korea Polar Research Institute (KOPRI) was established in 2004; Korea built its first ice-breaking research vessel *Araon* in 2009; and Korea joined the Arctic Council as a permanent observer along with Japan and China in May 2013. Korea established its official policy on the Arctic by adopting the Arctic Policy Master Plan in December 2013.

KOREA'S ARCTIC POLICY MASTER PLAN

The Master Plan is the first integrated Arctic policy coordinated by multiple governmental agencies in contrast to a single unified national strategy. The overarching vision of the Master Plan is to contribute to a sustainable future for the Arctic by enhancing cooperation with the Arctic states and relevant international organizations in the areas of science, technology and economy, especially by participating in the Arctic Council and its working Groups.

The first Arctic Policy Master Plan sets forth four major goals for the period from 2013 through 2017, including the following:

1. Strengthening international cooperation: Korea has tried to expand activities in the Arctic Council and among its members. It has participated in cooperative programs of Arctic-related organizations and facilitated private and academic initiatives.
2. Enhancing scientific research activities: The Master Plan supports scientific research in Arctic stations, in order to build science infrastructure in the Arctic, carry out more research on climate

change in the Arctic, and launch a spatial information project to enhance a safer Arctic.

3. Exploring new business opportunities in the Arctic: The Master Plan aims to assess the feasibility of the Arctic Sea Route, facilitate the development of Arctic technologies, and seek cooperation in the fisheries sector.
4. Developing domestic institutional foundation support: Korea is pursuing the enactment of legal grounds for cooperation in the Arctic region, and for building a polar information service system.

To implement this first Master Plan, detailed action plans are created and updated every year.

FUTURE POLICY DIRECTIONS: THE SECOND MASTER PLAN

As the first Arctic Policy Master Plan covered a five-year period from 2013 through 2017, Korea is now preparing its second Arctic Policy Master Plan for the next five years, from 2018 through 2022. The second Arctic Policy Master Plan will build upon lessons learned during the period of the first Master Plan. The focus will continue to be on supporting Arctic scientific research, increasing cooperation to address climate change in the Arctic, building cooperation with Arctic indigenous communities, and identifying sustainable business opportunities in the Arctic. The second Master Plan is to be publicized around the end of 2017. In addition, in order to enhance capability for Arctic research, Korea plans to build a second ice-breaking research vessel. The vessel's construction is slated to begin in 2018, and the ship is projected to enter service by 2022.

KOREA'S ARCTIC ACTIVITIES

Based on the Master Plan to date, Korean governmental agencies have carried out various projects and activities on the Arctic, both internationally and domestically, to achieve its vision of contributing to the sustainable future of the Arctic. Korea's Arctic activities are focused in two directions. The first direction is to contribute to address the challenges of climate change in the Arctic by promoting scientific research activities. The second is to explore business opportunities in the Arctic, especially those arising from the opening of Arctic sea routes. All these activities should be conducted and achieved through global, regional and local cooperation. Korea's observer status on the Arctic Council has brought a great opportunity to promote shared interests and cooperation in the Arctic. Obtaining this status has played a significant role in laying the groundwork for establishing relations with the Arctic Council's Working Groups and Task Forces, and for strengthening bilateral and multilateral cooperation with various stakeholders in the Arctic, including the region's Indigenous Peoples.

KOREA'S ACTIVITIES IN THE ARCTIC COUNCIL

Korea has participated regularly in Arctic Council activities since joining the Council as an observer in May 2013. Korea recognizes the vital role that the Arctic Council has played as the premier forum on Arctic issues in promoting peace and cooperation throughout the region for the last 20 years. Firmly committed to promoting sustainable development and protecting the Arctic environment, Korea has regularly attended the Senior Arctic Officials (SAO) meetings and the Ministerial meetings, and has participated in working groups (AMAP, CAFF, PAME, EPPR, SDWG), task forces (SCTF, TFAMC), and expert groups (EGBCM). The SAO meetings serve as useful opportunities to keep abreast of the current priorities and issues of the Arctic Council, and to introduce Korea's Arctic-related activities. Korean experts, mostly members of the Korea Arctic Experts Network (KAEN), attended approximately 30 meetings of the subsidiary bodies of the Arctic Council over the past two years. Notable Korean activities in the working groups include: participation in the Arctic Indigenous Marine Use Mapping Project led by AIA under PAME, which aims to produce a tool based on established techniques and open-source software that allows coastal indigenous communities to produce their own scientifically informed maps identifying their marine use; contribution to the Arctic Migratory Bird Initiative (AMBI) under CAFF, especially through sharing data on carrying capacities and habitats of migratory birds in the Yellow Sea area; and the voluntary submission of a national report on black carbon and methane to the EGBCM. In addition, efforts have been made to explore cooperation with the Arctic Economic Council (AEC). Currently, Korea is discussing plans with the AEC to host an AEC event in Korea toward the end of 2017.

INTERNATIONAL COOPERATION: BILATERAL CONSULTATIONS AND INTERNATIONAL FORUMS

In order to promote cooperation on Arctic issues, Korea maintains bilateral Arctic consultations with most of the Arctic states. This year, Korea plans to hold bilateral consultation meetings with Norway, Russia, Finland and Canada, and in 2018 with Denmark and Iceland. Korea also pursues cooperation with other observer nations of the Arctic Council through various activities. In view of the significant potential of observers to contribute to the Arctic, Korea took the initiative in convening the Trilateral High-Level Dialogue on the Arctic among Korea, Japan and China. The first Trilateral Dialogue was held in Seoul in April 2016; the second Dialogue was held in Japan in June 2017. In addition, Korea attended the fourth Meeting of the Observer States in the Arctic Council in Warsaw, Poland in April 2016. The observer sessions introduced by the U.S. chairmanship, which were held on the margins of the SAO meetings, were very helpful for the observer states' representatives. Therefore, all observer states strongly hope this practice of engaging observers will be maintained under the Finnish chairmanship. In addition, Korea has participated in international forums on the Arctic including Arctic Frontiers, the Arctic Circle assembly, and the annual international meeting on the Arctic in Russia. Korea hosted the Korean Night event at the Arctic Circle in Reykjavik in October 2015 and plans to organize breakout sessions at this year's Arctic Circle assembly, as it did last year. Korea is considering hosting an Arctic Circle regional forum in Korea toward the end of 2018. Lastly, since 2011 the Korea Maritime Institute (KMI) has co-hosted the annual North Pacific Arctic Conference (NPAC) with the East-West Center in Hawaii.

ACTIVITIES IN SCIENTIFIC RESEARCH

As for Korea's Arctic research activities, the Korea Polar Research Institute (KOPRI) is the leading agency for the national polar program.

To contribute to advancing Arctic scientific knowledge, KOPRI has been conducting research, utilizing platforms such as the Dasan Arctic Research Station in Svalbard and the icebreaker research vessel *Araon*. In 2017, *Araon* conducted a 70-day research expedition from 21 July through 29 September in the Bering, Chukchi, and East Siberia Seas. KOPRI is actively engaged in scientific cooperation with Arctic states, and also in international scientific collaborations through the International Arctic Science Committee (IASC) and the Pacific Arctic Group (PAG). Currently KOPRI has established partnerships (such as Memorandums of Understanding) with about 70 polar research institutes in 21 countries including the United States, Russia, Canada, Norway, Finland, the United Kingdom, Germany, Japan, and China. In particular, KOPRI has been working on the Circum Arctic Permafrost Environmental Change monitoring (CAPEC) program, a multidisciplinary project which aims to track ongoing environmental changes in the circumarctic permafrost with observation sites at Council in Alaska, Cambridge Bay in Canada, Svalbard in Norway, Nord in Greenland, and Storhofði in Iceland. A sixth post began operations at Baranova, Russia in October 2017.

SUSTAINABLE ARCTIC BUSINESS

To date, Korea has mostly engaged in Arctic business in the fields of shipping and ship-building. Korean companies made the first test navigation through the Northern Sea Route (NSR) in 2013 and sent ships through the route three times in 2016. In particular, one of the companies took an innovative approach by combining the NSR with internal waterways (the Ob and Irtysh Rivers) in Russia. These voyages reaffirmed that that the NSR is a shorter route to connect Asia and Europe, compared to the southern route via the Suez Canal. Also, Korea has been taking necessary steps to implement the Polar Code, which entered into force on January 1, 2017, by preparing domestic laws and providing training courses related to the Polar Code to mariners. In addition, Daewoo Shipbuilding & Marine Engineering (DSME), a leading Korean shipbuilding company that was awarded a contract to build a total of 15 Arc-7 class ice-breaking LNG carriers for the Yamal project, delivered the first of these vessels in March of 2017. The vessels are the world's first liquid natural gas (LNG) carriers that have ice-breaking functions. A single vessel can carry 170,000 of

LNG, an amount that is equivalent to two days' worth of consumption in Korea, for example. Moreover, Korea has been participating in negotiations aimed at preventing unregulated commercial fishing in the high seas area of the Central Arctic Ocean.

OTHER ARCTIC-RELATED ACTIVITIES

Korea carries out a series of other activities related to the Arctic. KMI organizes the Korea Arctic Academy (KAA) every year, a ten-day long exchange program between Arctic and Korean youth. Since 2015 the KAA has invited about 40 students from Arctic nations, half of them from indigenous communities, to come to Korea for a highly engaging and productive program consisting of lectures about the Arctic, as well as field visits. The third Korea Arctic Academy was held from July 6 to 15 in 2017, and a total of 21 Arctic-nation students and ten Korean students participated in this year's program. Korea also organized the Arctic Partnership Week, a series of seminars, events, and exhibitions related to the Arctic, encompassing a wide range of topics such as policy, science, shipping, and cultures, in December 2016. It was highly successful, attended by more than 1,000 participants not only from Korea, but also from Arctic and non-Arctic countries including Norway, Finland, Russia, and China. Korea organized the second Arctic Partnership Week in the second week of December 2017. Korea is a member of the North Pacific Arctic Research Community (NPARC), a network of approximately 20 universities and research institutes in Japan, China and Korea. In December 2017, the annual NPARC seminar was scheduled to take place in Busan, Korea in conjunction with Arctic Partnership week, to promote cooperation among researchers from the three countries. This is in addition to a Korea-AEC cooperative seminar also scheduled for December 2017, the first time such an event has been hosted in a non-Arctic country. Lastly, Korea will host the Arctic Circle Seoul Forum in December 2018.

CONCLUSION

For the last four years, since joining the Arctic Council in May 2013, Korea has undertaken its responsibility as an observer, without interruption, based on its Arctic Policy Master Plan. Korea has engaged in various cooperative programs with the Arctic states, the Arctic Council's working groups and task forces, and with associations of Indigenous Peoples. With these efforts, Korea has been recognized as one of the most active observer nations in the Arctic Council. However, Korea's Arctic cooperation remains in its initial stage, as it establishes a cooperative network with the main players of the Arctic and continues to collect information on the Arctic and the activities of various stakeholders. Korea is now preparing the second Arctic Policy Master Plan for the next five years. Korea's Arctic policy and activities will focus on efforts for Korea to be accepted as a credible Arctic partner. To this end, Korea will continue to promote Arctic scientific research and cooperation to address climate change in the Arctic, enhance cooperation with Arctic indigenous communities, and explore sustainable business opportunities in the Arctic more actively.

U.S. Arctic Policy Since the Cold War, and What Comes Next

Brooks B. Yeager

This paper will explore the evolution of U.S. policy regarding the circumpolar Arctic since 1971, with the intention of providing some parameters that might help us understand the probable evolution of U.S. Arctic policy in the coming years. I derive these parameters by viewing the issue through three prisms: first, from my assessment of the United States' enduring national interests; second, from my reading of U.S. domestic political dynamics, particularly the relationship between the federal government and the State of Alaska; and finally, from my reading of the ideology and emerging belief system of the Trump administration.

In order to review the past five decades of U.S. Arctic policy in a systematic way, I will discuss the explicit articulations of the policy as they changed periodically over this time period. I will then explore the primarily domestic political undercurrents that, in part, drove these changes in policy, as well as the abiding interests of the U.S. in the Arctic that underpin the fundamental stability of American Arctic policy over almost half a century. I hope this review will provide a useful backdrop for the subsequent discussion of current U.S. perspectives.

THE EVOLUTION OF THE EXPLICIT POLICY OF THE UNITED STATES REGARDING THE CIRCUMPOLAR ARCTIC

Since 1971, there have been at least 17 U.S. policy papers, declarations, or statements associated with international agreements, all of which have the circumpolar Arctic as their primary focus. Taken together, they illustrate the gradual but significant evolution of almost half a century of U.S. Arctic policy (See Annex 1 for the full list).

It would be superfluous to attempt to analyze the details of each and every one of these policy statements, so I will restrict myself to identifying the more significant trends. In the process, I attempt to ground the evolution of these policies in domestic politics and in what I describe as the abiding U.S. interests in the Arctic. It is my hope that this rudimentary framework will be sufficient to provide a foundation on which to project the possible evolution of U.S. policy under President Donald Trump.

There are have been seven significant themes in the evolution of explicit U.S. policy toward the circumpolar Arctic since 1971:

- First, a gradual diminishment of the early dominance of national security and policy issues, which clearly emanated from the reality of the Cold War as an overriding concern for U.S. policy-makers. In fact, the waning of the national security perspective as the dominant theme of U.S. Arctic policy was an implicit recognition of the end of the Cold War, and was undoubtedly influenced by Mikhail Gorbachev's famous call for an Arctic "Zone of Peace" in his speech in Murmansk in October 1987.
- Second, a gradual elevation of environmental issues as a priority concern in the Arctic. This focused first on pollution from internal Arctic sources, then on pollution of a global nature that had particular importance or impact in the Arctic, such as the challenges posed by persistent organic pollutants (POPS) and mercury.
- Third, within the broader panoply of Arctic environmental issues, a focus on challenges related to the health of Arctic wildlife, including fish, marine mammals, and sea birds. This concern was gradually expanded to include issues of the health of Arctic marine ecosystems, and to efforts to raise the priority of particularly fragile, vulnerable, or otherwise important ecosystems, defined geographically.
- Fourth, an emerging concern for the health of the Indigenous Peoples of the Arctic, for their social organization, and for policies that might encourage or facilitate sustainable development of Arctic communities.
- Fifth, the dawning recognition that the Arctic is no longer a remote, frozen outpost. Instead, it is a region gradually being integrated into the global economy, perceived by the global south as a source of oil and gas, coal, and minerals, as a potential new area for commercial fishing, and as a new global transportation route for maritime commerce.
- Sixth, a focus on the emerging challenge of climate change. The Arctic is warming much faster than lower latitudes, threatening the wildlife and ecosystems of the Arctic, the health and development of

the communities that depend on the region's current abundance of wild resources for their subsistence, and, finally, to the planet more generally, as the accelerating warming in the Arctic begins to affect global climate conditions, the chemistry of the global ocean, the stability of fundamental oceanic currents, and sea level rise.
- Finally, a halting, but ultimately transformative understanding of the international nature of Arctic issues, and of the desirability of addressing these issues in a cooperative manner that is coordinated with the efforts of other Arctic nations, and therefore of the value of institutions such as the Arctic Council in facilitating cooperation on such issues.

These trends must be considered as positive, particularly in light of the dramatic challenges facing the Arctic and its people today. In the next section, I will examine some challenges posed by long-term domestic political dynamics. These challenges will continue, in my view, to be important in determining the future of U.S. Arctic policy.

Since Alaska was granted statehood in 1959, Alaskan priorities have been influential in the development of national policies relevant to Alaska, and also national policies regarding the Arctic more generally. These policies, therefore, must be considered as products of a dialogue between the State of Alaska and the federal government, rather than as merely federal policies concocted in Washington D.C.

In the same period, a counter-weight emerged in the form of a national interest in particular aspects of Alaskan policy, even at the state level. This stems from the fundamental concern for security stemming from Alaska's position in the Arctic, from the historic federal responsibility for national public lands remaining in Alaska after the transfer of lands to the state, and from the federal government's statutory duty to assist the sustainable development of Alaskan native communities.

As the reader may guess, the relevant perspectives of the state and the federal governments have not always been in harmony. In fact, the relationship might best be described as a domestic version of the Cold War. At best, the state-federal partnership can be described as "wary." At worst, it has descended into open hostility. Alaskans often regard the federal government, and even the whole "Lower 48," as an occupying power. They customarily refer to American citizens who are residents of the other 49 states as "outsiders."

At the same time, the federal government sometimes considers Alaska as a reluctant or even hostile ward, one who has conveniently forgotten not only the generous benefits conferred at statehood, but also the constant stream of federal money and support that come its way year after year. The conflict arises not only in the environmental sphere, but also in the treatment of the subsistence rights of Alaska Natives to harvest marine and terrestrial mammals and access certain fisheries denied to non-native Alaskans, who often view these prerogatives with resentment and jealousy as an unearned privilege.

In addition to the issue of paternalism, we must add the contest between the boosterism of the pro-development Alaska business community and its political allies, including the Alaska legislature and the state's delegation in Congress, and the federal concern for the conservation of Alaska's natural and living resource assets, and of Indigenous Peoples' ways of life that depend on them.

These issues are not primarily partisan, although at times they can take on a partisan color. They represent a legitimate debate regarding the best use of the state's natural resources, and the trade-offs between the immediate use of such resources as opposed to their conservation for future generations.

In any case, the current state of this ongoing dialogue has an important influence not only on U.S. domestic Alaska policy but also on its circumpolar policy.

For instance, the state's initial fear of international influence was a factor in the early federal opposition to the very idea of the Arctic Council. The state's anxiety about international and even federal oversight is reflected in its opposition to the creation of special management areas in the Arctic. Perhaps more significantly, the state's paranoia regarding constraints on its economic development emanating from the nation's capital makes it wary of any international commitment that might influence federal policy.

At the same time, there are a number of fundamental and abiding interests that drive, or at least inform, U.S. Arctic policy.

First and foremost is the priority placed on national security, and therefore on the Arctic as a potential zone of conflict. Alaska has been and remains a zone of operations for the U.S. submarine fleet, deploying both a nuclear first strike capability and an immediate response capacity in case of nuclear attack.

Allied with this national security concern is the global pragmatic interest of the U.S. Navy in the doctrine of "Freedom of the Seas." Thus, the U.S. would never be likely to agree to any effort to constrain commercial or recreational use of Arctic marine passageways in a manner that could provide a precedent for similar restrictions in, for instance, the Straits of Hormuz or Malacca.

The Arctic is also a zone of potential resource claims. These could involve oil and gas and seabed minerals, but also fisheries and biological resources. Although the most well-known debates involve the appropriate disposition of resources within the U.S. economic zone, the U.S. has never renounced interest in resources beyond present U.S. boundaries, the status of which, in any case, is at best unclear.

Equally important, the Arctic is home to Indigenous Peoples who are American citizens, and specifically to the Inuit, Yu'pik and Gwich'in communities of the Arctic slope, northwestern Alaska, and the Brooks Range. The welfare of these communities is an ongoing concern of the federal government, which sees itself as having a fiduciary responsibility for Native Americans generally.

The conservation of the land and waters of the United States in Alaska is also an ongoing concern of the federal government. In this view, the federal government is responsible to care for the lands and waters in Alaska that have belonged to all the people of the United States since Alaska was a territory. These lands include not only National Parks, Monuments and Wildlife Refuges, but also the residual lands remaining after the transfer of federal lands to the state under the Alaska Statehood Act of 1958, which are now managed by the Bureau of Land Management. These include, importantly, the National Petroleum Reserve (NPRA), which occupies the largest portion of Western Alaska north of the Brooks Range. Last but not least, the federal government is responsible, to a more limited extent, for all Alaskan lands and waters insofar as they support the livelihoods of Alaska Natives.

The fact that international cooperation among the Arctic nation governments has become imperative to addressing the environmental, social, and sustainable development challenges emerging in the Arctic has gradually become an integral part of U.S. policy in the region. This includes the recognition that most of the challenges in the Arctic marine system transcend borders, and therefore the awareness that there is a shared responsibility for the conservation of the Arctic Ocean and its various ecosystems.

Finally, the recognition that the Arctic is a political arena in which the

United States and Russia have powerful and mutual interests to cooperate has reinforced the broader trend toward making international cooperation and the institutions that foster it, such as the Arctic Council, priorities for U.S. policy.

Overall, it is my view that, although U.S. Arctic policy has indeed evolved and matured over the last 50 years, its core has remained remarkably stable through both Democratic and Republican administrations. The key factors contributing to this stability are that the domestic political dynamic affecting Arctic Policy has remained structurally the same over time, and that the abiding interests of the U.S. in the region have also remained unchanged, with the exception that international cooperation has supplanted Cold War antagonism as the main national security policy in the U.S. approach to the international Arctic.

This is the historical background for what can only be described as informed speculation regarding the future evolution of U.S. policy regarding the circumpolar Arctic under President Trump. Understandably, with the administration at a very early stage, the limited attention that the White House and the nation give to foreign policy has focused on the highest-level issues of immigration, trade, national security, energy policy, regulatory approaches, and President Trump's relations with Russia. Although the Trump administration's policy regarding the management of resources in the U.S. took some time to unfold, it now appears that it will be strongly oriented to the production of new oil and mineral resources, including opening up more drilling in Alaska, and not to the conservation of the living resources of the north. We may be able to further discern some of the more likely vectors of the new administration's Arctic policy on the basis of a careful reading of the comments of the president and other administration officials on related issues, such as climate, energy policy, regulation generally, and the prospect of improved relations with Vladimir Putin and the Kremlin.

Some things are clear, if not exactly reassuring. The Trump Administration does not believe that climate change is a problem, nor that its causes are predominantly anthropogenic. More than once during the 2016 campaign, Trump claimed that global warming was "a hoax." It is therefore reasonable to expect the Trump Administration to oppose any effort to articulate a direct linkage between the dramatic changes in the Arctic and global climate change, despite the clear conclusion of almost all climate scientists that global warming is the cause of the drastic physical changes in the Arctic, and that much of that warming is directly attributable to humans' combustion of fossil fuels.

In addition to its reluctance to accept the reality of climate change, the Trump Administration has announced its intent to boost, to the extent possible, the nation's production of oil, natural gas, and coal. Early in his administration, and with some fanfare, President Trump personally rescinded the Obama ban on offshore drilling in the Chukchi and Beaufort Seas.

Despite these two signal departures from Obama-era policies, the broader sweep of this administration's policy in the circumpolar Arctic, and more importantly, of the impacts of U.S. actions on the pace of economic development in the Arctic region, are likely to resemble the pattern of the last eight years. The reasons for this seemingly contrary conclusion are as follows:

First, reality will intervene. In fact, it already has. The biggest barriers to the development of the Arctic's fossil fuels are not regulatory or ideological. Instead, they include the low world price of natural gas and oil, uncertainty as to when or if prices will rise again, and the high capital and operational costs of extracting gas and oil from a region that, despite historically unprecedented warming, is still a cold, remote, and dangerous place to work. In 1988, Russian geologists discovered the Shtokman field in the southern Barents Sea, projected by some to be the largest natural gas reservoir ever found on Earth. By 2007, after twenty years of planning, engineering design, further reservoir delineation, and the formation and unraveling of two generations of corporate partnerships, Gazprom put Shtokman on the shelf indefinitely, because it could not compete in the market against the flourishing hydraulic fracturing boom in the United States. At the time, hydraulic fracturing in the U.S. was largely restricted to the Marcellus Shale play in Pennsylvania. There are now more than 50 shale "plays" in 21 states, and increasing interest in the new technology in Canada and Eastern Europe.

Second, the Trump energy policy, if we can all it that, suffers from a fatal self-contradiction. Administration spokespeople assert that the administration will bring back coal jobs by eliminating unnecessary and onerous environmental regulation. At the same time, the administration is doing everything it can to promote the expansion of private sector efforts to produce ever-greater quantities of natural gas. The obvious difficulty is that the further expansion of natural gas use will only undercut the coal market even further, and cost more coal jobs than it already has.

There are similar but different constraints impeding the expanded development of the Arctic's plentiful solid minerals such as coal, iron, and even rare earths. All are available and less expensive somewhere else.

Transport of bulk ores in the Arctic, or from the Arctic to world markets, is expensive. The idea that adequate environmental and safety regulation is a significant contributor to the extractive industry's net costs in the Arctic is, to the say the least, not supported by the evidence.

In the context of this new reality, is there still a possibility for "sustainable development in the Arctic?" The answer appears to be: "Yes, but not as a global resource colony."

First, the Arctic's mineral and fossil fuel resources are finite, and therefore inherently not sustainable. The curve of oil and gas development, in particular, has always followed the classic "boom and bust" cycle. There is no obvious reason to believe that this cycle will be broken.

Second, to the extent that Arctic resources are to be refined, smelted, forged, and utilized in population centers far from the Arctic, most of the profits associated with their associated business cycles will naturally end up in the southern business and finance zones as well.

Still, there remain reasons for optimism. There are more innovative approaches to achieving sustainable development under consideration or even underway in a number of Arctic countries. Most of these "Northern Development" strategies center on the potential to better integrate each country's northern region with the national and global economy, to support the subsistence activities of northern indigenous communities, and develop educational, scientific, or telecommunications and IT capabilities in northern communities, sometimes in combination with natural resource development efforts and sometimes not.

A visit to Tromsø or Rovaniemi will quickly demonstrate that these efforts are already producing a certain amount of success. Of course, the Scandinavian countries, and particularly Norway, have a significant geographical advantage in the form of a more moderate climate in their northern lands and waters, largely a happy consequence of the northern extension of the Gulf Stream. Tromsø, which is at the same latitude as Barrow, has an ice-free harbor even in winter, a large university, a modern cathedral, good hotels, and a functioning port that makes tourism possible all year.

Although actual progress is harder to find outside the oil regions of the Russian Arctic, such as the Yamal Peninsula, Russian federal consideration is still being given to strategies to develop the potential of northern communities to capitalize on the increasing mobility of work in the internet age by creating special capabilities in the realm of IT and telecommunications, as well as establishing new or renovating existing ports along the Northern Sea Route.

Whether such strategies can succeed in Alaska, Canada, or Greenland remains to be seen. Given their greater distance from United States, Canadian, and Danish economic and political centers and their relatively more hostile climate, it may be that other opportunities, such as exploiting cultural knowledge, tourism, and a sustained subsistence economy will provide more assured benefits to people and communities of these areas.

This brings us to the question of the role of natural and living resource stewardship in underpinning possible routes to sustainable development in the Arctic. One can reasonably argue that the only really pragmatic and possible path to sustainable development in this very harsh, beautiful, and extremely fragile region is to combine innovative approaches such as those mentioned above with the careful conservation of the living resources of the Arctic. These approaches include considering the habitats and ecosystem linkages that sustain them, the prudent management and use of the region's non-living resources, the equitable distribution of the benefits of their uses, and the husbandry of the communities and cultures that depend on these resources. Such a course would perforce include the conservation and increasing reliance on the knowledge, arts, and lifeways of the Arctic's Indigenous Peoples. The necessary approach will be holistic, integrated across sectors, customized to local geography, and owned and informed by the people of the region.

Annex 1: Documents, Declarations, and Agreements explicitly articulating 50 years of U.S. Circumpolar Arctic Policy:

1971: National Security Decision Memorandum 144 (NSCM 144)
[Nixon]

1983: National Security Decision Directive 90 (NSDD 90)
[Reagan]

1984: U.S. Arctic Research and Policy Act, PL 98-873 (ARPA)
[Reagan]

1991: Declaration on Arctic Environmental Protection (AEPS)
[GHW Bush]

1993: Report to the President on U.S. Arctic Policy pursuant to PRD/NSC-1, by the Interagency Working Group on Global Environmental Affairs.
[Clinton]

1994: Presidential Decision Directive/NSC-26
[Clinton]

1996: Ottawa Declaration (Arctic Council)
[Clinton]

1999: NSPD-66, United States Arctic Policy
[Clinton]

2001: Statement of President Bush regarding the Stockholm Convention on Persistent Organic Pollutants. April 19, 2001.
[George W. Bush]

2008: Ilulissat Declaration
[George W. Bush]

2009: National Security Presidential Directive NSPD-66
[Obama]

2011: Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic.
[Obama]

2013: National Strategy for the Arctic Region (NSAR)
[Obama]

2013: Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic
[Obama]

2014: Implementation plan for the NSAR
[Obama]

2015: President Obama's Executive Order 13689
[Obama]

2015-16: Federal Agency Arctic Strategies and Implementation Plans
[Obama]

Laws and Regulatory Decisions that have helped shape U.S. Arctic Policy over the last 50 years:

1959: Alaska Statehood Act

1971: Alaska Native Claims Settlement Act (ANCSA)

1981: Alaska Natural Interest Lands Conservation Act (ANILCA)

Canadian Arctic Policy: A Fragmented Seascape

David L. VanderZwaag

INTRODUCTION

Getting a grip on Canadian Arctic policy is not easy! There is no up-to-date overarching Canadian Arctic policy document. In December 2016, Prime Minister Justin Trudeau, when meeting with then-U.S. President Barack Obama, issued a Joint Arctic Leaders' Statement that committed Canada to developing a new Arctic Policy Framework. However, a new Arctic policy document has been slow to materialize, with no expected publication date announced yet.

Mary Simon, former Canadian Ambassador for Circumpolar Affairs who was appointed by the Minister of Indigenous and Northern Affairs Canada as Special Representative on Arctic Leadership, has assisted with consulting northerners on future policy directions for the Arctic. Her final report released in May 2017, *A New Shared Arctic Leadership Model*, besides recommending key elements that should be included in a future Arctic policy, calls for the convening of a summit of northern Premiers and indigenous leaders with the Prime Minister and key Ministers to discuss a process for developing a new Arctic Policy Framework.

Meanwhile, the present policy reality might be described in two words, "policy pieces." Canada's policies towards the Arctic are fragmented and spread across a wide spectrum of documents, statements and legislative and policy commitments. The policy pieces fall into two main categories: past policies and present policies.

PAST POLICIES

Two policy documents from the previous Stephen Harper government are still relevant, and many policy commitments continue to be followed by the Trudeau government, elected in October 2015. Pursuant to *Canada's Northern Strategy* (2009), Canada remains committed to building up to six Arctic offshore patrol vessels to help ensure Canadian northern sovereignty and security. Canada is still committed to resolving its Arctic jurisdictional disputes (ownership of Hans Island, Beaufort Sea boundary, Lincoln Sea boundary and legal status of the Northwest Passage) peacefully and in accord with international law. Promotion of social and economic development in the North continues as a priority with the Canadian Northern Economic Development Agency (CanNor), established in 2009 and funding various projects and capacity-building initiatives that include a pledge to invest in promoting renewable and clean energy technologies in the 2017-2018 timeframe. Canada's commitment to establish a new High Arctic Research Station has been fulfilled. Construction began in the summer of 2014 and the official opening of the new research facility in Cambridge Bay was planned for October 2017, but subsequently postponed.

Many commitments from a second policy document, *Statement on Canada's Arctic Foreign Policy* (2010), are still relevant. For example, Canada remains committed to submitting a full Arctic extended continental shelf submission to the Commission on the Limits of the Continental Shelf and to peacefully resolving any future continental shelf overlaps with neighboring states. Canada actively engaged in global negotiations to reduce mercury emissions and subsequently ratified the 2013 Minamata Convention on Mercury on April 7, 2017.

PRESENT POLICIES

The Trudeau government has promoted Arctic-related policy developments on six main fronts: marine protected areas; climate change; oil and gas; shipping; legislative and regulatory efforts; and fisheries.

Marine Protected Area Policy

Through ministerial mandate letters, Prime Minister Trudeau has set a clear Canadian marine protected area (MPA) target of increasing protection to encompass five percent of coastal/marine waters by 2017 and ten percent by 2020. The establishment of MPAs in the Arctic has been accelerating. On October 28, 2016, Canada established a second Arctic MPA under the Oceans Act for an area including Darnley Bay and Amundsen Gulf in the Beaufort Sea (Anguniaqvia niqiqyuam MPA). In August 2017, Federal Environment Minister Catherine McKenna announced an agreement with the Nunavut government and the Qikiqtani Inuit Association to designate

Lancaster Sound (Talluratiup Imanga) as a national marine conservation area covering about 110,000 square kilometers of ocean. To further expedite the establishment of MPAs, a bill has been introduced to amend Canada's *Oceans Act* to give the Minister of Fisheries and Oceans authority to designate MPAs through ministerial orders.

Climate Change Policy

The present Canadian government is strongly committed to addressing the threats of climate change. Canada ratified the Paris Agreement on October 5, 2016. Canada released an overarching national strategy on addressing climate change in December 2016, the *Pan-Canadian Framework on Clean Growth and Climate Change*. In May 2017, Canada submitted its Nationally Determined Contribution (NDC) commitment under the Paris Agreement. Canada has committed to reducing GHG emissions by 30 percent below 2005 levels by 2030.

Oil and Gas Policy

In the *United States-Canada Joint Arctic Leaders' Statement* of December 20, 2016, Prime Minister Trudeau announced an indefinite moratorium on future offshore Arctic oil and gas licensing. The moratorium is applicable to all Canadian Arctic waters and is to be reviewed every five years through a climate and marine science-based, life-cycle assessment.

Arctic Shipping Policy

Canada is moving forward on three major fronts to ensure safe shipping in the Arctic. The Canadian Coast Guard and Transport Canada are collaborating in a Northern Marine Transportation Corridors initiative. The program aims to bolster charting, aids to navigation and marine infrastructure for major shipping corridors in the Arctic.

Canada is in the process of implementing the new IMO Polar Shipping Code into Canadian law. Proposed *Arctic Shipping Safety and Pollution Prevention Regulations*, which would incorporate most provisions of the Polar Code, were released for public comment on July 1, 2017. The public had until September 14, 2017 to submit their comments.

Through a \$1.5 billion *Oceans Protection Plan* announced in 2016, Canada has committed to enhance safe shipping around the country including in the Arctic. The Plan pledges to provide eight new community response boats in the Arctic for responding to emergencies. The Plan also promises to develop appropriate vessel routing and speed measures in collaboration with indigenous and coastal communities.

Legislative and Regulatory Policy

The present Canadian government might be described as very proactive in trying to strengthen and rebuild Canada's environmental laws. It is in the process of trying to rework the *Canadian Environmental Assessment Act, 2012* to make it less discretionary. It is committed to strengthening the fish habitat protection provisions of the *Fisheries Act*, which were gutted under former Prime Minister Harper. Modernizing the National Energy Board and its legislative framework is a further commitment, with a discussion paper on possible legal reforms released for public comment in June 2017.

Fisheries Policy

Canada has taken various policy steps to encourage sustainable Arctic fisheries. In 2014 the federal government reached agreement with the Inuvialuit in the Beaufort Sea region on an Integrated Fisheries Management Framework. The Framework sets out a common vision where no commercial fisheries will be allowed until there is adequate scientific research and understanding of marine ecosystems in the region. Future priority for any commercial fisheries will be given first to local communities.

A Policy for Managing the Impacts of Fishing on Sensitive Benthic Areas (2009) pledges particular precautions for proposed new fisheries in frontier areas. Frontier areas are defined as Canadian waters deeper than 2,000 meters or areas of the Arctic where there is no history of fishing and little if any information available concerning the benthic features (habitat, communities and species). Future fishing efforts in frontier areas will be subject to an exploratory fishery protocol where carefully controlled small-scale exploratory fisheries may be allowed.

Canada has also been actively engaged in international negotiations for a new fisheries agreement for the central Arctic Ocean beyond national jurisdiction. In July 2016, Canada hosted in Iqaluit the third round of talks among the Arctic Ocean coastal States, China, the European Union, Iceland, Japan, and the Republic of Korea.

Russia's Arctic Policy

Tatiana Mitrova

For the last several decades, the Arctic has proven to be a region of extraordinary political stability and peaceful cooperation, despite the fact that other parts of the world have experienced numerous border disputes and conflicts (including military conflicts and local wars). Arctic nations have so far managed successfully to keep the situation under control, even in the most difficult years of the Cold War. In the 1990s it seemed that the most dramatic geopolitical conflicts had abated, but the beginning of the new century marked a new round of discussions and potential conflicts concerning the Arctic.

Russia's Arctic border is the longest in the world: 22,600 km. As such, the Artic is regarded as a key national security priority. Keeping this border protected is a challenging task, requiring huge investments into infrastructure development. At the same time, the Arctic is playing a critical role not only in the Russia`s security agenda, but also in the country`s economic development, especially as a key region for hydrocarbon production.

Since the beginning of the 2000s, Russia has been planning massive Arctic development, including the ambitious Northern Sea Route project, the Yamal development, the Stockman project, and large-scale off-shore oil exploration and production. At least some of these projects have been regarded as an arena for international cooperation: bidding for Stockman came exclusively from independent oil companies (IOCs); deals between Rosneft and Exxon Mobile, ENI and Statoil were signed for Arctic offshore exploration; and the joint project between Novatek and Total regarding the Yamal region's LNG development are all examples.

Since 2014, however, as the first financial and technological sanctions were introduced against the Russian Federation by Western countries, the majority of these plans have been challenged. Some were frozen, and others had to adjust to this new reality. The new "Global Order," repeating a theme of the 1960s and 1970s, is unfortunately once again regarding Russia as an aggressive, non-democratic state in temporary confrontation with the West, and therefore should be limited and restricted in its Arctic ambitions. Obviously this rhetoric, supported now by the latest U.S. sanctions package of 2017, does not help to calm the situation. Relationships are deteriorating rather quickly, especially commercial and investment engagement of Western companies in Russian Arctic development. Instead, another serious geopolitical trend is becoming more and more visible: the increasing role of Asian, and especially Chinese, players. The Chinese are investing in Russian projects (such as Yamal-LNG) and providing critical technologies (not only for liquefaction, but also for much more sensitive offshore oil exploration). This alliance between Russia and China in the Arctic will likely increase in the coming years, marking a new era in the "Global Order" and significantly changing the entire Arctic agenda.

The Evolution of Arctic Policy Development and Arctic Research Planning in the United States

Fran Ulmer

The United States is an Arctic nation because of the location of its 49th state, Alaska. In order to understand the development of U.S. Arctic policy and research agendas, one must understand the development of Alaska itself. This contribution summarizes both; it then describes the recent evolution of U.S. Arctic policy and research coordination.

After the United States purchased Alaska from Russia in 1867, the Alaska territorial government focused primarily on internal matters such as building roads and schools, managing fisheries, and regulating hunting. After statehood in 1959, however, Alaskans sought to select lands from the federal government that could provide sufficient economic development opportunities to support a growing population. This ultimately led to more discussion about policies being adopted by federal agencies managing federal lands that either aligned or conflicted with the growing interest of state leaders in exploiting significant opportunities in the Arctic. It also led to investment in exploration, mapping, and research at the University of Alaska to support emerging economies.

Early engagement in Arctic policy by the United States was episodic, driven primarily by external, international forces that triggered intermittent attention. During the first part of the 20th Century, interest in Alaska was primarily in response to Japan's invasion of Alaska during World War II as well as the Lend-Lease policy with the Soviet Union, during which nearly 8,000 aircraft and other supplies were ferried by Russian pilots from Alaska to Russia to battle the Germans on the Eastern Front. However, during the subsequent Cold War, the relationship between the former allies deteriorated, changing from northern cooperation to northern defense.

To supplement observations from ships and submarines, the U.S. Navy established the Naval Arctic Research Laboratory in Barrow, Alaska, and in the 1960's significant research in the Arctic region was initiated in order to better understand the polar environment. During this period, the federal government built communication installations across the North American

Arctic to assist with defense intelligence, search and rescue, and general communication. The Distant Early Warning (DEW) Line stretched from the far northern Arctic region of Canada, with additional stations along the northern coast and Aleutian Islands of Alaska, in addition to the Faroe Islands, Greenland, and Iceland, providing a basic level of infrastructure that would enable research operations and other development.

After surveying areas considered promising for mining and other uses, the state selected acreage north of the Brooks Range near Prudhoe Bay. This area of the North Slope turned out to be the site of the largest oil field ever discovered in North America (still to this day). During the 1970s, the State of Alaska and the participating oil companies built the pipeline and other infrastructure necessary to bring this Arctic oil 900 miles to the Port of Valdez to be shipped south to refineries.

Federal policies regarding land management and resource development on federal lands to the east and west of Prudhoe Bay have varied, based on the philosophy of different administrations and congressional leadership. During the second half of the 20th Century, the federal government's attention broadened from national security to include conservation, oil development, scientific research, and the settlement of Alaska Native land claims. Several major pieces of legislation adopted during this period illustrate the types of policies that were the focus of action:

- ANWR: The Arctic National Wildlife Refuge was created first by executive action and later codified by Congress because of the important biological, ecological and cultural resources of the area. One section of the Refuge, however, was left open for "future use designation" by a future Congress (Section 1002 of the relevant act). As a result, the Coastal Plain of ANWR remains a place of controversy pitting those who wish to designate it permanently as wilderness against those who want to allow oil development.
- NPRA: The National Petroleum Reserve Alaska was created, as the name implies, as an area for potential oil development for the federal government to manage and control. Parts of NPRA are being developed for oil and gas extraction, and other parts (those that have vulnerable and valuable habitat) have been set aside administratively as critical habitat, although that determination can be altered).
- ANCSA: The Alaska Native Claims Settlement Act of 1971 resolved claims of the Alaska Native peoples by creating regional and village

corporations that hold land in trust for their members (never to be sold), which can be developed or protected as determined by the boards of those corporations. The Inupiat Eskimos of Arctic Alaska selected a sizable portion of the Arctic encompassing their home for thousands of years. The land use policies adopted by the villages and their regional corporation, the Arctic Slope Regional Corporation, have been a mixture of both resource development and habitat protection.

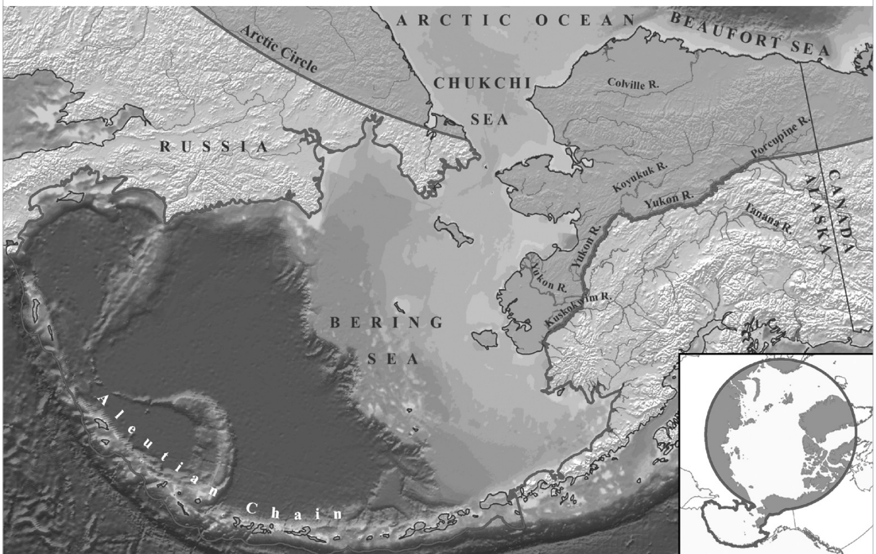
- ANILCA: The Alaska National Interest Lands and Conservation Act of 1980 was the most controversial of all these examples. For almost twenty years, battles raged over the best combination of federal lands to be designated as open for development, national parks, wildlife refuges or other specific use designations. The push and pull between state and federal interests, between conservation and development interests, and between local and global concerns provided ample opportunity for politicians, businesses, non-profit organizations, scientists, local leaders and editorial writers to offer hundreds of different approaches to resolving the disputes. Eventually, a compromise was struck, and President Jimmy Carter signed the legislation in 1981. He called it the most important piece of legislation he signed as president.

In 1984, Congress sought to focus federal Arctic research efforts by passing the Arctic Research and Policy Act (ARPA), which created both the Arctic Research Commission and the Interagency Arctic Research and Policy Committee (IARPC). In January 1985, President Ronald Reagan issued Executive Order 12501, consistent with ARPA, establishing the Commission and directing it to implement the following programs: develop and recommend national Arctic research policy; assist the National Science Foundation and IARPC in establishing a national Arctic Research Plan; review federal Arctic research programs and suggest improvements; facilitate cooperation among federal, state and local governments in advancing Arctic research; and publish a statement of goals and objectives to guide IARPC. IARPC became the mechanism to coordinate the research efforts of multiple federal agencies by developing a research plan and providing a mechanism for coordination among the agencies. ARPA also specified the geographic area treated “Arctic“ for purposes of the Act (Figure I.1).

Despite legislation regarding land use in Alaska and on the coordination

Arctic Boundary as defined by the Arctic Research and Policy Act (ARPA)

All United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine. Yukon, and Kuskowim Rivers; all contiguous seas, including the Arctic Ocean and Beaufort, Bering and Chukchi Seas; and the Aleutian chain.[1]



Acknowledgement: Funding for this map provided by the National Science Foundation through the Arctic Research Mapping Application (amap.org) and Contract #0520837 to CH2M HILL for the Arctic Research Policy Committee (IARPC).
Map author: Ailison Gaylord, Nuna Technologies. May 27, 2009.
1. The Aleutian chain boundary is demarcated by the 'Contiguous zone' limit of 24-nautical miles.

Figure I.1 Arctic Boundary as Defined in U.S. Law

of Arctic research, the United States did not develop a comprehensive Arctic policy that shaped either the administration of programs or Congressional appropriations. The aforementioned legislation represents significant policy steps, but does not easily integrate into broad themes, goals, or visions of what the country either expected or demanded from the region. Clearly, there was recognition of the opportunities: to extract mineral resources, to provide for indigenous culture and communities, to protect fragile and rare habitat, to manage fish and game, to develop at least basic infrastructure including communication facilities and airports, and to assure a federal presence from a strategic and national security perspective. However, no administration, federal or state, developed a comprehensive policy describing the roles and responsibilities, goals, objectives, or guidance for public policy, or clearly articulated the necessary research to support decisions pursuant to the policy. It is notable that President Clinton issued a policy statement in 1994 addressing the differences between the Arctic and the Antarctic that declared the need for stewardship in a vulnerable environment and the importance of international cooperation.

This intermittent engagement in Arctic policy changed in the 21st century. A growing awareness of the rapid changes in the region spurred global interest in the Arctic. The Arctic was changing and attracting attention, environmentally, economically, culturally, socially and geopolitically. It was emerging as a place where the past was no longer a guide to the present or future. The principle drivers of this change were climate change and global demand for resources.

Warming in the Arctic has increased access to an area that has been locked in ice, snow, cold and darkness for much of human existence. Less sea ice and shorter winters mean that a new ocean is emerging, providing novel opportunities for shipping, tourism, fishing and resource development, including oil and gas. These changes also stimulated increased interest in Arctic scientific research. Both the International Polar Year activities and national initiatives provided focus, resources, and research reports about the changes taking place and the significance of those changes to the planet and its people.

For these and other reasons, many national governments, including the U.S. federal government, became increasingly interested in the region. Nations started developing and adopting national policies and strategies to articulate their national objectives more comprehensively along with the methods to achieve them. An interagency team prepared a U.S. Arctic Policy (https://fas.org/irp/offdocs/nspd/nspd-66.htm), adopted in 2009, at the end of the George W. Bush Administration, which was reaffirmed in the early months of the Obama Administration.

Simultaneously, leaders of several nations, particularly Norway, Finland and Russia, focused on the need to think holistically, in addition to nationally, about effectively managing a multinational region united by the Arctic Ocean and its adjacent seas. The eight Arctic nations evolved the Arctic Council as an intergovernmental forum to cooperate on two primary goals: protection of the environment and sustainable development in the region. Officially created in 1996 and arising from several previous joint efforts, the formation of the Arctic Council was an important turning point. It required the eight national governments to consider factors that made their countries uniquely Arctic yet completely conjoined in interest. They recognized that the region is a shared space where activity in one part has the potential to affect the entire area.

The United States chaired the Arctic Council from 1998-2000 and again from 2015-17, following the chairmanship rotation scheme established at the outset. Between these periods, the level of U.S. attention directed to the Arctic increased dramatically. Why? In addition to the factors mentioned above, the political environment was more favorable. Leadership from the State of Alaska and members of the Alaska congressional delegation helped. They advocated for research funding and cooperation, for the appointment of an Arctic ambassador, and for programs focused on unique aspects of life in the Arctic. Alaskans advocated for more Cabinet-level engagement during the Obama administration, and convinced Secretary of State Hillary Clinton to personally attend (for the first time) the Arctic Council Ministerial in Greenland (2011). Obama's subsequent Secretary of State, John Kerry, attended in 2013 and assumed the chair in 2015. President Donald Trump's Secretary of State Rex Tillerson presided as chair in 2017.

At the state level, the Alaska legislature created the Alaska Arctic Policy Commission (AAPC) to develop and propose Arctic policies, which it did in 2014. This effort focused state discussions about the roles and responsibilities for efforts to adapt to environmental change. The AAPC report emphasized the importance of research in both the public and private sectors to improve decisions and evolve Arctic specific technologies, solutions and economies. www.akarctic.com/

The Obama administration provided leadership by prioritizing policy and program initiatives in the Arctic, and by emphasizing the importance of action on climate change. Several members of the White House staff and Cabinet were knowledgeable about the Arctic and understood the need to use science as a building block, politically and diplomatically. The level of engagement in the region can be illustrated by the following chronology of federal leadership:

- 2013: White House releases the National Strategy for the Arctic Region (NSAR).
- 2014: White House releases implementation plan for the NSAR.
- 2015: President Obama issues Executive Order 13689, creating the Arctic Executive Steering Committee (designating the President's Science Advisor John Holdren as Chair, and Deputy Homeland Security Advisor Amy Pope as Vice Chair. Mark Brzezinski, former U.S. Ambassador to Sweden, was subsequently appointed as executive

director).

- 2015: President Obama travels to Alaska and hosts a meeting entitled, "Global Leadership in the Arctic: Cooperation, Innovation, Engagement and Resilience" (GLACIER), for foreign ministers and government leaders, discussing climate change in the region.
- 2016: White House hosts the inaugural Arctic Science Ministerial, convening 25 nations to discuss increasing collaboration and investment in science and research.
- 2016: IARPC publishes the 2017-2021 Arctic Research Plan.

During this period, federal agencies with responsibilities in the region adopted strategies specific to their jurisdiction. Federal governmental entities, such as the Office of the Secretary of Defense, the U.S. Navy, the U.S. Coast Guard, the Department of the Interior, and the National Oceanic and Atmospheric Administration (NOAA), produced specific strategies and comprehensive blueprints for action, consistent with the National Strategy for the Arctic Region. Examples include the U.S.G.S. Arctic Science Strategy, the Department of Interior's report, *Managing for the Future in a Rapidly Changing Arctic*, and the *Department of Defense Report to Congress on Strategy to Protect U.S. National Security Interests in the Arctic Region*. Each strategy highlighted the importance of increased observing, monitoring and research to further their missions.

The three lines of effort in the NSAR are:

- Advance United States security interests
- Pursue responsible Arctic region stewardship
- Strengthen international cooperation

The NSAR Implementation Plan described the methodology, process, and approach for executing the strategy. "This Implementation Plan complements and builds upon existing initiatives by federal, state, local, and tribal authorities, the private sector, and international partners, and focuses efforts where opportunities exist and action is most needed." In other words, this was an effort to use all existing resources, working together "as a coherent whole," supported by programs overseen by relevant federal entities.

A few examples will be helpful to illustrate the relationship between the

Strategy, the Implementation Plan, and the agencies efforts. Under "Pursue Responsible Arctic Region Stewardship," four key areas were identified:

- Protect the Arctic environment and conserve Arctic natural resources.
- Use integrated Arctic management to balance economic development, environmental protection and cultural values.
- Increase understanding of the Arctic through scientific research and traditional knowledge.
- Chart the Arctic region.

Specific projects, programs or directives focused agencies on the work to be done in these four areas. The Arctic Executive Steering Committee established working groups focused on specific projects, from energy to suicide prevention. This was done to promote interdepartmental cooperation to make progress on the strategies, and to support the State Department's agenda for a robust chairmanship of the Arctic Council in 2015-2017.

Given the timing of the U.S. chairmanship and the work that was done before and during the chairmanship, it is indisputable that progress was made under the third strategy goal of strengthening international cooperation. The U.S. chairmanship had three thematic areas:

1. Addressing the impacts of climate change.
2. Assuring Arctic Ocean safety, security, and stewardship.
3. Improving Arctic economic and living conditions.

More than two dozen projects were launched in May 2015, and most were completed by the ministerial meeting in May 2017. These projects included the *Circumpolar Local Environmental Observer Network (CLEO), Marine Protected Areas (MPA) Network Toolbox: Area-based conservation measures and ecological connectivity*, and a series of projects aimed at improving the health and mental wellness of indigenous and Arctic communities, such as *Rising Sun*, an analysis of suicide prevention programs. Major reports released during the chairmanship include *Telecommunications Infrastructure in the Arctic: A circumpolar assessment, Snow, Water, Ice and Permafrost in the Arctic* (SWIPA, 2017), the *State of the Arctic Marine Biodiversity report, and Standardization as a tool for prevention of oil spills in the Arctic*. Those few projects that were not finished will continue under the Finnish Chairmanship. See www.arcticcouncil.org for a complete list of projects and access to the products.

One of the most significant legacies of the chairmanship was the adoption of the legally binding *Agreement on Enhancing International Arctic Science Cooperation* during the 2017 May Ministerial meeting. The task force that developed the language and built the consensus for it was co-chaired by Sweden, the Russian Federation and the United States. The agreement reflects the growing support for cross-border access and collaboration, and the recognition that region-wide information is essential to support better understanding of the changes taking place across the Arctic region (see www.state.gov/e/oes/rls/other/2017/270809.htm).

While the U.S. State Department was preparing and managing the Arctic Council Chairmanship, and the Obama administration was advancing its National Strategy for the Arctic Region, the Interagency Arctic Research Policy Committee was preparing and finalizing the *Five Year Arctic Research Program Plan*. The plan, released in November 2016, reflects agencies' efforts to align their research needs with their agencies' missions and with the NSAR. Although it was challenging to align research priorities and to focus solely on interagency research efforts, the attention given to the overarching goals produced a significant improvement over the previous five-year plan. The IARPC plan can be found at www.iarpccollaborations.org/plan/index.html.

The predominant theme in the plan is the rapidly changing Arctic, which includes outlining efforts to understand the shifting boundaries and characteristics of water, ice, flora, fauna, people and institutions. Observing, monitoring and documenting the changes that have occurred is central to the plan, as is understanding the processes that led to these changes and how future changes are likely to further affect these systems. The plan includes research that reflects the interests of the people who depend upon these ecosystems and how they may be able to cope with the changes in them over time. The plan also focuses on ecosystem services and products, such as subsistence foods, sustainability of communities, and the resilience of indigenous cultures. The plan prioritizes research that supports decisions that need to be made on the basis of the best available science, whether that concerns fisheries management, oil and gas development, or resource protection in wilderness areas.

One of the most innovative outreach efforts to connect the broader research community with the federal planning effort has been the creation of IARPC collaboration teams. They are open to anyone who wishes to join and contribute to the effort. This has provided academic and institutional researchers with access to federal employees engaged in the research. It also provides those employees with a much wider talent base to conduct important and relevant science. A list of the nine teams can be found here: https://www.iarpccollaborations.org/teams/index.html

What is the role of the National Science Foundation in the process? The NSF Director serves as an ex-officio member of the U.S. Arctic Research Commission and chairs the IARPC, which President Obama elevated to the National Science and Technology Council in 2010 via a presidential memorandum. The Chair of the Commission is a liaison to IARPC, and the Commission produces reports that help guide IARPC's plans and activities. NSF grants enable the academic research community to collect data and build the body of knowledge necessary to achieve the goals articulated by both the Commission and IARPC. NSF's Office of Polar Programs supports Arctic and Antarctic research, and the infrastructure and logistics needed to support it. Nationally, at least $400 million is invested annually in a wide

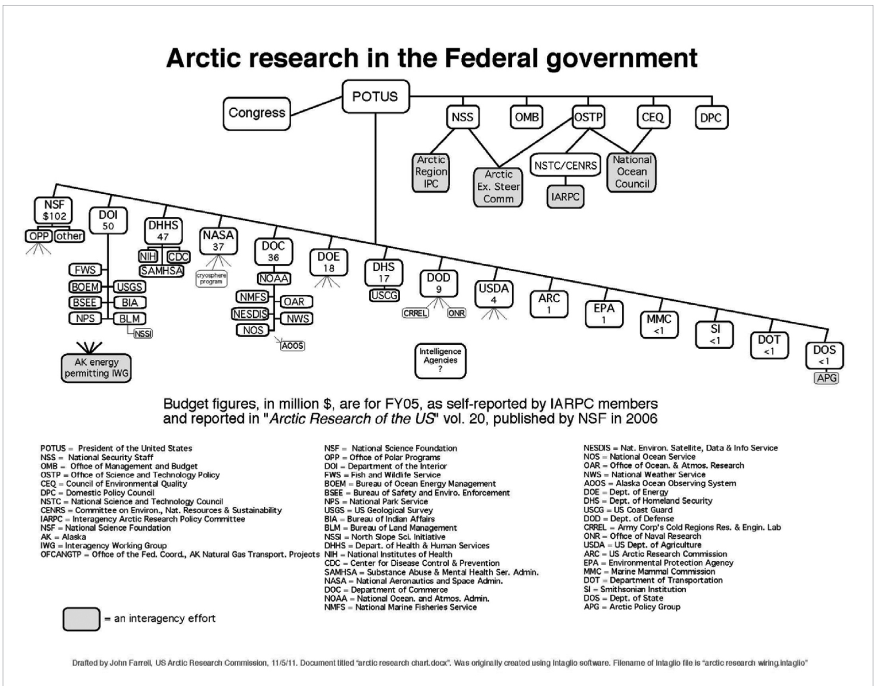


Figure I.2 *Arctic Research Funding in the U.S. Government in 2005* range of Arctic research efforts (Figure I.2). Other major funding agencies include the Department of Interior, NOAA, the Office of Naval Research, and NASA.

The U.S. Arctic Research Commission (USARC) released its *Report on the Goals and Objectives for Arctic Research 2017-2018 for the U.S. Arctic Research Program* (Goals Report) in December 2016. Emphasizing the need for continued scientific research to support its six major goals, the report includes new recommendations for fulfilling these goals. In addition, the Commission also calls attention to progress made on these goals over the past two years.

The Goals Report is published biennially, and it currently includes six priority research goals:

1. Observe, Understand, and Predict Arctic Environmental Change.
2. Improve Arctic Human Health.
3. Transform Arctic Energy.
4. Advance the Arctic "Built Environment."
5. Explore Arctic Cultures and Community Resilience,
6. Enhance International Scientific Cooperation in the Arctic.

The Commission's research goals help shape the IARPC plan and provide guidance to other research organizations that are seeking to contribute to the national priorities.

The White House Arctic Science Ministerial in 2016 provided additional energy to the international cooperation goal of the National Arctic Strategy and reinforced the agencies' efforts to align research priorities and efforts. The ministerial statement and the compendium of each of the 25 nations' summaries of their Arctic research initiatives provide excellent insight into the progress that was and is being made. Finland, Germany and the European Union have indicated their intention to continue the effort, host the next ministerial in October 2018 (https://www.whitehouse.gov/the-press-office/2016/09/28/joint-statement-ministers).

The future work of the Commission, IARPC, AESC and other entities that have been described above and illustrated below may change as the Trump Administration clarifies its policies, goals, objectives and procedures. It is too soon to predict those changes. However, a great deal of work has already been done in advancing connections between policy and research in the Arctic, which hopefully will be used productively in the future.

Social Science Perspectives on Arctic Research, Partnerships, Organizations, and Inter-Regional Collaboration

Peter Sköld

It is well known that the Arctic is facing rapid and far-reaching changes. Consequently, policy-based decisions need an improving, relevant and up-dated knowledge base to help adapt to these changes. As a response to this, we have witnessed an increase in research from multiple fields that can be utilized in guiding policy decisions and informing the general public. Fostering communication and understanding between scientists and the public is a persistent challenge, regardless of the changing threats and opportunities (ICARP III 2016). From a social science perspective, it is important to have a holistic approach to Artic science and to ask questions concerning relevance, impact, power dimensions, planning processes, representation, and how research-partner relations might be developed (AHDR II 2014). The dimension of collaboration is evident at many points during the research process, and the emerging infrastructure offers great opportunities to develop Arctic research, both through established international science organizations and through initiatives between the Arctic Council and national arenas.

SCIENCE AND THE PUBLIC

In the past, the adventures of explorers and stories of northern exoticism dominated the message of communication between Arctic science and the general public, including policy-makers and their advisors (Sales 2002). That is changing, as the importance of the Arctic grows among those who seek to understand climate change and variability. Equally interested are social scientists seeking to create conditions that will permit sustainable development of the region, and also seeking to understand the forces that will invigorate the resilience of human communities faced with processes of rapid and multidimensional change (Keskitalo 2012). As a result, there is a growing effort in the circumpolar North to find better for Arctic science to interact with, and focus on, issues that are important in the public eye as well as to ensure that the insights generated in science are put to better use (Joint Statement of Ministers 2016).

Generally, it can be stated that there are as many publics as there are different sciences, and their relations are multidimensional. We might assume there is a continuum from the value base that all decisions and choices are based on, by relying on three related research processes of defining the issues, conducting the work, and communicating the results before finally analyzing the work's impact. Based on this perspective of the research continuum, Chris Southcott and colleagues (Southcott et al. 2006) identified five key headings:

1. The image of the Arctic and of Arctic science.
2. Construction of research questions.
3. Conduct of research in the Arctic.
4. Control and communication of knowledge (ownership/sharing).
5. Impacts and relevance of research.

Science and communication have the positive potential to make a difference in the Arctic. Their impacts occur on several levels, including but not limited to the political, economic, cultural, social, and environmental spheres. Consequences may be intended and unintended. It is now commonly accepted that new economic activities must undergo social and environmental assessments. There is a need for improved assessments of research impacts to better understand the driving forces behind Arctic science and its relationship to the public interest. Most research-related institutions and organizations have established ethical principles to guide research in the North. A question remains as to how these principles are disseminated and implemented (Drugge 2016). How have ownership, legitimation, dissimulation, and dissemination of knowledge in and about the Arctic been effected in the past? Who controls the knowledge that is produced by Arctic science? Whose interests does this knowledge serve? How are research findings used in decision-making processes? What forms of knowledge are seen as legitimate or valuable? Which forms are discounted? Why is this so?

In the context of these important questions, science has a great responsibility to serve sustainable policy decisions. Over the past decades, science has developed innovative partnership structures both in commercial enterprises and in non-profit initiatives. Researchers and external partners have improved their communication techniques, not least through the digitization revolution. Co-production of knowledge has grown into a common way of proceeding with research questions (Armitage et al. 2011). Today collaboration begins very early in the planning process, and partners play a more active role. It appears that research councils and foundations have higher expectations today on co-funding, which to some extent have been met by an increased will of partners to contribute to project financing. On the other hand, research funders have also realized that partners must be compensated for their participation in the project.

Based on the experiences from the project, “New Governance for a Sustainable Development in the European Arctic,” a model has proved to be useful where funding is allocated in the budget for partner initiatives each project year. During public town hall meetings and regular consultation with project partners, progress of the project has been presented, gaps have been discussed, and partners and the public have suggested additional initiatives to be included in the project (New Governance 2015). The project has responded with targeted efforts attached to the existing program. This has provided tools for a dynamic project, and increased the relevance overall.

INTERNATIONAL SCIENCE ORGANIZATIONS AND ARCTIC RESEARCH PLANNING

Collaboration has been a key strategy for the international Arctic research community.

It is manifested in everything from two persons interacting all the way to large-scale international projects. Some of these large projects that are endorsed by the Arctic Council are more likely to influence later decision-making. But projects exist during a limited time, and research requires more constant structures to communicate with policy makers (Kankanpää and Young 2012; Chater 2016).

The International Arctic Social Science Association (IASSA), the International Arctic Science Committee (IASC), and the University of the Arctic are the three science organizations with observer status at the Arctic Council. These organizations are each about 25 years old, and have developed thorough science agendas. They each, however, have different structures: IASSA has individual memberships; IASC has appointed delegates of the member states; and UArctic has member universities and institutes. The formation of these science organizations represents an important improvement of the science infrastructure, but there are good reasons to strive for further development. In dialogue with high political leadership, it is important for researchers to be able to speak with one voice, which makes it a stronger voice. A strengthened collaboration between IASSA, IASC and UArctic increases these opportunities, and it is a positive development that the organizations signed a Letter of Agreement aiming to work toward sustainability and to conduct research driven by solutions and social impact at the Arctic Science Summit Week in Prague in 2017.

Communication is also a key word for research organizations. Their collaboration is dependent on a firm structure for information exchange, discussions and mutual initiatives. Moreover, they must reach national policy makers, universities and individual researchers. This is a great challenge, especially because researchers in different countries have varying opportunities to participate actively.

Policy makers can only digest a limited amount of research results and recommendations. At the high political level, these results are presented by various project leaders and Arctic Council working groups. Do we know the processes that form the final results that are presented to the Arctic Council? Why these projects in particular, and what drives them? Policy makers at the national, regional and even local levels are often informed by other sources. These processes also are relatively unexplored. We might even want to ask if direct deliveries of scientific information are their primary source of information.

The international research community has developed instruments to guide policy makers and to lead planning processes for future Arctic research. The International Conference on Arctic Research Planning (ICARP) has produced three reports that have set the course. For social sciences, the Arctic Human Development Report I & II have been important. In order to proceed we need to know how these guidelines have been understood and used by policy makers, and ask how they have been implemented at the national and regional levels. And we might want to ask if there are competing forms of guidance. ICARP III and AHDR are certainly not the only sources of influence. It is easy to locate more than 100 policy documents and reports with different recommendations. There are also many different actors involved in putting the recommendations into final practise. They are supposed to correspond with the Arctic Council and the national (and EU) Arctic strategies and their research priorities. They should influence the different research funders and their efforts to cooperate, thereby producing relevant calls for project support. In addition, they should be important instruments in the national initiatives to strengthen research infrastructures, and they should guide and inspire individual researchers in their efforts to establish new projects.

An additional challenge for establishing major research priorities is the link to partners. Recommendations, the research results that are produced, and the construction of new initiatives must all be developed in conjunction with partners from communities, politics, administration, enterprises, NGOs, and the general public. Nevertheless, research planning efforts play an important role in shaping Arctic research.

The Arctic Council is unique in its construction, which requires assembling eight member nations around the table, joined by delegates from the six Permanent Participants. Indigenous Peoples have a distinguished position in the Arctic, and research has a certain responsibility to build respectful, reciprocal, and meaningful relations and collaborations with those who have lived in the region for millennia. These processes are often complex, and there is a need for an improved understanding and evolution of best practices (Graczyk and Koivurova 2015).

INTER-REGIONAL AND INTERNATIONAL COLLABORATION

Arctic research is multi-dimensional, and it is beneficial to optimize the integration of its different levels. It is, however, also important to develop collaboration within each level. At one level we find that all Arctic countries, and often non-Arctic countries, are represented. This includes the Arctic Council, the Arctic Economic Council, and international research organizations. At another end of the spectrum, we find individual researchers developing national initiatives. In the Scandinavian context, they would not necessarily see themselves as Arctic researchers, since there is an identity transformation taking place also in the research community. In the context of these multiple levels, we find collaboration between and among some, but not all, Arctic countries, sometimes including non-Arctic countries. Occasionally these structures have deep historical roots, and in some cases they are responses to more recent initiatives.

There are of course a large number of bilateral cooperation agreements in the Arctic, as well as collaboration at administrative, political, cultural, and economic levels. If we restrict the discussion to research, we can see substantial multinational cooperation. However, a burning question is whether and how the initiatives that are restricted to only one part of the Arctic can contribute to overall regional development. One example of such collaboration is the Barents region, with long-term experience of regional interaction (Elenius et al. 2015). The Barents Joint Working Group on Education and Research (Barents JWGER) reports to the Barents Euro Arctic Council (BEAC) and has during the last 20 years successfully developed a network of students and academic staff. Today, when the development of Northern resources is higher on the agenda than ever before, Barents JWGER states that it is crucial that Northern communities succeed in developing the knowledge and competence needed to play a leading role in this development. More recent initiatives include efforts to build cooperation with Asian nations, such as the North Pacific Arctic Conference (NPAC) and the Chinese-Nordic Arctic Research Conference (CNARC).

Research deliveries to top policy makers depend on solid structures of cooperation at university and national levels. They can, however, also benefit from inter-regional cooperation involving two or more countries. In the Nordic region, borders have shifted over the centuries, and people have migrated back and forth over these borders. There is a fair notion of togetherness among the Nordic peoples, and universities here have great expertise and obvious responsibilities to meet the challenges in the Arctic with innovative and solution-oriented research.

The Nordic Arctic universities strive to advance their long-term capacity building, and implement education, mobility, international networks and outreach activities into an agenda that addresses the priorities stated by the leading Arctic research planning frameworks. One result of these ambitions is the Joint Arctic Agenda (JAA) where the universities of Tromsø, Umeå, Luleå, Oulu and Lapland (Rovaniemi) are partners. With a starting-point in the firm foundation of strong Arctic research and the shared ambition to be key players in the field, JAA endeavors to identify emerging policy-relevant Arctic issues and explore innovative ways to address them, to build a network of senior and early-career researchers concerned with these issues, and to improve the dialogue between practitioners (including government officials, industry executives, indigenous leaders, and civil society leaders) and analysts. The intention is to develop new strategies for communicating research findings to a variety of audiences, and to contribute to the emergence of the next generation of knowledgeable people who will become leaders in dealing with Arctic issues in the future.

The overall aim of JAA is to cross borders and to establish synergies while developing various parts of the Arctic research agendas at the respective universities. Their organizations build an infrastructure that has both general and Arctic-specific strengths. The research profile of JAA is solution-oriented and strives for a sustainable regional development. Whether that is in the largest cities or in small, remote communities, the challenges are often relatively similar for different parts of the Nordic Arctic region (Mega Trends 2011).

Inter-regional and international research cooperation should strive to enable opportunities for the traditional set of activities such as mobility, educational collaboration, project initiatives, workshops, and to build networks for future strategies. Nevertheless, it is essential to develop new forms that include various external partners.

Nordic research cooperation has expanded the international concept of AIMdays, which strive to create unique opportunities for academic scientists, SMEs and other kinds of organizations for mutual capacity building. By matching organizations' need for new knowledge with academic expertise, AIMdays bring understanding and new perspectives to actual problems of SMEs and other organizations. This process centers on small group discussions where a question is highlighted and discussed intensively in hour-long sessions by scientists and experts from different disciplines (Larsson 2015). Innovation is a driving force in the development of Arctic research, and academic entrepreneurship is important. While there are already existing incubator facilities associated with many universities, it is possible to refine the initiatives with an Arctic relevance, and to search for synergies when linking the infrastructures to each other.

At the inter-regional international level, collaboration strives to contribute to better understand the contextual and cultural issues of Arctic educational features via engagement with local communities, indigenous and minority populations, and through institutional and research collaborations. Schools in the Arctic face challenges in meeting the needs of students and communities and confronting issues such as high dropout rates, especially for indigenous students, students with special needs, and males. Problems are further compounded by the size of geographical areas and low population densities, which often result in a thin distribution of resources. This requires educational institutes to provide education that is tailor-made for local circumstances, place-based and grounded in the local knowledge.

Is it possible for bilateral and inter-regional partners to develop cross-border research cooperation, with the aim of strengthening international competitiveness and reinforcing research on challenges and opportunities for sustainable community development in the sparsely populated and multi-ethnic Arctic, particularly in response to global matters? Among such concerns are climate change, growing urbanization, altered mobility and migration patterns, including recent booms in migration and tourism and the recurring "boom-and-bust" cycles of resource industries. A shared interest in assessing the dynamic forces and socio-economic consequences of these trends as well as in identifying how Northern communities encounter them in innovative ways is important (Husebekk, Andersson and Penttilä 2015).

The social sciences are occupied with human activities in all aspects of Arctic research. It is true that humans caused many of the climate changes we are experiencing today, and humans alone can improve the conditions caused by it. In the best of worlds, research produces tremendously important results that are absorbed by policy and decision makers, endorsed by an actively engaged public, and implemented in collaboration with a large set of non-academic partners. The understanding of the Arctic writ large, the construction of research questions, the conduct of research, the communication processes, and the impact and relevance of research are all crucial to development of Arctic research. International Arctic science organizations can also play an important role, and inter-regional international collaboration has the potential to contribute favorably. We might not live in the very best of worlds, but Arctic research continues to be of both local and global importance.

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How Science Can Influence the Way Finland's Chairmanship in the Arctic Council is Advanced

Timo Koivurova

I will be speaking in this sub-session about how the project we are conducting for our Prime Minister's office can contribute to the efficiency and effectiveness of Finland's chairmanship of the Arctic Council.[1]

Our Prime Minister's Office opens a call every year for topics that are of immediate policy interest to the government. In 2015 this funding program, which is based on open competition among consortia, included one for producing information to inform the upcoming Finnish Arctic Council chairmanship. Our consortium based at the Arctic Centre in Rovaniemi won. It included experts from the Finnish Institute for International Affairs (FIIA) and the Finnish Environment Institute (SYKE). This is an inter-disciplinary (within social sciences) group of experts, many of whom have followed—and directly participated in the work of—the Arctic Council and/or Arctic affairs for years.

Of interest is that this specific call to provide analysis relevant to the Arctic Council chairmanship had been launched in March 2016, much before the Finnish chairmanship commenced in May 2017. The effort continues well into the Finnish chairmanship, which formally ends in December 2018. In practice, it will continue until the end of the chairmanship in May 2019.

Another point of interest is that this is potentially an interactive project. Policymakers can ask for policy advice and briefings on any topic, but we can also suggest potentially important topics for them to consider. So far, it has been mostly the foreign ministry's Arctic team that has asked for briefings on the following topics:

1. UN Sustainable Development Goals (SDGs) and how they could be used in the work of the Arctic Council. In these meetings, we brainstormed over how the Finnish chairmanship could advance the SDGs in the Arctic Council. For example, we entertained various ideas about how to catalyze the production of information that would enable the Arctic Council to make a contribution to

the attainment of SDGs in a way that takes into account Arctic-specific circumstances. This included the question of how to increase knowledge of the role traditional livelihoods play in the welfare of the human communities in the Arctic (presently, only Alaska of all the eight Arctic jurisdictions assesses the importance of traditional livelihoods).

2. How the Arctic Council's climate work could be strengthened in light of the adoption of the Paris Agreement, and how Arctic issues could be better included in global climate regimes.
3. Arctic Europe: Bringing together EU Arctic policy and Nordic cooperation. This was specifically requested to give our Prime Minister food for thought when he was delivering a presentation at the Arctic Frontiers meeting in Tromsø, Norway.

One briefing was conducted interactively, rather than taking the form of a commissioned study. The Ministry of the Environment needed our special expertise on a topic that is confidential, and we provided shorter briefings as they prepared for one Arctic regulatory issue.

We have also produced one longer study (a so-called background study) designed to educate policymakers and others on the structure and aspirations of the Arctic Council and its chairmanship. This study was released before the Finnish chairmanship commenced. The report also included our evaluation of the current trends and challenges in the Arctic and what the Arctic Council and the Finnish chairmanship can do to address them. This report was prepared in Finnish and its content was discussed in constructive meetings between the consortium and representatives of the ministry. The final results were presented in a seminar that was convened by our foreign minister in February 2017 in our Parliament building and drew more than 200 participants.

Currently, we are helping the Finnish chairmanship to produce a long-term strategy for the Arctic Council. The 2017 Fairbanks ministerial declaration stated:

> *"34. Recognize that the Arctic Council continues to evolve, responding to new opportunities and challenges in the Arctic, and instruct the Senior Arctic Officials to develop a strategic plan based on the Arctic Council's foundational documents and subsidiary body strategies and guiding documents, for approval by Ministers in 2019."*

In our last steering committee meeting, we were asked to assist the Finnish chairmanship to produce ideas for this long-term strategy. We were also asked by our Arctic team to include in this independent research group an expert representative from the previous chair and from the next chair, which we have done. So far, we have produced a discussion paper elaborating on ideas presented during the Finnish chairmanship. I was able to present our findings to the SAO executive committee on 14 June this year, and it was well received. This work is likely to continue, even if the project ends, up until the final SAO meeting before the ministerial in 2019.

WHAT CAN OUR PROJECT OFFER DECISION-MAKERS?

It is a challenge for a small country like Finland to run the chairmanship of the Arctic Council, an institution that has grown into a broad, complex and ambitious governance body with a constantly expanding agenda. It is always good to get more experts involved in thinking about how the chairmanship can be taken forward.

It is also important for the Finnish chairmanship to have experts, such as those in our consortium, who have a long-term perspective regarding the Arctic Council and Arctic issues in general. Most of the officials who are running the Arctic Council and the related chairmanships (AEC, ACGF and the OFRF) do not have a long-term focus on the Arctic Council and Arctic issues. Most of the Finnish officials in our Arctic team in the Foreign Ministry and in the Ministry of the Environment (who take care of WG participation) have focused on these issues only for a limited number of years, with couple of exceptions. Ministry officials, especially in the foreign ministry, are expected to rotate among different positions, and hence cannot accumulate a long-term knowledge about an institution such as the Arctic Council, or Arctic issues in general.

It can also be perceived that with its “research arm” helping to inform its decision-making, the Finnish chairmanship has increased its legitimacy, especially in leading the long-term strategy work within the Arctic Council. These efforts are enhanced by our addition of research representatives from the previous chair and the next chair of the Council, working in concert with our consortium to provide ideas and drafts for the Finnish chairmanship to develop the first ever long-term strategy for the AC.

One important role for us is that we, as researchers, can offer more courageous and far-reaching ideas. Diplomats in the foreign ministry need us to do the brainstorming, since they often do not have time for this sort of exercise—and perhaps researchers are better equipped to engage in informed, strategic thinking about these complex issues. It is this type of role we have had in producing briefing papers to date, perhaps especially so in our SDG study, which has identified various ways that Finland can take SDG work forward in the Arctic Council.

ATTRIBUTES OF A GOOD SCIENCE/POLICY INTERFACE

We have learned some important lessons so far in this project. First, there needs to be a team of people involved who develop a basic sense of respect and trust toward each other. This has been gradually building in our project, in part because we meet with government officials often. To date, they have been very satisfied with what we have produced, and we have been able and willing to exceed their expectations on many occasions. We, in turn, have appreciated that those officials have shown great flexibility in terms of how they have managed the project. This gradual building of trust has resulted in creating ongoing informal contacts, where they trust us on our knowledge (and occasionally our silence), and we trust that they are trying to be flexible and understand the project from our viewpoint—and that they will listen to our arguments even if they find them unrealistic at the outset of the discussion. This type of interaction creates real possibilities for us to substantively influence policies that they will ultimately need to advance. Even when our work does not obviously contribute to their decisions, the lines of communication we have established provide opportunities for them to give clear reasons why they cannot follow our suggestions and recommendations.

Notes

1. In our steering committee, there are also ministry officials who are leading (e.g. the Arctic Coast Guard Forum), so it is mainly but not exclusively intended to improve the functioning of the AC chairmanship.

PART II

RESPONSIBLE ECONOMIC DEVELOPMENT IN THE ARCTIC

Perspectives from the Industry Sector

Tero Vauraste

INTRODUCTION

This conference paper discusses selected conference and session framing questions, first on a general level, and then in light of a recent international collaboration between academia and the business community in the Arctic.

The general discussion focuses on international trade policy developments and their potential implications for the Arctic. Free trade developments, trade barriers, protectionism and international financial value chains are also reviewed.

INTERNATIONAL TRADE POLICY DEVELOPMENTS

Framing questions:

1. What are the barriers to developing natural resources under current and expected future geopolitical and economic conditions?
2. Are there opportunities to achieve long-term sustainable economic development in the Arctic as a distinct region within the global economy?

Trade is an integrated part of social and societal developments, whereas creating added value is, perhaps, ultimately the only sound base of sustainable economical development.

Unless value is added at every turn, the value chain flows in the wrong direction, which consumes economic assets instead of creating them. This is actually the case in most Arctic societies, as they are in a complex transformational process from traditional livelihoods into modern societies —or some mix of those.

As these developments create new markets and infrastructural needs, the challenge of producing added value still remains in many cases. There are about four million taxpayers in the Arctic, in an area that is comprised of eight nations and their indigenous peoples. Based on this, we may ask ourselves whether simply increasing trade within the Arctic can actually create value in the foreseeable future.

If that is not the case, at least in certain areas, perhaps the solution is to combine these local or regional value chains into broader and perhaps even global trade value chains as vital component parts. Here, the challenge is to ensure that local environments, societies and traditional livelihoods are always respected while integrating Arctic Small and Medium-Sized Enterprises (SME's) and societies into these chains. In contrast, large multinational corporations have been working in the Arctic and will continue doing that in the future as well.

An Ethical Business Code for the Arctic could at least to some extent ensure that the value chain additions are done in a sustainable manner. This could be produced as a joint effort of the World Trade Organization (WTO), World Economic Forum (WEF) and the Arctic Economic Council.

During the past 20 years there has been a macro trend to lower global trade barriers. We have witnessed the developments of NAFTA and the European Union as well as significant bilateral free trade agreements. These have resulted in boosting international trade with more comprehensive and stronger value chains. Further attempts to proceed were taken with the proposed TTIP free trade agreement between the U.S. and the EU as well as the TPP agreement.

After this positive development, there has been a recent change in this macro trend. The U.S. and the EU are instituting trade sanctions that target Russia, the United Kingdom has voted to leave the European Union, and the U.S. pulled out from the TPP earlier this year. From the United States, the world is hearing confusing slogans such as, "America first, but not alone."

Simultaneously, there has been a trend to work more bilaterally in various areas of trade. For instance, Russia and China are working together on the Northern Sea Route development. Iceland and China have declared a free trade agreement. Canada and the EU have prepared the CETA agreement, which is expected to have significant implications: According a Canadian government announcement, trade with the EU will provide benefits on many levels: "For example, prior to CETA's entry into force, only 25 percent of EU tariff lines on Canadian goods were duty-free. Upon CETA's entry into force, the EU will remove tariffs on 98 percent of its tariff lines. Once CETA is fully implemented, the EU will have eliminated tariffs on 99 percent of its tariff lines." (http://www.international.gc.ca/gacamc/campaign-campagne/ceta-aecg/index.aspx?lang=eng).

Free trade ensures that the best available technologies and services can be exported wherever needed. Protectionism, on the other hand, ensures less competition and slower technological development. Hence the current trends described above that suggest a move by some countries towards isolation and protectionism are alarming for the Arctic. Best available technological services and products are vital in ensuring sustainable investments and economic activity in the region.

The Arctic is often considered as a region that is isolated from global geopolitical developments. This has partially been the case, as dialogue around Arctic issues has remained active even though the international geopolitical tensions have been rising. However, the Arctic is not an isolated area. As a result of climate change, rising temperatures, and the current and projected effects of sea level rise, the Arctic has become mentally closer to "Southerners." It is considered that the Arctic's natural resources can be more easily extracted. Rare earths and other elements and minerals that can only be extracted currently in a limited number of regions can also be found in the Arctic.

Alun Anderson, in his book: *After the Ice: Life, Death and Geopolitics in the New Arctic*, holds that the Arctic is based on humans, ice, borders, oil and ships. The book also includes an excellent analysis of the need for minerals and rare earths elements. In order to navigate the ice and to extract natural resources like hydrocarbons, minerals and rare earths, best available technologies and services must be made available. This requires low or no trade barriers. It also requires strong financial value chains.

During the preparation period of the Arctic Economic Council in 2012-2013, a vision for a "Pan-Arctic Free trade zone" was established. As we have perhaps moved further from this opportunity, it is even more important to work towards this vision.

The Arctic is a region that four million people call home. It is a large geographical area connected by the icy Arctic Ocean. The investment potential has been considered to be as high as $1 trillion by the World Economic Forum. The entire population of Finland is slightly less than six million people, which is almost equivalent to the population of the Arctic. The Finnish national budget is around $70 billion, and taxes there are high. It is easy to verify that the taxpayer income potential of the whole Arctic is inadequate to serve the its investment opportunity. Hence, international financial value chains need to be connected into Arctic value chains. Additionally, public-private partnership models are vital.

Asian countries have shown an increased interest in the Arctic and they play a major part in global trade and investment. Japan and China have increasingly invested in Arctic research. Korea's Arctic research efforts and development have taken giant steps forward through the past years. What does this mean for international cooperation and business in the Arctic? Indeed, this growing interest will foster increased and much needed investment power. It will also provide opportunities in linking international financial value chains into the Arctic.

A PRACTICAL EXAMPLE

Framing questions:

1. Does the idea of stewardship offer a basis for a useful science-policy dialogue regarding Arctic economic development?
2. Can we identify success stories illustrating novel or innovative strategies for promoting responsible economic development in the Arctic?

CASE STUDY: MULTIPURPOSE ICEBREAKER NORDICA'S ROUTE ON THE NORTHWEST PASSAGE

With the permission of our Chair and with a sense of novelty, we can explore a positive response to these questions in light of a very recent, successful international endeavor.

The Arctic 100 Expedition was concluded in the end of July. Arctia's Finnish icebreaker *Nordica* transited the Northwest Passage (NWP) from Vancouver, Canada, to Nuuk, Greenland. To celebrate the centenary of Finland's independence and Finland's first year as Chair of the Arctic Council, the *Nordica* and an international team of experts executed a successful and novel study mission.

Prior to departure, the vessel visited Busan, Korea, to host Korean and Japanese researchers, politicians and business representatives. Arctia's multipurpose icebreaker *Nordica* then set off from Vancouver, Canada, on 5 July and arrived in Nuuk, Greenland, on 29 July.

The Arctic 100 Expedition had a strong focus on social and natural sciences with an international team of around 20 experts from Canada, including First Nations representatives, Finland, Sweden, the United States, Australia and Russia with a crew of 21 experienced seamen.

The team and the icebreaker set a new record for the earliest crossing of the NWP. The icebreaker traveled more than 6,214 miles to set the record and was at sea for 24 days.

Including the *Nordica*, there have been just 411 recorded NWP transits since 1903, when Norwegian explorer Roald Amundsen reached Alaska from the Atlantic.

During *Nordica's* transit through the NWP, the vessel's crew and the experts on board observed ice conditions and sea mammals while developing international ties among representatives from maritime businesses and academia. The journey also reached out to deepen international and local dialogue in the field of Arctic research.

While at sea, the scholars and crew on board organized 16 expert presentations, resulting in more than 25 hours of engaged transnational, multidisciplinary and intersectoral knowledge exchanges. Among other things, the expedition participants discussed the future management of operations in projected sea ice conditions, the meaning of Finland's and Canada's Arctic expeditions, as well as the means to ensure pluralism and diversity in the process of planning the Arctic's future.

The expedition was open to the general public through social media. Almost every day, the crew and scholars on board posted updates and pieces of information based on their area of expertise to the "Arctic 100 Expedition Blog" on Facebook. During the expedition, the blog reached approximately 12,000 Facebook users and had more than 1,000 regular followers. Taking into account the general public's overall interest in topics related to polar areas, the expedition's coverage in global news media was also extensive – thanks to the team of Associated Press journalists on board.

The expedition was conducted in cooperation with the Canadian Coast Guard, Transport Canada, Martech Polar, Nunavut Impact Review Board, and the Nunavut Fisheries and Marine Training Consortium. It was part of the program for the centenary of Finland's independence in 2017 and planned in cooperation with the Ministry for Foreign Affairs of Finland and the Ministry of Education and Culture of Finland.

Route and schedule on the Northwest Passage

Departure from Vancouver	July 5th
Enter Bering Sea via Unimak Pass	July 11th

Transit Bering Strait, enter Chukchi Sea	July 14th
Enter Amundsen Gulf	July 18th
In Larsen Sound	July 22nd
In Peel Sound	July 23rd
Pass Bylot Island	July 24th
Exit Canadian waters in Baffin Bay	July 26th
Arrival in Nuuk	July 29th

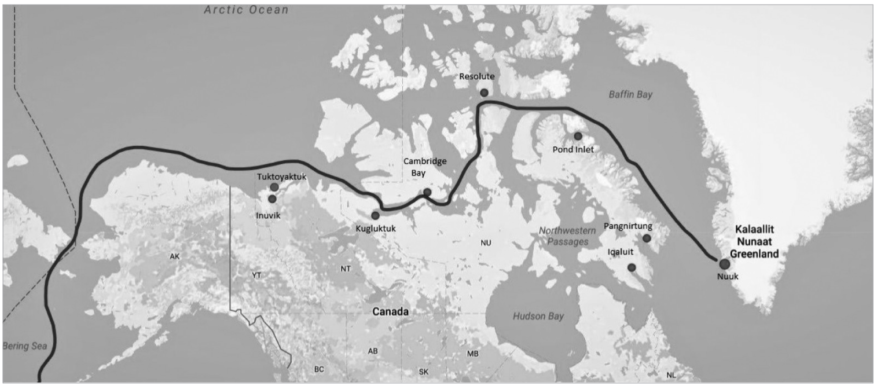

Figure II.1 *The Northwest Passage Route*

THE RATIONALE

Research on both the Arctic and the Southern Ocean is essential for the study of climate change and many other challenges facing us today. Yet many nations and institutes around the world with research interests in polar areas do not have the logistical means to access these areas. Therefore, Arctia Ltd. offered its fleet and expertise to the international research community.

International polar expeditions during transit voyages of commercial icebreakers are still very rare. This expedition demonstrated the idea of jointly using icebreakers from around the world, not only the limited number of national polar research vessels, for research purposes in polar areas. In addition to using transit voyages to take on board researchers, icebreaker operators could in the future charter vessels for the use of joint ventures of multiple research institutes in a flexible way. Arctia Ltd. wants to be in the forefront of this new way of thinking: pooling and sharing Arctic assets.

In 2015 Arctia Ltd. invited more than 100 universities and research institutes around the world to join in planning and executing the Arctic 100 Expedition. The concept was new to the research world, and the project group did not secure financing early enough to realize the project in its original form. However, the support already secured by Arctia as well as the extensive international interest in the project provided sufficient motivation to continue the project, and it was combined with MSV Nordica's transit through the NWP in July 2017.

The idea of sharing icebreaker assets among all nations in need of icebreaking services is not new. It has been discussed in many international events and forums, most recently at the Wilson Center-Arctic Circle Forum in Washington D.C. on June 22nd, 2017. The "Arctic 100 Expedition" demonstrated Finnish competence and willingness to cooperate with other nations in designing, building and operating the global icebreaker fleet.

Using the NWP to transit from the Pacific to the Atlantic makes sense for an icebreaker, because it saves fuel and time compared to the Suez Canal route. We estimate that using the NWP for this particular transit saved about 16 days and 640 m^3 (170,000 gallons) of fuel compared to the Suez Canal route.

In addition to the NWP, Arctia's vessels *Nordica* and *Fennica* have transited the Northern Sea Route (Northeast Passage) twice and assisted in various offshore operations in Alaska, Greenland and elsewhere in the Arctic. These multipurpose vessels reach polar waters that are inaccessible or hard to reach with ice-strengthened research vessels. The icebreakers are also easily equipped for research purposes.

The Finnish Meteorological Institutes' new ice and weather service concepts were tested for user experience during the expedition. Meteorological cooperation is one of the four priorities of Finland's Chairmanship of the Arctic Council in 2017-2019.

Arctia Ltd. wishes to continue dialogue with the world of research to solve the challenges of combining lengthy funding and planning processes in academia with often rapid decision-making in the shipping industry. Facilitating knowledge and data exchange between industry and academia is one of the five overarching themes of the Arctic Economic Council (AEC).

CONCLUSION AND A RECOMMENDATION

Trade barriers and protectionism pose a significant threat to sustainable Arctic Investment developments. A Pan-Arctic free trade zone, broadened to include the trans-Pacific Rim, would be a recommended initiative and a potential research area for the East West Center. To safeguard sustainable development, an Arctic Business Ethical Code could be developed to act as a framework and make recommendations.

Canadian Perspectives

Victor Santos-Pedro

INTRODUCTION

What kind of responsible economic development will benefit Northerners?

This question is often asked at the final phase of planning development projects, including those labeled as "sustainable." Today, it must be the first question we pose. The classic definition of sustainability, *"development which meets the needs of the present without compromising the ability of future generations to meet their own needs,"* is broad enough to consider sustainability that focuses on local interests ahead of national or global demands.

This essay addresses some of the framing issues established in advance for this session. The Canadian experience has both general application and unique features that are germane to discussions on building capacity and sustainable development.

SUCCESS STORY

The Baffin Fisheries Coalition recently announced they signed a letter of intent with Norway for a new 75 m trawler, designed and built to fish turbot and shrimp in Nunavut waters. The story of Baffin Fisheries exemplifies on a small scale the many desirable features of successful developments with lasting benefits.

The implementation of the Nunavut Land Claim Agreement of 1993 ultimately created the Nunavut Territory in 1999. Soon thereafter, the federal Department of Fisheries and Oceans allocated exclusive exploratory fishing quotas of 3500 tonnes to the region. The Baffin Fisheries Coalition was formed in 2000, bringing together five associations of hunters and trappers to take advantage of favourable conditions in the new Territory. Without expertise in financing, ownership, or in operating fishing vessels, the Coalition sought partnerships that would build capacity that would eventually lead to self-sufficiency. In 2005, the Coalition gained majority interest in two factory-freezer harvesting vessels. By 2011, Baffin Fisheries became wholly owned by the original five Baffin Island Hunters and Trappers Associations. Today, the Coalition is based in Iqaluit and owns and operates four factory freezers, two gillnetters and two multi-species vessels. It hires and trains individuals from local communities in safe marine operations and in sustainable fisheries management. The devolution of authority in Land Claims, availability of private sector funding for small and medium enterprises, the willingness for all concerned to cooperate and partner, plus the initiative and entrepreneurship of the Inuit provided the right circumstances for this nascent company to make significant long-lasting contributions to local communities and the fishing sector in general. Now, if only a number of harbours were available in the Canadian Arctic to deliver that fish catch…

CONTEXT

Canada's North is vast, mostly empty, and beautiful. This quarter of the global Arctic has approximately 135 thousand inhabitants (three percent of Canada's population), depending on where one draws the southern boundary (for example, at the edge of the Boreal forest, 60 degrees North latitude, or the Arctic Circle). Socio-economic studies often dip below 60° latitude to include communities that primarily lie in the provinces of Manitoba, Ontario, Quebec, Newfoundland, and Labrador. Communities are sprinkled across this vast landmass (40 percent of Canada), often with poor access to basic infrastructure elements such as affordable transportation, viable energy sources, or reliable telecommunications, not to mention healthcare and education. The combined annual contribution to Canada's GDP from the Territories is one percent. It is costly to do business and to live in the North. A startling economic fact: if a resident of Ottawa wants to buy a head of lettuce, it is cheaper for them to fly half-way around the world to Perth, Australia, and back, than it is for them to fly to the Northmart in Iqaluit, the capital of Nunavut, which is only three hours away by air from Ottawa. (Of course it is cheaper still for the Ottawan to go to the Canadian Superstore to buy their produce.)

Non-renewable resource extraction has been and continues in many areas of the North as the most visible economic stimulus. Yet, even more people are employed in the public sector, including administration, health care, social assistance, and educational services. The traditional economy based on hunting, trapping, and arts and crafts remains culturally significant and supports the growing tourism sector. Mining, oil, and gas products are exploited for export. Not surprisingly, this kind of project development is seen first from an external perspective. Benefit packages target project needs, workers' tailored capacity, and transportation routes but not necessarily the basic needs and long term health of surrounding communities. Sustainable economic development requires a more holistic approach, with coordinated activities from government, private agencies and companies. Not least, it requires engagement with local authorities and consultation with Northerners in general and Indigenous Peoples in particular. It is vital that any development be viewed through local lenses, and shown to be viable and sustainable for local communities.

There is already a great volume of literature devoted to the focus of this NPAC conference. Here, I have not included an exhaustive list of references but instead reference key citations. Strategies, studies, and case studies of solutions abound, including some excellent submissions for this discussion by participants with experience in the field.

Even with the best intentions, many significant projects fail for various reasons: market forces and dwindling demand; misguided policy measures; insufficient consideration of local interests; or the lack of active consultation. The tendency of many private sector developers is to build the cheapest possible, shortest life infrastructure to maximize return on investment. Various tiers of government and the private sector need to take a longer-term view. The Supreme Court of Canada has just released an important ruling on Government duty (and by extension the private sector) to consult indigenous communities about development projects in their territories. The Court ruled that the National Energy Board has the capacity to make decisions, but the consultations are only acceptable if conducted in the most robust and comprehensive manner. This ruling emphasizes the need to reconsider the design and planning stages of any development and to have local demands placed on equal footing with external considerations.

ECONOMIC FRAMEWORK

Canada has instituted a framework for responsible economic development that considers local interests, mainly by the settlement of Land Claims, most of which have been in the North. CanNor, the Canadian Northern Economic Development Agency, partners with communities, indigenous organizations, industry and business, other federal departments, and with all three Territorial governments. In promoting economic development, its mandate supports science and innovation projects in areas such as renewable energy, clean technologies, and cold-climate research. Businesses engaged in tourism, fisheries, and bio-energy, among others, can apply for contributions from an annual budget of $CAN 35 million ($28 million USD) via two main programs. One supports indigenous communities and businesses while the other promotes economic diversification and growth. The Northern Projects Management Office aims to improve the environmental review process for major projects in the North. Other nationwide federal programs provide expertise on regulatory and policy matters. Despite this substantive federal government framework for Northern economic development, or because of it, there are many criticisms and concerns. Coordination and consultations must be robust and responsive to community interests. Strategies should be comprehensive in nature. One major barrier to economic development is jurisdictional overlap in regulation and authority: what applies where and who is in charge. Streamlining and harmonizing rules, regulations, and policy is one approach.

Canada's Northern Strategy does tout that the government wants to promote development in a sustainable way and that Northerners should benefit directly from economic growth, and should also enjoy increased access to skills training and education, better housing, and improved health. Also, the Government wants to encourage responsible development by having "improved regulatory systems" and investing in "critical infrastructure."

BASIC INFRASTRUCTURE

In practical infrastructure terms, the most recent addition was celebrated in 2013, when the community of Pangnirtung started using their new small craft harbour, the first and only in Nunavut. The harbour supports commercial and subsistence fishing, tourism, and with a deeper approach channel can now be used by Sealift vessels bringing vital supplies from the south. Many other coastal communities could benefit from similar endeavours. Recent studies indicate that a deepwater port in Iqaluit would have a dramatic effect on seasonal Sealift operations and risk reduction.

Other transportation infrastructure is being completed and envisioned as well. Later this year, the much anticipated all-weather road between Inuvik and Tuktoyaktuk will be open for traffic. Apart from creating obvious links between these two communities, the energy sector already sees opportunities for exploration of gas wells that will now be viable because of the new road. Further extension southward that connects with the existing road system in the Northwest Territories could engender many new ventures. The proposed Mackenzie Highway extension would connect Inuvik to Wrigley. These types of basic infrastructure projects, albeit costly to build and maintain, are known to generate welcome activity that strengthens the fabric of remote communities.

In other fronts, the Canadian Coast Guard (CCG) maintains six aging icebreakers during the summer in Arctic waters, acting as first responders when vessel owners cannot respond to emergency situations. The CCG operates the NORDREG communications system, receiving reports from passing ships and providing weather, ice conditions, and routing information. Some communities have spill-response equipment, but studies have identified gaps at all levels. Often mentioned is the lack of an integrated plan for emergency situations, a lack of dedicated equipment in place for major events, and much need for greater community involvement.

The *Arctic Marine Shipping Assessment Report* of 2009, commissioned and approved by the Arctic Council, has an entire chapter on marine infrastructure. Many of the recommendations are relevant and still valid but have yet to be taken up, including several proposals to improve emergency preparedness and response.

EMERGENCY PREPAREDNESS

It is easy to forget that the *Exxon Valdez* oil tanker struck Bligh Reef in 1989 at full speed while avoiding ice cover present in the customary and well-known traffic lanes of William Sound, Alaska. The crew had no knowledge of the vessel's capability to operate in ice-covered waters, lacked situational awareness and training, and suffered from poor leadership and navigational skills. Also, there was inadequate shore management and operational oversight. This entirely preventable catastrophic event has become a classic example for teaching accident root cause analyses. Twenty years on, in 2010, the *Deepwater Horizon* drilling platform exploded and subsequently sunk in the Gulf of Mexico, causing loss of life and substantial pollution. No Arctic ice was involved, but once again the incident showed that human organizations are often ill-prepared and ill-equipped to deal with low-probability, high-consequence events. The U.S. Coast Guard cited "inadequate assessment and management of risks" when Shell's drilling rig *Kulluk* ran aground off the coast of Alaska in icy, storm-tossed waters. Elsewhere, in Antarctic waters, the Liberian flagged, "ice-capable" cruise ship *Explorer* sunk in ice-covered waters in 2007, with 154 passengers and crew aboard, but thankfully without loss of life.

While there have been no comparable catastrophic events in the high Arctic, there are several examples of near misses. Accidents will happen. The probability of accidents can and should be reduced by collecting better data, developing more robust design solutions, including redundancy provisions, establishing clear lines of communication during emergencies, and providing better training and decision-support tools. When prevention measures fail, there must be continued improvement on preparedness for the aftermath of accidents by having more than adequate mitigation measures commensurate with the risk, equipment in place that is maintained and ready for use, and frequent training drills. Both sides of the risk assessment "bow tie" need new approaches in order to reduce all risks to the point where they are As Low As Reasonably Practical (ALARP). Currently, for a risk to be accepted as ALARP it must be shown that the cost involved in reducing the risk further would be disproportionate to the resultant benefit. Considering the worst-case scenario is not popular and neither are the consequences when it happens. The *Crystal Serenity's* 2016 and 2017 voyages establish a high benchmark for cruise ship voyages, but it is necessary to recognize that many of the risk-mitigation measures put in place were completely voluntary, and other operators may have neither the resources nor the inclination to adopt a similar approach.

CERTAIN REGULATIONS

The outdated 1970's legalese of the preamble of the Canadian *Arctic Waters Pollution Prevention Act* (AWPPA) first recognizes the economic potential of the region. Then, it underscores the obligation for development to benefit Northerners and to do so responsibly, in ways that do not disturb the environment.

> *"Whereas Parliament recognizes that recent developments in relation to the exploitation of the natural resources of arctic areas, including the natural resources of the Canadian arctic, and the transportation of those resources to the markets of the world are of potentially great significance to international trade and commerce and to the economy of Canada in particular. And whereas Parliament at the same time recognizes and is determined to fulfil its obligation to see that the natural resources of the Canadian arctic are developed and exploited and the arctic waters adjacent to the mainland and islands of the Canadian arctic are navigated only in a manner that takes cognizance of Canada's responsibility for the welfare of the Inuit and other and other inhabitants of the Canadian arctic and the preservation of the peculiar ecological balance that now exists in the water, ice and land of the Canadian arctic."*

In the AWPPA, the Act protects Canadian coastal waters north of 60° latitude and out to 200 miles offshore in line with the *UN Convention on the Law of the Sea*. Preventive measures in the Act apply to pollution from ships, from land, or from undersea sources (offshore work) and are the responsibility of three federal ministers, respectively. The main regulations and standards under the Act address shipping activities and are currently under review (public consultation stage) to incorporate by reference the *International Maritime Organization* (IMO) Polar Code, which became mandatory for new ships on January 1, 2017. During the course of 20 years of deliberation at IMO, the *Polar Code* was developed using a holistic, risk-based safety management regime that incorporates critical elements: hazard identification, with realistic evaluation of risk; appropriate risk mitigation measures; competent personnel (training); owner/operator commitment (accountability); and effective oversight.

The system needs to be comprehensive and clear in purpose to ensure that the responsibilities of all parties are recognized and appropriate. If applied to individual projects the approach needs to encompass all phases from design to disposal, and to quote the Act, to restore "preservation of the peculiar ecological balance." There are additional responsibilities for the proponent, the government, and others, including those robust consultations.

Drafting of the *Polar Code* started with the simple aim of harmonizing many disparate requirements of rules and regulations that exist for ships operating in international ice-covered waters, as well as to have specific measures for the anticipated conditions. Of note, until the *Polar Code* comes fully into effect for larger vessels after 2018, there are no mandatory requirements outside of Russian or Canadian waters. Any vessel can travel to the North Pole with the same equipment as they use going to the Equator. The insurance will cost more, however.

CONCLUDING THOUGHTS

The Canadian North is home to a young, fast-growing population, situated mostly in remote areas where addressing shortcomings in fundamental needs is of great importance to communities seeking responsible economic

Figure II.2 A Grocery Store in Iqaluit, Canada development. There is a range of issues to address related to education and the low rate of high school graduation, training and skills development, health, including social welfare and drug addiction, the diminishing use of Indigenous languages, the lack of recreational facilities with ongoing relevant programs, and basic infrastructure.

Increasingly the use of the field of behavioural economics is being applied on a wide variety of subjects. Richard H. Thaler has developed the concept to contrast with classical economics theory, which widely assumes human beings to be rational. The UK Government has reduced red tape by applying the principles of behavioural economics to decision-making, while the European Union is exploring its application in policy and other areas by using what it calls behavioural insights. In 1967 Edward de Bono introduced "lateral thinking" as a creative approach to solving problems that otherwise do not respond to step-by-step logic. Behavioural economics is evolving to provide tools and methods in a systematic way to solve problems in the most cost-effective way. In combination with technological advances and tempered by robust consultation, it could foment responsible Northern development by simply reducing the cost of doing business. That lettuce in Iqaluit should not cost much more than it does in Ottawa.

Russian Perspectives

Tatiana Mitrova

The Arctic is critical to Russia's future economic performance. Estimates vary, but an estimated one-fifth of Russia's landmass is north of the Arctic Circle. This part of the country generates about 15 percent of Russia's GDP, and this share is expected to increase in the future as traditional areas of hydrocarbon production become depleted. Russia has utilized the Arctic for economic gain for centuries for both shipping and fishing. Today, onshore hydrocarbon production in the Arctic provides the bulk of Russia's oil and gas supplies, and Russia currently has plans to exploit large offshore resource deposits in the Arctic. The main goals of Russia in its Arctic policy are "to utilize its natural resources, protect its ecosystems, use the seas as a transportation system in Russia's interests, and ensure that it remains a zone of peace and cooperation."[1]

Simultaneously the Arctic is extremely important for Russia from both a national security and a geopolitical point of view, factors that make the Arctic one of the most important regions for the country's leadership. Russia plans to increase its military presence in the Arctic. In the event of increasing geopolitical confrontation, the Arctic is also regarded as Russia's last line of defense, which makes the region's protection critically important.

As Russian President Vladimir Putin announced in March 2017, "we need to protect Russia's economic and security interests in the Arctic. Natural resources, which are of paramount importance for the Russian economy, are concentrated in this region."[2] He has reaffirmed the Russian presence in the Arctic as a top priority amid an intensifying rivalry over the region, and this prioritization is being supported and promoted by all respective ministries and other governmental agencies.

Despite Russia's strong desire to develop the Arctic, there are numerous climatic, logistical, technological, and environmental barriers to developing this region and exploiting Arctic natural resources. Moreover, under current and expected future geopolitical and economic conditions, new challenges and barriers are arising. Increasing geopolitical tensions among Arctic countries—first of all between Russia and the United States, but also between the U.S. and non-Arctic nations like China, and even the U.S. and European countries—do not help to build cooperation in the region. It would not be such a big problem for any other part of the world, but the extremely fragile Arctic environment and challenging transportation conditions in this area make international cooperation absolutely necessary for safe and sustainable development.

It is not only the deteriorating geopolitical situation that undermines economic development of the region. Probably even more harmful was the recent change in economic conditions, which includes both much lower commodity prices (notably, in the price of oil) and also Russia's economic slowdown partly due to the negative impacts of financial and technological sanctions on investment availability. Arctic offshore hydrocarbon resource development was specifically targeted by the sanctions, and trade in nearly every technology required for oil and gas production is now banned. There are some attempts to find Chinese replacements, but it seems that Chinese companies also prefer to be very cautious and not to take any serious risks to violate international sanctions. Altogether these factors are making Arctic development tremendously difficult. Many projects that were under consideration in 2012-2013 are now becoming economically inefficient or technologically impossible without foreign equipment and technologies, such as the Kara Sea oil offshore development or Shtokman gas and condensate project.

Another problem is related to diminishing Russian domestic financial resources, a growing budget deficit, and related investment constraints, paired with a poor investment climate that is not attractive for private investors. In sum, the current situation in Russia's Arctic development is characterized by high ambitions and strong motivation, which are tempered by limited technology access and constrained finances. This combination looks pretty disturbing, as it is increasing barriers for sustainable and safe development of the local resources.

The situation is aggravated by the fact that there are nearly no systems of emergency response in case of any accident arising from many operations (especially offshore hydrocarbon production and in maritime transportation). Several recent cases, such as the incident in October 2015 with the Norwegian tanker *Norvarg*, which was drifting in the Barents Sea,[3] demonstrate that the density of emergency security stations and alert systems is currently too low in the region. Fortunately, many countries realize the importance of developing these systems: every year Russian-

Norwegian rescue exercises take place in the Barents Sea. But this is still insufficient for the secure functioning of the whole Northern Sea Route.

There are still opportunities to achieve long-term sustainable economic development in the Arctic as a distinct region within the global economy. However, capitalizing on this opening would require a completely different geopolitical landscape. Unfortunately, over the last few years the window of opportunity for mutually beneficial cooperation has been shrinking fast. Theoretically, the idea of stewardship could offer a good basis for a useful science/policy dialogue regarding Arctic economic development. But in the current geopolitical situation, as Russia is becoming increasingly cornered and isolated, any dialogue could be only very limited until the deepest contradictions are solved. It seems that at the moment the only acceptable option is reminiscent of the Cold War concept of "peaceful coexistence," when the parties may not cooperate but at least do not harm each other. Of course such an approach would mean a long delay in the proper civil development of the Arctic territories for all sides (although it could provide a boost for military-related developments).

It is still difficult to say whether the new Russian approach to the Arctic region's development will become a success story. For now, it seems at least to be an interesting method for promoting economic development in the Arctic. It is to a certain extent a forced policy driven by the lack of money. The idea is based on prioritizing the development of so-called "Arctic Support Zones." In this time of limited resources, it may be the only realistic way to keep development going. If Russia cannot afford to develop its entire Arctic territory, it will likely decide to focus development using two critical defining principles: 1) areas that are important from the maritime transport and military points of view; and 2) have significant mineral resources.

The Russian Ministry of Economic Development has identified eight such Arctic Support Zones on which funds and projects will be focused, "with the aim of fostering the economic potential of the Northern Sea Route while ensuring that the Russian presence will not be limited to resource extraction."[4] These eight zones are Kola, Arkhangelsk, Nenets, Vorkuta, Yamal-Nenets, Taimyr-Turukhan, North Yakutia and Chukotka (Figure II.3). Each of these zones are expected to help develop the potential of the Northern Sea Route ports and simultaneously to facilitate exports of ores, hydrocarbons and other natural resources.

According to the State Program on Arctic Development, 80% of the

Source: O. Smirnova, S. Lipina, E. Kudryashova, T. Krejdenko, Y. Bogdanova. "Creation of Development Zones in the Arctic: Methodology and Practice." *Arctic and North*. 2016. No 25. PP. 149-157.

Figure II.3 Eight Arctic Support Zones

investments required until 2030 should come from private investors. So the key question now is how to make these territories attractive, assuming that nearly all tax breaks have already been provided and have proven to be insufficient incentives. Despite all the incentives during the last decade, only four large-scale projects were built: Prirazlomnoe, Bovanenkovo, Novoportovskoe and Yamal-LNG – all with FIDs made before 2014. No new projects have been approved since then.

Assuming this lack of outside financing will continue, the idea is to develop new infrastructure in these "Support Zones" using public-private partnership mechanisms, unifying the financial capacities of the large private companies and of the state budget. As Deputy Economic Development Minister Alexander Tsibulsky said recently, "The idea is to create transparent investment conditions, some kind of agreement between the government and business. Business should take responsibility for investment and job creation, while the government will focus on infrastructure issues."[5] Some observers are even interpreting it as an attempt to restore the kind of production sharing agreement (PSA) that was popular in the mid-1990s to spur international investment in the Russian hydrocarbon sector.

To date, there have been several positive examples of such partnership: with Nornikel (Norilsk city development); and with Novatek (Sabetta port construction). These large companies were actively participating in the development of transportation, telecommunication and energy infrastructure in the region, which was partially state-financed and exempted from taxes.

Russia's Arctic development policy recently found itself facing enormous unexpected threats. There is still no clear vision how to deal with all these new unfavorable developments, therefore the request for policy-relevant research on responsible Arctic development at a time of very limited financial resources and technology availability in Russia is especially urgent. The main question is whether researchers will be able to deliver any new creative ideas and constructive suggestions (and articulate them in a way that is understandable for politicians). Either way, Russia will keep developing the Arctic—hopefully in responsible and sustainable way.

Notes

1. *Russia's Arctic Policy To 2020 And Beyond*.
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South Korea's Perspectives

Sung Jin Kim

The Arctic, one of the coldest places on Earth, is getting hotter. Arctic sea ice is melting faster than expected because of global warming, greatly affecting the Arctic environment and ecosystem. However, the reduction in sea ice is also enabling access to the Arctic, which in turn is opening up opportunities to develop energy and mineral resources and access biological resources such as fisheries.

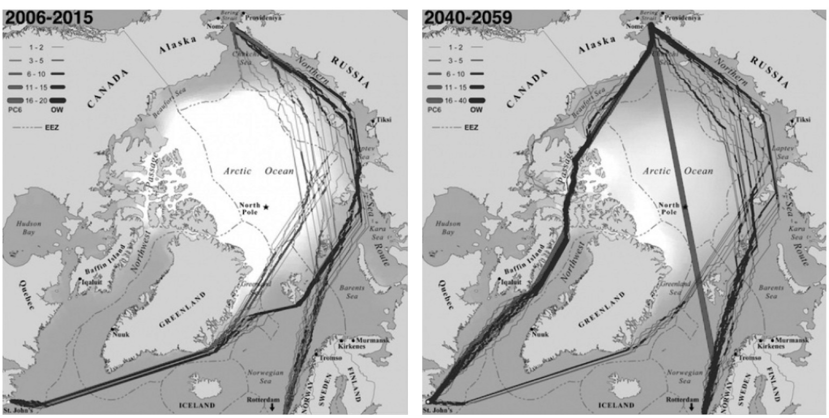
The estimates of vast Arctic resource reserves and the ensuing emphasis on potential resource development have fueled discussion about responsible economic development and the importance of the Arctic in the global logistics network. Many countries are focusing on the possibilities and the potential that the Arctic future holds.

The interests in the Arctic and the mid-to long-term investments will likely result in an Arctic that is different from what it was 20 years ago. In this paper I will review opportunities and challenges in developing the Arctic economy, together with the importance of responsible Arctic economic development. Furthermore, I will suggest some guidelines for responsible development. South Korea's involvement in Arctic economic development will be introduced, focusing on smart development such as e-navigation and Prompt Port Facilities. In conclusion, I would like to suggest a critical need for a new Arctic code for responsible Arctic economic development through increased international cooperation.

OPPORTUNITIES AND CHALLENGES IN DEVELOPING THE ARCTIC ECONOMY

South Korea has an open economy that is about 96.7 percent reliant on foreign trade. Exports mostly consist of semi-conductors, petroleum products, steel products, cars, vessels, and other manufactured goods, which are all energy-intensive to produce. However, South Korea is a resource-poor country that imports more than 95 percent of its energy. Since the country borders North Korea and the sea, about 99.7 percent of our trade is conducted through shipping. As the Arctic sea ice melts, the most frequently talked about potential economic opportunities becoming available in the Arctic relate to the increasing access to Arctic shipping routes and energy resources, which are naturally attractive for a country whose economy is heavily reliant on shipping and energy imports.

Arctic shipping routes are seen as attractive alternatives to existing ones, such as the route through the Suez Canal. Traveling by way of Arctic shipping routes would provide for a much more secure voyage than the pirate-infested southern route. Shipping time and distance could be significantly reduced, enabling shipping companies to save costs. For example, the Northern Sea Route (NSR) through Russia is expected to reduce time and distance for vessels traveling from Busan, South Korea to Rotterdam, Netherlands by about 10 days and 7,000 kilometers compared to the existing route via the Suez Canal. Thus, more and more shipping companies, including South Korean and Chinese ships, have been attempting to navigate the NSR. In the case of South Korea, the government encourages the use of the NSR by providing support in fees paid to use port facilities. With decreasing sea ice extent, two major Arctic shipping lanes are emerging: the NSR (also called the Northeastern Passage), which is the route that follows the Russian Arctic coastline; and the Northwest Passage (NWP), which travels through the Canadian Arctic. However, a transpolar



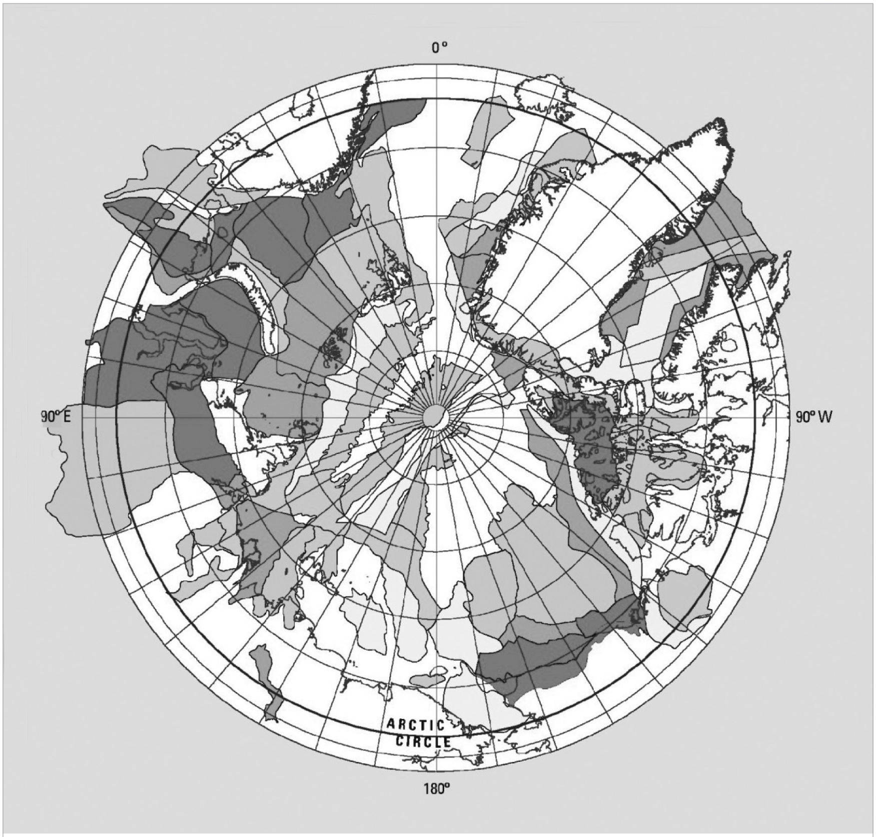
Source: L.C. Smith and S.R. Stephenson, PNAS.

Figure II.4 *Trans-Arctic Navigation Routes Today Versus Mid-Century* route through the North Pole is also projected to be possible at some time in the future, especially during summer.

While the decrease in Arctic sea ice extent is an ongoing trend, Arctic shipping routes are not yet available year-round. In 2012, September sea ice extent was the lowest since satellite records began in 1979, and the past six years have had the six smallest sea ice extents since 1979, indicating that the ice has not recovered from the previous record low in 2007.[1] Estimates vary on exactly when the Arctic sea will be completely ice-free, but most project that it will happen by mid-century. Current impediments to navigating the Arctic sea route include difficult weather and navigating conditions, a limited number of days that the sea lanes are open for navigation, lack of infrastructure, and safety challenges. Even in the future when the Arctic sea is expected to be more open, there will likely remain substantial challenges to attracting vessel traffic. These include a lack of infrastructure and markets along the route, higher insurance rates, weather, and the limited number of days annually when the sea lanes are open. Additional barriers include the lack of capacity to respond to oil spills and conduct emergency search and rescue missions.

The vast natural resource potential in the Arctic is generating great economic expectations. The United States Geological Survey (USGS) drew worldwide attention to the region in 2008 when it estimated that there are 90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids in the Arctic, of which about 84% is expected to occur in offshore areas.[2] If these resources were to be developed, the Arctic could potentially serve as an alternative source of energy supply, especially for resource-poor countries like South Korea, which may find an opportunity to diversify its energy imports and reduce risks. However, as evidenced by Shell's abandonment of drilling operations in the Alaskan Arctic even after spending $7 billion, the natural resource development environment in the Arctic is difficult and precarious, and may lose its appeal if, among other things, the global oil price remains too low. The challenge of natural resource development in the future would also include whether it could offer foreign buyers a price advantage and create a stable supply source.

A challenge for the economy of the Arctic region itself is that it generally depends on non-renewable resources such as petroleum and minerals, which also pose challenges to the region's sustainable development. There are regional variations in the circumpolar Arctic on how much of each local or national economy is dependent on natural



Note: Assessed probability of the presence of at least one undiscovered oil and/or gas field with recoverable resources greater than 50 million barrels of oil equivalent. A stronger blue indicates high probability.

Source: USGS.

Figure II.5 *Petroleum Potential in the Circum-Arctic*

resource production, but the Alaskan economy and the Russian Arctic are particularly heavily reliant. Due to the drop in oil prices in 2014, the economies of these two regions have been especially hard hit. In Alaska, for example, the state government's drop in oil revenue forced the state to cut various parts of its state budget, from education to tourism. Russia had the added challenge of being sanctioned by Western countries because of the Ukraine crisis, which affected their Arctic offshore oil projects that relied on the advanced technologies provided by Western oil majors.

Table II.1 Distribution of GRP for Arctic Regions, 2005 (percent)

	U.S.	Canada	Finland	Iceland	Norway	Russia	Sweden	Denmark
Fishing	0.6	0	0.1	4.7	5	0.6	0	10.5
Mining and petroleum	33.2	27.7	0.8	0.1	1	59.9	7.5	3.2
Other resource	0.1	0.4	4.7	1.4	0.9	1.3	3	2.4
Resource Processing	2	0	13.3	4.8	5.2	4.4	7.2	5.8
Construction	5.4	8	6.8	9.6	6.9	5	5.4	7.2
Public sector	26.9	28.7	24.8	23.8	40.5	9.1	32.6	29.9
Other services	31.3	34.8	37.7	50.1	37.4	22.1	36.6	38.9
Remainder	0.5	0.4	11.8	5.5	3.1	0.6	7.7	2.1

Source: Based on tables in Glomsrød, et al., 2009 cited in Arctic Human Development Report, 2014.
Note: GRP represents Gross Regional Product

There are other challenges to developing an Arctic economy. They include factors such as low population and population density, remoteness of the region, limited infrastructure and market, and low level of connectivity. Infrastructure such as roads, ports, airports, and speedy telecommunications are needed to propel economic development, but they are all very limited in the Arctic. Increasingly, it is becoming an even greater challenge to build this kind of infrastructure, due to melting permafrost that makes the ground unstable—in addition to requiring a considerable amount of capital investment. Guggenheim Partners has estimated that over the next 15 years, infrastructure requirements in the Arctic may reach $1 trillion.[3] In recent years there has been a greater push towards assessing and attracting investments on important infrastructure projects.

One notable effort at the regional level is the effort to assess telecommunication needs in the Arctic. The Arctic Economic Council, which was established in 2014 to facilitate Arctic business development and responsible economic growth, has produced one such report, *Arctic Broadband: Recommendations for an Interconnected Arctic*, early in 2017. Furthermore, the new Arctic Council chair, Finland, has made "connectivity" one of the four priorities of the Arctic Council chairmanship program and is interested in promoting the Northeast Passage submarine fibre cable connection project, about which it is holding talks with potential partner countries such as China.

Then there is consideration of the fragile Arctic environment that may be affected by unintended and/or irreversible consequences if developed irresponsibly and without care. In that respect, the effective implementation of the Polar Code, in effect since January 1st this year, will be important, as well as promoting cooperation through forums such as the Arctic Coast Guard Forum, to build response capacity among the eight Arctic nations. In pursuing development in the Arctic, the Arctic Investment Protocol,[4] an initiative of the World Economic Forum, could serve as a guideline:

1. Build resilient societies through economic development.
2. Respect and include local communities and Indigenous Peoples.
3. Pursue measures to protect the environment of the Arctic.
4. Practice responsible and transparent business methods.
5. Consult and integrate science and traditional ecological knowledge.
6. Strengthen pan-Arctic collaboration and sharing of best practices.

These are very promising developments towards new guidelines for responsible economic development in the Arctic. The question remains how this guideline can be realized as a standard code of conduct and how it can be leveraged to foster cooperation between Arctic and non-Arctic nations.

SOUTH KOREA'S INVOLVEMENT IN ARCTIC ECONOMIC DEVELOPMENT

South Korea's current involvement in Arctic economic development could be characterized as "doing what it does best": shipping and shipbuilding. Accessing Arctic shipping routes, particularly the Northeastern sea route, is probably what interests South Korean ship owners the most due to potential cost reductions. Since the 2012 sea ice extent broke the 2007 record as the lowest ever recorded, there have been several attempts by South Korean companies to test and experience navigation in the Arctic waters. The first came in 2013 by a company named Hyundai Glovis, which completed a test service carrying 44,000 tons of naphtha from the Russian port of Ust-Luga to the South Korea's port of Gwangyang. Then in 2015, CJ Korea Express left the port of Mussafah in the United Arab Emirates for the Yamal Peninsula of Russia, carrying 4,000 tons of offshore terminal facilities. Of the voyage of 16,700 kilometers, only 500 kilometers were traveled on the Arctic sea route—yet it is noteworthy because it was South Korea's first commercial Arctic operation. In 2016, a total of three Arctic voyages was made by companies such as SLK Kukbo and Pan Ocean.

In addition, educational efforts have also been made to gain Arctic operational experience. In 2014, a memorandum of understanding was signed between the Korea Institute of Maritime and Fisheries Technology (KIMFT), which is a public organization that provides various training courses, and the Admiral Makarov State University of Maritime and Inland Shipping in Russia. KIMFT professors received training in ice navigation at the Russian university, and the knowledge was used to develop a training program for Arctic seafarers. The training program has since been approved by the Lloyd's Registrar, and graduates of the program were on board the Arctic voyage conducted by CJ Korea Express in 2015.

South Korea is well known for its shipbuilding industry, and South Korean companies have been particularly involved in building vessels to be deployed in the Russian Arctic. In 2005 Samsung Heavy Industries won the order to build the world's first bi-directional ice-breaking oil tankers from Russia's Sovcomflot, and three vessels were successfully delivered in 2009. In 2014, it landed another deal for three ice-breaking oil tankers to be used in delivering oil produced from reserves near the Novy Port to Murmansk. Also, Daewoo shipbuilding and Marine Engineering (DSME) won the bid to build 15 icebreaking LNG carriers for Sovcomflot in 2014. The first complete vessel was launched in 2016 as the world's first icebreaking LNG carrier, and its ice trials were completed just this year.

Currently, South Korea is not investing in any natural resource-related project in the Arctic. However, recently, Alaska Gasline Development Corp. (AGDC) and Korea Gas Corp. (KOGAS) signed a memorandum of understanding on June 28, 2017 to explore the possibility of KOGAS investing in the $40 billion Alaska LNG Project. Whether this MOU will turn into something more concrete is yet to be seen. Other than that, South Korea was the largest customer for Alaskan oil exports to foreign countries from 1996 to 2004, when exports stopped as production from the Alaska North Slope decreased. Then in 2014, a tanker carrying oil from Alaska's North Slope headed to South Korea.[5] South Korea's status as an important trade partner for the state of Alaska is also noteworthy, which perhaps results from their geographical proximity. In fact, Alaska's top three export markets are China, Japan and South Korea. South Korea is currently Alaska's third largest trade partner, and in 2016, about 16.8 percent of all exports from Alaska went to South Korea.[6] In turn, South Korea accounted for 15.1 percent of all imports to Alaska.[7]

SOUTH KOREA'S CONTRIBUTION TO A RESPONSIBLE ARCTIC ECONOMIC DEVELOPMENT

The Arctic needs is a "smart" development strategy that considers both the environment and the economy. In this regard I am going to introduce two "smart" ideas that could contribute to sustainably and responsibly developing the Arctic.

First is e-navigation, intended to ensure safe and secure navigation of vessels while protecting the ocean environment at the same time. According to the IMO, e-navigation is the "harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment."[8] There are various benefits to using e-navigation, such as improved safety through promotion of standards in safe navigation, better protection of the environment by reducing the risk of collisions, and reducing emissions by using optimum routes and speeds, with higher efficiency and reduced costs. Therefore, the adoption of this technology is being promoted by IMO through its e-navigation Strategy Implementation Plan, where countries are requested to identify tasks and timelines for implementation of prioritized e-Navigation solutions, as well as new standards and regulations from 2015 to 2019. Accordingly, South Korea has an e-Navigation project called SMART-Navigation[9] which is expected to greatly reduce marine accidents in South Korea, where fishing vessels are the cause of about 81% of marine accidents in South Korea, and 81 percent are also caused by human error.[10] As Arctic shipping routes open up, more ships are expected to traverse the Arctic Ocean. Increasing the rate of adoption of e-Navigation systems by Arctic-going vessels will certainly help in minimizing adverse environmental impacts, which become more likely with increased shipping traffic.

A second "smart" idea is the Prompt Port Facility, or PPF.[11] PPF is a semi-permanent offshore plant mainly for port function. These are converted from used bulk carriers, and can be used as a prompt port, mini-power plant, desalination plant, waste treatment plant, storage, and emergency rescue base. In other words, it is designed to be a multipurpose convergent facility that utilizes shipbuilding engineering for convergence and takes advantage of the inexpensive ship price, as they are made from second-hand vessels. The technology for PPF was developed by a professor at Korea Maritime and Ocean University at the request of the Korea Maritime Institute. In the Arctic context, PPF would be most useful to many isolated communities along the coast, as PPFs provide an all-in-one solution vessel. To build an economy, you need infrastructure, but that takes time to build and is expensive. However, with PPFs, communities would be able to have infrastructure similar to a port without the costly investment of having to construct an actual one. Such a facility could help improve the living quality of small isolated Arctic communities as well as help promote thriving local economies.

CONCLUDING REMARKS

As Arctic economic activities become wider in scope and responsible economic development becomes a higher priority for global partners, the South Korean government and Korean industries are growing more interested in participating in Arctic development. The South Korean economy is currently making an effort to overcome its current phase of low economic growth and to secure new growth engines for the country to realize an economy where per capita income surpasses $40,000. As Arctic resource development and the commercial use of Arctic sea routes begins in earnest, economic activities in the Arctic are expected to contribute to securing resources and gaining a comparative edge in South Korea's logistics network. Furthermore, it could spur the development of a new high value-added industry, thus providing the basis for the development of a high-tech industry of the future. In other words, the Arctic could become another "blue ocean." South Korea's position on Arctic economic development is that the country should contribute to enabling sustainable development and in achieving a common prosperity for humanity. Since it was invited as an Observer to the Arctic Council in May 2013, South Korea has been developing a comprehensive plan on the Arctic.

One important factor related to responsible economic development in the Arctic is the need to consider various complexities such as the speed at which the ice continues to melt, global economic circumstances, changes in natural resource markets, current climatic conditions, surrounding infrastructure, a balance between the environment and development, and respect for local communities and indigenous traditions and ways of life. The Arctic needs to be approached gradually, and with a long-term perspective. Unlike the Antarctic, there is no common international regulation on the Arctic. That is why international cooperation by stakeholders through the Arctic Council and Arctic Economic Council is all the more important. We need to start building a New Arctic Code of responsible development now. Basic surveys, full utilization of big data, sharing of information, science technology cooperation, and regional cooperation are very much needed. South Korea is both a major resource importer and a holder of significant experience in shipbuilding, offshore plants, machineries, technology development, and polar research. At the same time, its status as a middle power enables South Korea to facilitate cooperation between developed and developing countries. E-navigation and Prompt Port Facility (PPF) could contribute to addressing both environmental and socio-economic issues to help ensure smart development.

The prospect of encouraging responsible economic development in the Arctic is opening both opportunities and challenges. South Korea is ready to set sail on a long journey with nearby partners to achieve common prosperity for all. I am certain that NPAC, a leading agent for change, will be South Korea's closest partner in that journey.

ANNEX 1: PPF (Prompt Port Facility) in Brief

PPF is a semi-permanent offshore plant converted from second-hand bulk carriers in different sizes (dwt 6,000-92,000 tons, depending upon the demand and purpose) to serve primarily for promptly built port function. These facilities have been designed and built with additional functions that include a mini-power plant, desalination, a small scale school and hospital, accommodations, waste treatment, storage (dry and wet bulk), large scale-food provision and emergency rescue base, among other services that include a NIMBY facility, geographical and/or political strategic production facility, and an aircraft carrier that can be used as a re-supply base for military purposes. Target Delivery: 12-14 months

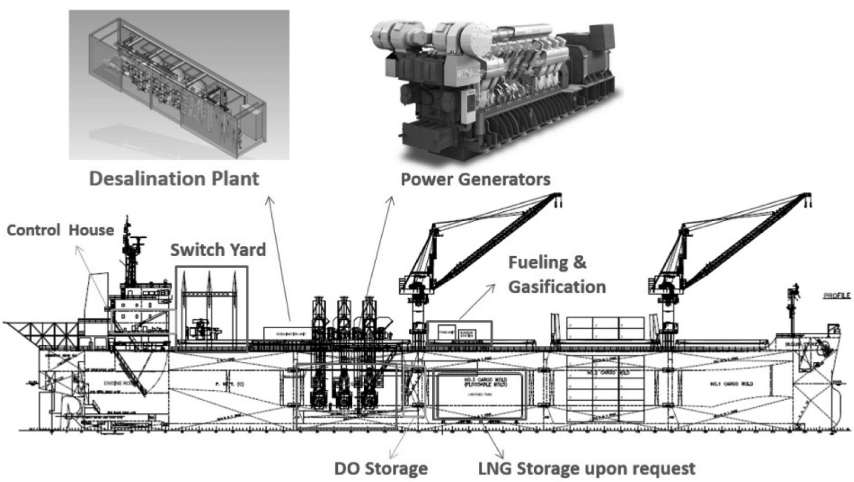
A "Prompt Port Facility" has "Sail In and Sail Out on Demand" capabilities, representing an "All-in-One but Green Solution" due to the technical convergence and utilization of waste energy.

What is Multi-Prompt Port Facility?

A Multi-Prompt Port Facility (MPPF) is a semi-permanent offshore plant whose function includes power generation, storage of major resources (drinking water, oil and grains), port control, a small-scale school and hospital, residence and garden along with its primary function as a port. Secondhand vessels or surplus vessels of different sizes are converted into MPPF in order to serve as ports and other social infrastructures. Depending on their features, there are 14 modules of MPPF including PPF-logistics type, PPF-port type, PPF-NYMBY type, emergency rescue base, and supply base for military purposes. Each of these modules provides flexible and customized solutions for various regional demands for prospective Markets of MPFF.

Applicable Modules of M-PPF

- Port Module for cargo handling and storage of container and bulk: grains, oil, water
- Power module for electricity generation
- Desalination module for freshwater production utilizing waste energy
- Fuel supply module for oil fuel and gas fuel (LNG) with re-gasification system



Note: The patent of MPPF was registered in Korea on May 16, 2016 and the patent is applied to be registered in China, Indonesia, Malaysia and in other PCT contracting states. Its intellectual property rights are shared by the Korea Maritime Institute and the Korea Maritime & Ocean University.

Figure II.6 *Prompt Port Facility: General Arrangement*

- Waste treatment module: incinerator to generate steam and water heating
- Accommodation module for custom-sized school, hospital, leisure and convention
- Factory module for production in different political regions
- RPU module for rice processing and logistics
- Agricultural module for gardening
- Aqua module for fishery products and aquaculture
- Emergency rescue module for rescue base (heli-deck) and additional services

Notes

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View from a Young Analyst

Meredith Jennings

INTRODUCTION

Responsible economic development of natural resources in any environment requires a coordinated effort to minimize negative effects on human and ecological systems, build a capacity for resilience and sustainability, and promote equal opportunity for all parties involved to prosper. Meeting these goals is especially challenging in the Arctic region, where the harsh climate makes development of valuable natural resources such as fish, minerals, and hydrocarbons to be very expensive and technically difficult endeavors. The Arctic is estimated to contain 20-25 percent of the world's oil and gas reserves. Approximately two-thirds of the major Arctic fields exist on the continental shelf, and about 46 percent of the shelf is Russian controlled (Frolov 2015).

The Russian Yamal Peninsula has rapidly and recently developed the most infrastructure in the Arctic. Currently under construction and scheduled to go online in late 2017, the Sabetta Port project in Yamal promises to support the export of 16 million tons of liquefied natural gas (LNG) per year through the Northern Sea Route (NSR). Combined with a new railway project to connect Sabetta to Bovanenkovo, as well as a new customs task force and airfield in Sabetta, this infrastructure is the largest ongoing commercial investment in the Arctic and carries a price tag of roughly $30 billion. The NSR saw record activity in 2016, with 120 vessels transporting 505,000 tons of goods and construction materials into the Arctic.

The goal of this analysis has been to identify examples of modern geopolitical, economic, environmental, and scientific challenges that could be systematically analyzed for opportunities to enhance the responsibility and sustainability of Arctic resource development. Because these massive projects in Yamal are at the center of Arctic development, special attention is given to the economic, geopolitical, scientific, and humanitarian challenges faced in the Russian Arctic. The analysis of resilience in the indigenous Yamal-Nenets (Forbes et al. 2009) and the application of socioeconomic indicators to evaluate the development of the Arctic region (Vylegzhanina 2017) have been identified as useful for directing the construction of a code of conduct, or best practices, for private and public actors in the Arctic regions. In the development of new Arctic infrastructure, field observations and enhanced technologies are also necessary to build a capacity for innovation, efficiency, and economic prosperity while maintaining environmental stewardship and sustainable resource development.

GEOPOLITICAL AND ECONOMIC BARRIERS TO DEVELOPING NATURAL RESOURCES

Arctic nonrenewable minerals account for approximately 15 percent of Russia's GDP and 20 percent of Russian exports, suggesting the Arctic is a significant determinant of Russia's geopolitical and economic potential (Shestak 2015). In recent Federation reports, Russia has prioritized the preservation of the Arctic region as a zone of peace, safety and stability that possesses the potential for international economic, technological, educational, scientific, and humanitarian collaborations. For Russian LNG to be successful and for Russia to maintain positive relationships with foreign partners in the global market, the Russian gas industry requires a new regulatory framework that is supportive of international competition and cooperation (Mitrova 2013). The Sabetta project is a unique co-investment between the private industry (Novatek), the Russian government, and a mixture of foreign partners that provide financial and technical support. Completion of this project requires dredging in Ob Bay, an updated icebreaker fleet to escort ice class tanks, and a proper communications and emergency response system. The return on investment for these costly expenses may be delayed by decades. On top of that, external factors such as sluggish European markets, development of more efficient LNG supplies from competitors, and increased competition from shale production in U.S. and Canada could potentially drive further instability affecting the Russian gas industry.

In addition to geopolitical and economic barriers, a study by Leksin and Porfiryev (2015) also identified specific humanitarian barriers for successful (social) development of the Arctic. The 2.5 million Russians living in the Arctic make up less than two percent of the Russian population, but about

40 percent of the total Arctic population, which is characterized by low population density and a net negative migration. The Russian Arctic is at risk of delayed sustainable development because the regional economy is likely to deplete natural resources and pollute the environment, while also suffering from poor social indicators such as higher than average suicide and infant mortality rates (Leksin & Porfiryev 2015). Thus, it will be necessary to improve the quality of life for the local population and foreign (non-local) workers who are forced into cultural isolation in the far North.

Acceptable systems of emergency response in the Arctic

Climate change is making the NSR more desirable than traditional sea routes in some respects, yet the NSR lacks the infrastructure to support anticipated transportation and logistic needs for this future demand. A recent review of coastal infrastructure of the NSR and Russian military infrastructure (Frolov 2015) highlighted the importance of science to help in modernizing the NSR. The existing scientific infrastructure that supports safe navigation of the Arctic (communications, hydrography, and meteorology) is dilapidated and cannot support a global trade corridor. Russia plans to build new military camps along the NSR, which will present opportunities to update and restore the current fleet of Russian icebreakers, ice detection aircraft, hydrographic service and meteorological support, rescue infrastructure, and implement drifting stations to forecast ice conditions.

Ten new search-and-rescue centers were created along the route in 2014. The final construction of the Sabetta Sea Port will undoubtedly add necessary infrastructure to help provide emergency response support. Russia plans to launch new satellites to enhance communication and navigation systems, and introduce three new generation icebreakers (Shestak 2015). Furthermore, if the Russian military expands its security presence in the Arctic, the additional infrastructure they add will support emergency response by engaging existing Arctic settlements, which are usually isolated (Leksin & Porfiryev 2015). Such an engagement would provide co-benefits, as settlements are able to provide civil services such as local food and healthcare and would undoubtedly benefit from having access to new infrastructure such as military transportation.

Opportunities for long-term economic sustainability

In order to accumulate national wealth, Russia needs to invest in both science and production. Russia's current economic model is based on the export of raw materials, while increasing the rate of imports, neither of which propel innovation or develop technical capacity. Instead, this model reduces interactions between the science and manufacturing sectors and depletes natural resources (Borisov & Pochukaeva 2015). Since this particular analysis specifically targeted the role and impact of Russian development in Yamal, it is recommended to consult the various perspectives represented by each of the Arctic nations and observers. Each Arctic nation or observer nation has identified its own priorities for developing, trading, and researching Arctic resources. Yet, from a purely economic point of view, long-term sustainability will be generally difficult to achieve when the current global supply of easy-to-reach energy sources outnumbers the demand for hard-to-reach nonrenewable sources situated in the Arctic.

STEWARDSHIP AS A PLATFORM FOR SCIENCE/POLICY DIALOGUE

There is a growing awareness that accelerating environmental challenges will require a variety of mitigation responses. The concept of stewardship serves as an instrument to incite wide-ranging benefits by accepting a certain level of responsibility and altruism. It is important not to confuse stewardship with general conservation practices. Instead, stewardship can be viewed as a mechanism for preserving and sharing natural resource equity. Valuable institutions such as the Arctic Council work to solve urgent social, economic, and ecological problems and improve the welfare, tourism, infrastructure, science and education, healthcare, and culture of the whole Arctic region. Protection and preservation of the fragile Arctic ecosystem involves coordination of knowledge driven by scientific research, ecological education, and ecological tourism. Therefore, similar to the goal of achieving long-term economic and social sustainability in the Arctic, stewardship could also serve to promote collaborations and partnerships aligned to mutually benefit the environment as well as various stakeholders.

SUCCESS STORIES

A recent case study (Forbes et al. 2009) identified a high level of resiliency in the Yamal-Nenets, whereas other indigenous populations were found to be less resilient and successful in the face of climate change and modern industrial development. The Yamal peninsula has 10,000 indigenous Nenets, half of whom still nomadically herd reindeer. Despite facing rapid change climate and the development of land and streams by the oil and gas industry, the Yamal-Nenets' success lies in their adaptive capacity to work smaller flexible herds and rely on larger families to allow them to herd on different lands. They also have a positive general approach to coexist with industrial workers within the oil and gas villages. This enables them to gain access to energy company helicopters to engage in business ventures such as the velvet antler trade, and barter for goods and supplies in the summer. However, this infrastructure also has negative impacts, as gas workers are presently not able to sell fuel to herders who use gas for snowmobiles and lamps, causing the herders to buy gas illegally in the black market. The recent development in the Yamal has brought a massive influx of 50,000 shift workers who often engage in illegal hunting, fishing, and recreational travel, and accidently wander onto herder camps uninvited. This affects the herders, who obtain their primary source of summer protein from fish, during a time when they do not traditionally slaughter reindeer. Further compromising essential food and freshwater sources, construction often blocks rivers or fills lakes for sand quarries.

Based on the relative success of the Yamal-Nenets who have fared better than other Indigenous Peoples facing similar challenges, Forbes et al. (2009) suggest certain policies that could facilitate the coexistence and resilience of industrial development and nomadic herders in the Yamal peninsula. By putting less emphasis on developing sedentary communities, funds could be redistributed to enhance the ecological safety of the tundra system and raise the pipelines to enable easier migration of humans and animals. To minimize ecological damage to pastures and freshwater fish, it would be beneficial to concentrate areas of development and emphasize air-based supplies instead of building more roads. A code of conduct should be formalized and implemented between herders and workers that would impart respect for the customs and way of life of Indigenous People. Kryazhkov (2014) also proposed a fixed compensation for external use of natural subsurface resources that derive from indigenous minority institutions (separate from the compensation for lost benefits, moral damages, and costs to develop new lands incurred in the traditional fashion), and that outside companies will be required to include locals in the environmental review of commercial projects.

OPPORTUNITIES FOR POLICY-RELEVANT RESEARCH

When identifying challenges for redeveloping the Russian Arctic, Leksin and Porfiryev (2015) highlighted the need to develop a comprehensive research plan that focuses on basic and applied scientific problems with indicators that can be quantified over the long-term. They suggested the use of a dedicated institutional framework to choose and fund proposals for this focused research, which would complement the existing Russian Academy of Sciences. This effort would help build a community of non-governmental and interagency governmental research groups that specialize in Arctic megaprojects, thus enhancing the scientific and institutional capacity for the region.

Investigators at the Arctic and Antarctic Research Institute evaluated ice conditions associated with the Port of Sabetta through data collected from multiyear field studies, aimed at supporting the development and design of the port (Zubakin et al. 2013). Their study characterized the natural climate of Ob Bay, evaluated ice conditions from archives and recent field data, modeled ice channels in the region as well as ice cover in the port, and modeled port water area heating process. Ice thickness and progression (ice cakes, fast ice, and brash ice) has considerable influence on navigation and affects the schedules of LNG transportation and other port operations. Knowing when to line new channels and systematically break ice in the port is informed by these models that depend on accurate field observations.

A recent socioeconomic study by Vylegzhanina (2017) evaluated risks to sustainable development across the entire Arctic region by evaluating indicators such as changes in population density and suicide and infant mortality rates, in addition to unemployment and income rates. The study found that the Arctic regions Finnmark (Norway), Troms (Norway), Norrbotten (Sweden), and Iceland had the highest potential for sustainable development based on their population density, low suicide and infant mortality rates, higher employment rates, and implementation of effective health and social care systems. Further study of these regions is required before best practices can be applied to other regions of the Arctic, including Russia.

CONCLUSION

Climate change and technology will enable use of alternative land and ocean routes and promote the exploration and exploitation of precious nonrenewable Arctic resources. Efforts to improve navigation, ship technology, and science for Arctic development will benefit the required improvements to port and marine infrastructure that would be necessary to fully utilize the NSR. Such enhancements will likely result from renovation of military infrastructure, yet state partnerships with foreign and local enterprises have the potential to also significantly contribute. However, if the Russian goal of developing the Arctic is purely economic, modern development will also demand improvements in production in addition to enhancing energy and transportation infrastructure. It will be important to consider how any development will affect the local populations, with special care to preserve and protect the heritage of indigenous populations. With the extreme financial and environmental costs associated with building the necessary infrastructure to exploit natural resources in the Arctic, one must ask if it is even worth the risk. Such an exercise highlights the importance of regular meetings (NPAC, Arctic Council, and Arctic Economic Council, etc.) that facilitate open and honest discussions between decision- makers and stakeholders.

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PART III

SUSTAINABLE ARCTIC COMMUNITIES

Building Sustainable Arctic Communities Begins with Self-Determination

Herb Nakimayak

INTRODUCTION

International attention on the Arctic has surged in recent decades, with interest in Arctic issues emerging from all corners of the globe. We cannot address global issues of importance to the Arctic, such as climate change, without the attention and expertise of actors from a diversity of sectors and places. It is important to recognize, however, that most actors interested in Arctic issues, and indeed many of the attendees at the North Pacific Arctic Conference, are not from the Arctic. Decisions that affect the Arctic and consequently affect Inuit are often made by people external to the region, that is, people who are viewing the Arctic from the outside, looking in.

The 2017 North Pacific Arctic Conference is focused on improving dialogue among practitioners—government, business, and Indigenous decision-makers—and researchers to develop innovative solutions to challenges involving Arctic issues. In essence, the theme of this conference is breaking down barriers to communication in order to propel solutions that will lead to a sustainable future for the Arctic. Essential to meaningful communication, as well as to development of innovative solutions to complex problems such as those facing the Arctic and its peoples, is finding ways to understand an issue from another point of view. To illuminate a path forward for sustainable Arctic communities, Inuit invite all the external actors interested in this effort to begin by viewing and understanding the Arctic as Inuit see it: from the inside, looking out.

THE INUIT PRESENCE GLOBALLY

Inuit are an international people with one language and one culture; 160,000 Inuit live in Canada, Greenland (Kalallit Nunaat), Alaska and Russia, under four different political realities. Together, our expansive lands

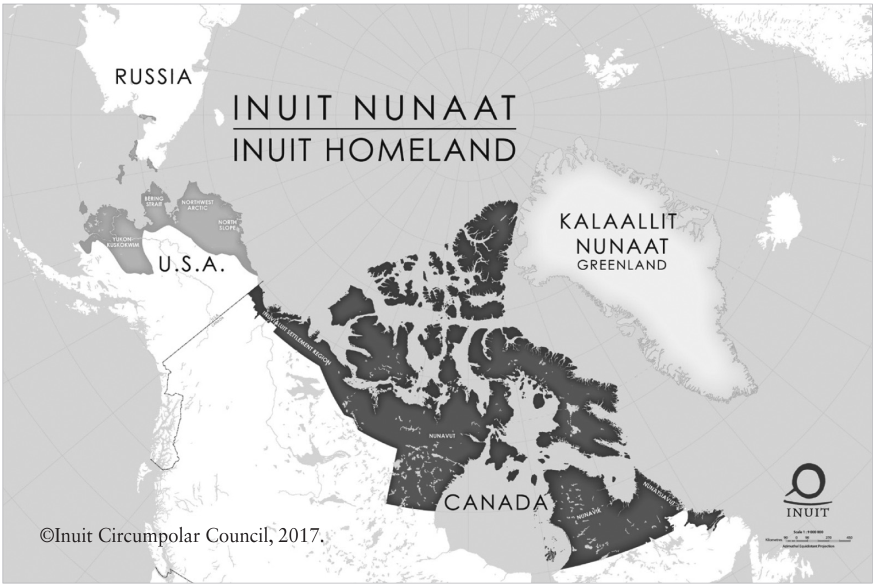

Figure III.1 *Inuit Nunaat / Inuit Homeland*[1]

form Inuit *Nunaat*, or the Inuit homeland (Figure III.1). While the Inuit population is relatively small in a global sense, our geographic presence is large. Inuit Nunaat encompasses more than 5.5 million square kilometers —larger than the size of the European Union—despite having less than 0.001 percent of the European Union's population.

If Inuit Nunaat were a country, it would be the seventh largest country in the world, just behind Australia and ahead of India. While political realities in each of our territories is different, collectively our relatively small numbers are responsible for administering governments, managing infrastructure, providing health care services and education, and running a vast array of businesses.

In 1977, the Inuit Circumpolar Council (ICC) was established, bringing together all Inuit to unify and amplify our collective voice. We are an international organization with official status within the United Nations and Permanent Participant status on the Arctic Council.

MOVING BEYOND THE STATUS QUO OF ARCTIC DEVELOPMENT

Too often, the Arctic is considered "a treasure-laden frontier"[2] that belongs to everyone—or alternately—belongs to no one. The Arctic development conversation typically considers only two options: either a global "feeding frenzy"[3] or an orderly, externally-driven resource development. We challenge these framings. Mary Simon, renowned Inuit leader and former Canadian diplomat, addresses the fallacy of the perspective that development in the Arctic is possible without Inuit. While her comment is in reference to Canadian Arctic policy under a previous federal government, her point is applicable to an international context:

> *There is a core fallacy that threatens to take hold at the heart of the federal government's emerging northern and Arctic policies: that the top third of Canada can be managed and developed as if its aboriginal history, demography, and its aboriginal values and character, are peripheral and transitional. Policies built around such a misleading notion will be unsound in concept and unsustainable in practice.*[4]

The notion that development in the Arctic or decision-making about the Arctic can proceed without Inuit front and centre is false. From our political rights and jurisdiction, to our human rights, to our unparalleled knowledge regarding our homeland, to our enduring presence in the Arctic, excluding Inuit from any conversation about Arctic development or solutions to Arctic issues is imprudent. No one is as invested in a sustainable future for the Arctic as we are. We cannot together forge ahead in ensuring sustainable Arctic communities without also ensuring that Inuit are part of the conversation—and indeed leading the conversation—regarding Arctic policy and governance, economic development, marine shipping and climate change research and policy.

To make this point simply, the Arctic is like our house. Imagine that you have a house that has been in your family for generations, on land that has been in your family for as long as memory extends. Your children and your children's children also will live in this house. You deeply love your house and your land, and you know them inside and out. External people are very interested in your house: they see opportunities to change it, rebuild it, reorganize it. Experts come and tell you that external forces are undermining the integrity of your house: they want to help you adapt to these threats.

All this interest and assistance can be beneficial. We all need expert advice at times to address complex issues that are beyond our knowledge, or to work collectively to address mutual problems. But what is crucial for good decision-making is for external actors and experts to always remember that your house is not a collective asset or vacant property, but your home, and that the person that is the most invested in its long-term future is you. It would be impractical, unethical and unwise for decisions about your house to exclude you and your perspective. This is how Inuit feel about the Arctic.

SUSTAINABLE COMMUNITIES BEGIN WITH INUIT RIGHTS

The Circumpolar Inuit Declaration on Sovereignty in the Arctic establishes the collective Inuit perspective on this issue. It recognizes that sovereignty claims of states to the Arctic are inextricably linked to Inuit sovereignty and self-determination, and that Inuit perspectives, rights and voices must be central to efforts to make progress on Arctic issues. It states:

> *Inuit consent, expertise and perspectives are critical to progress on international issues involving the Arctic, such as global environmental security, sustainable development, militarization, commercial fishing, shipping, human health, and economic and social development… We have unique knowledge and experience to bring to these deliberations… Partnerships must acknowledge that industrial development of the natural resource wealth of the Arctic can proceed only insofar as it enhances the economic and social well-being of Inuit and safeguards our environmental security.*[5]

The Circumpolar Inuit Declaration on Resource Development Principles[6] states that those who face the greatest impacts of resource development must have the greatest opportunities, as well as a commensurate role in decision-making. As such, all resource development in the Arctic must actively and significantly contribute to raising living standards and improving social conditions in the Arctic in the long term. Let us be clear that Inuit welcome the opportunity to work in full partnership with resource developers, governments, and local communities in the sustainable development of the resources of Inuit Nunaat. As we do so, we will ensure that development contributes to the long-lasting benefit of Inuit and upholds our environmental and social responsibilities.

These two circumpolar Inuit declarations are anchored in international law and human rights norms. The *United Nations Declaration on the Rights of Indigenous Peoples*[7] (UNDRIP) builds on existing human rights instruments to establish “minimum standards for the survival, dignity and well-being of our peoples”[8] and create a benchmark for accountability of the state to its obligations.[9] The UNDRIP affirms the inherent Indigenous right to self-determination—that is, to freely and collectively determine our political, social, economic, and cultural development.

As climate change continues to dramatically alter the Arctic, creating ever easier access to our homeland, these principles become that much more important. We are observing and being affected by numerous changes, such as the arrival of new species in the Arctic and changes in sea ice conditions that make ice-based travel more difficult and dangerous. The natural world is very adaptable, but the pace of environmental change in the Arctic and globally is outpacing nature’s ability to adapt. Humans are also interfering in natural cycles that are critical for balance, adaptation, and renewal in the natural world; suppression of low-level forest fires, coupled with warmer temperatures, and the consequent rise in pine beetle damage and large-scale fires is one example of this. Our actions have brought the natural world to a tipping point.

We must remember that climate change is not an external force happening to us; it is the result of our actions. It is also worth noting that the global distribution of activities that drive climate change and the impacts of climate change are not equitable. While contributing almost nothing to historic greenhouse gas emissions, Inuit are at the forefront of some of the most significant climate change impacts globally.

THE PATH FORWARD

What do all of these observations mean for sustainable communities in Inuit Nunaat? As the UNDRIP states, Indigenous Peoples have suffered from historical injustices as a result of colonization and the dispossession of our lands, territories, and resources. This has prevented us from exercising our right to development in accordance with our own needs and interests. Colonization and dispossession are the source of many of the social and economic challenges facing our communities today. They are key reasons why, despite living in lands that have sustained us for millennia and that are rich with natural resources, our communities are not at the standard of health and well-being of our non-Indigenous counterparts. Ensuring healthy, sustainable Inuit communities must begin with Inuit self-determination and sovereignty.

The Government of Canada has come to share this perspective, signing a precedent-setting Inuit-Crown Partnership declaration in early 2017 with Inuit in Canada.[10] The basis of this agreement is the recognition of rights, respect, cooperation, and partnership to achieve reconciliation between the federal government and Indigenous Peoples. Through this partnership, the Government of Canada and Inuit have demonstrated their firm commitment to energetically and creatively pursue the socio-economic, cultural, and environmental conditions of success for Inuit to generate prosperity for our communities and benefits for all Canadians. There is much work still to be done, but also much that can be learned about the path forward from this important partnership.

For Inuit, a healthy environment and healthy peoples are inextricably linked. Moving forward, we see a need for states and non-state actors to strengthen their partnerships with us. The Government of Canada has committed to address urgent health and wellness priorities, including mental health, maternal health, and to improve delivery of culturally sensitive and appropriate health services. We see a need for much greater inclusion of Inuit leadership in determining Arctic science and research priorities. In line with this need, we are at the start of advocating for an Inuit-led body for international health research assessments.

Long-term and far-reaching changes in our environment originating from activities and decisions made outside the Arctic pose a significant challenge. The ICC has been actively engaged in advocacy around issues of climate change and contaminants since its founding four decades ago. We have had a strong influence on the *Minimata Convention on Mercury* and the *Stockholm Convention on Eliminating Persistent Organic Pollutants*, among other international agreements. Inuit were among the first to raise awareness locally, nationally and internationally about the impacts of climate change on the Arctic, and we have advocated vociferously for mitigation, monitoring, and adaptation that prioritizes the perspectives and needs of communities ever since—for example, in ICC's role as an observer to the United Nations Framework Convention on Climate Change. In conversations about marine shipping, which have the potential to produce significant impacts on Inuit sea ice travel and the marine mammals on which we depend, Inuit must be at the table.

When economic and trade considerations are reframed around Inuit self-determination, we move from questions about how to exploit resources most efficiently and how to minimize risk in marine shipping, to how can we work in partnership to ensure maximum recirculation of benefits within Arctic communities? And how can we generate the investments in establishing and maintaining transportation and communications infrastructure that are needed to facilitate growth in Inuit economies?

Reframing our thinking refocuses the discussion to seeking innovative solutions for diversified and sustainable economic growth, such as renewable energy development, broadband infrastructure expansion, and social financing. Inuit want to be having conversations about maximizing benefits of the bourgeoning Arctic tourism industry while minimizing environmental impacts. In part, this means continuing to remove barriers to sustainable wildlife trade, such as the U.S. 1972 Marine Mammal Protection Act, which makes it illegal for cruise ship passengers to bring sealskins into the United States.

Research is a significant industry in the Arctic. Inuit have been increasingly taking a leadership role, moving from a reactive position to driving the research agenda in the Arctic. Research is not only an opportunity to address community priorities and knowledge gaps, but also to facilitate international co-operation. Within Inuit Nunaat, these efforts must center around Inuit self-determination.

In all of these challenges, we can build upon many tangible successes. We also have history to guide us to ensure that our cultural values, such as benefits for the collective good, are at the core of how we move forward. We have the innovations of community and youth leaders to create and recreate value for communities through economic development.

Our role as leaders is to lift others up—to elevate them. We are defined by what we do during challenging times and how we address these challenges to create opportunity. Inuit are extending our hands to the world to say, let us work together so that you may share in the riches of our beautiful homeland in a way that is equitable and sustainable, that respects our rights, that centers our knowledge, and that elevates our communities according to our needs and priorities.

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View from the Arctic Environment

Kevin Harun

OVERVIEW: DEFINITION OF ARCTIC SUSTAINABILITY AND IMPORTANCE

What is sustainability? For years, it was defined as the ability of biological systems and ecosystems to persist with diversity and resilience. Today, however, as humanity consumes natural resources with enormous ecological impacts, any definition of sustainability must be broadened to include integration within the environment of human society and economics.

In 1983, the United Nations established the *World Commission on Environment and Development* (the "Brundtland Commission") to find ways to harmonize social and economic decision-making with the environment. The Commission produced a blueprint for sustainability entitled *Our Common Future: Report of the World Commission on Environment and Development*[1] and defined sustainability as:

> *Sustainability is the process of living within the available physical, natural and social resources in ways that allow the living systems on which humans are embedded to thrive in perpetuity.*

Nowhere is sustainability more critical than in the Arctic, where Indigenous Peoples have lived in harmony with their environment for thousands of years[2]—and where some of the fastest and most consequential impacts of climate change are being felt. The Arctic is in fact the proverbial "canary in the coal mine," and how this region addresses sustainability also has worldwide implications.

It is hoped that in the Arctic (in accordance with the U.N. definition) that "living systems on which humans are embedded…(will) thrive in perpetuity." But hope is not a plan and a rapid response is urgently needed, especially in light of climate change.

ARCTIC SUSTAINABILITY IS NOT POSSIBLE WITHOUT ADDRESSING CLIMATE CHANGE

Why did the dinosaurs disappear? Some paleontologists attribute it to volcanic action, while others impute meteoric impacts. In any event, about 65 million years ago[3] the climate changed so rapidly that most species were unable to adapt and survive.[4] However, in an even more eerie parallel to modern times, the greatest mass extinction recorded (earlier than the dinosaur extinction) killed 90 percent of ocean life and 75 percent of terrestrial life after volcanic fires burned through fossil fuel reserves, which rapidly elevated levels of carbon dioxide in the atmosphere.[5] At the macro level, the opposite of sustainability is mass extinction.

Slowing the rate of change is critical to sustainability. The primary reason for mass extinctions has been an inability to adapt to rapid change. To slow the rate of change, it is imperative that not only should the United States and other nations remain committed to the Paris Agreement[6] (which seeks to limit the increase in the global average temperature to well below 2°C above pre-industrial levels)—but also that Arctic and non-Arctic nations need to take aggressive action to adopt model measures within the Arctic.

TOWARD A FOSSIL FUEL-FREE ARCTIC

Unless the rate of climate change is slowed dramatically, the Arctic environment as we know it is doomed to unprecedented rates of change that exceed many organisms' ability to adapt. A report by Oil Change (August 2015) calculated that developing Arctic fossil-fuel reserves would unlock new carbon that would result in exceeding the 2°C limit mandated by the Paris Agreement.[7] In addition, temperature increases cause Arctic ice to melt, decreasing the Earth's albedo. According to NASA, "this decrease in albedo means more energy is absorbed, which causes further warming and in turn causes more melting."[8] The release of black carbon through fossil-fuel development and use also has a disproportionate impact on reducing albedo and increasing temperature.[9] It is a positive feedback loop that is anything but positive in its consequences.

The Arctic itself should be a model for developing standards to address climate change across the entire region. One big step would be to articulate and work toward a vision of a fossil fuel- free Arctic. While a fossil fuel-free Arctic may currently seem like a fantasy, climate-change impacts are accelerating so fast that it is only a matter of time before decision makers will be pressured to catch up. Already, for example, in a startling recent move the United Kingdom decided to ban the sale of all diesel or gasoline powered automobiles starting in 2040.[10] Also this year, France announced it was prohibiting all new oil and gas exploration licenses in a bid to spur renewables and reduce greenhouse gases.[11] Anecdotally, this author, through his organization's permanent consultative status at the United Nations International Maritime Organization (IMO), has seen (just in the past year) a rapid increase in international interest in more substantively addressing climate-induced concerns such as heavy fuel oil (HFO) use, energy efficiency and design standards, and ship greenhouse gas emissions.

ENERGY ISSUES: HELPING ARCTIC COMMUNITIES TO MAKE TRANSITIONS

Any movement toward a fossil fuel-free Arctic must address the fundamental question of how to assist communities in making transitions. Most Arctic communities are heavily dependent on fossil fuels for heating, power generation and subsistence activities. While some communities with identifiable renewable resources are making energy changes, it will take innovation, careful planning and time to ensure this transformation occurs in ways that are not harmful to local residents.

Complicating matters, many Arctic communities look to oil and gas development and other energy-intensive, non-renewable resource extraction projects for both jobs and infusions into the local cash economy. In many places, economic alternatives are not readily apparent. For Arctic sustainability to truly be supported, it is essential to identify viable economic activities as well as alternative energy sources.

REDUCING MAJOR THREATS: SHIPPING AND HEAVY FUEL OIL

The Arctic Ocean is one of the most pristine places on earth because it has been largely inaccessible to the outside world—until now. With climate change rapidly accelerating in the Arctic, sea ice is disappearing fast.

Current estimates suggest that the Arctic Ocean will be completely ice-free in the summer within 10 to 30 years. Sea ice reductions throughout the year will lengthen the navigation season, open new sea routes, and dramatically increase ship traffic. Arctic nations, along with other economic powerhouses like China, are eager to exploit the newly "open" seas.

Increased ship traffic threatens marine biodiversity and indigenous food security through potentially devastating oil spill disasters, routine oil discharges, chemical pollution, underwater noise, collisions with whales and other marine wildlife, introduction of invasive species, and destruction of ecosystems. Ship engines also emit the greenhouse gas carbon dioxide, and they are a significant source of other air pollutants, including black carbon.

In addition to its direct impacts on marine ecosystems and wildlife, increased shipping will accelerate land-based resource extraction. New shipping lanes will provide access to previously remote regions containing a wealth of fossil fuel and mineral resources, while deep-water ports and related industrial infrastructure will facilitate the export of extracted resources to industrial centers around the world.

The International Maritime Organization's (IMO's) new Polar Code contains several important environmental provisions that protect the Arctic marine environment, including a ban on discharges of oil and oily water, sharp restrictions for garbage discharges, and a provision that requires mariners to avoid marine mammal concentrations in voyage planning. However, several critical issues were left out of the code, including emissions of black carbon, disposal of ballast and grey water, and the use and carriage of heavy fuel oil (HFO). The Arctic Council has stated that an oil spill, and especially an HFO spill, is the biggest threat to the Arctic marine environment.

Despite shipping's impacts on Indigenous Peoples, there is still no indigenous representation at the IMO. Pacific Environment and allies have started collaborating with indigenous leaders in Canada, Russia, and Alaska to chart a path toward indigenous participation in IMO decision-making.

One hopeful new process at the U.S. domestic level is the Coast Guard-led "Port Study" for the Bering Strait region. The Coast Guard has included routing measures and several Areas to be Avoided (ATBAs) in its draft Port Study. Hopefully, new domestic rules will be enacted by the end of 2017.

Over the past few years, conservation groups have created extremely effective domestic and international coalitions to address changing Arctic marine conditions, including:

1. Reducing the risk of ecologically devastating oil spills in the Arctic Ocean by achieving a phase-out of the use of HFOs and laying the groundwork to phase out the carriage of HFOs in Arctic waters.
2. Protecting sensitive habitats and species, subsistence resources and secure marine protection measures in the Bering Strait region.
3. Collaborating closely with Arctic indigenous leaders to facilitate their participation in IMO decision-making through attaining permanent consultative status.

FOUNDATIONAL BLOCKS OF ARCTIC SUSTAINABILITY: CULTURE, LANGUAGE, ECONOMY

While actions taken nationally and internationally regarding climate change are critical to Arctic sustainability, local Arctic communities should be leaders in creating their own sustainable futures. Key foundational blocks of local sustainability are culture, language, governance, and the economy. Arctic communities must be supported in their efforts to sustain subsistence hunting and fishing and other activities, which are central for cultural as well as physical survival. Many decision makers outside of the Arctic have little understanding at how dependent Arctic residents are on local renewable resources and subsistence activities.

Language is important to preserve cultural information for current and future generations on many levels. It is a construct and vehicle to see the world, a key component of cultural identity, and, as a validation of all knowledge that has come to us from those who came before us. While some Arctic indigenous communities have lost their language, efforts to restore language and place names are a key component of sustainability. Language is a vehicle of connection between the traditional and contemporary and, as a cornerstone of cultural identity, it provides a foundation for the future. Recognizing the importance of language, last year the Alaskan Inupiaq community of "Barrow" changed its name to "Utqugvik," which means "place to gather roots."[12] Similarly, community governance geared toward maintaining cultural identity is a critical piece toward self-directed community sustainability.

A NEW ARCTIC ECONOMY

Economic development should be one of the pillars of sustainable communities. One place to start is to provide support for and strengthen traditional economic activities such as subsistence. Ways to promote subsistence, for example, should include utilizing local indigenous knowledge and the wisdom of community leaders in the governance of fish and game policies. One vehicle to integrate indigenous knowledge in fish and game decisions is to ensure that leaders who are recognized for their expertise in such knowledge are chosen to staff key regulatory governing positions. Similarly, governing bodies should develop policies to ensure those with indigenous knowledge fill administrative positions.

Traditional subsistence is in many ways what economists call "import substitution." Besides subsistence hunting and fishing, other potential import substitutions should be encouraged, such as horticulture in greenhouses to substitute for costly food imports. Of course, all these activities are highly dependent on energy costs. One important way to reduce energy costs is to focus on energy-efficiency projects and alternative energy.

In many ways, Arctic community hubs and villages mirror a good portion of the developing world, which means among other things that the Arctic can become a laboratory to develop new, exportable technologies. For example, most wind-energy development in the world has focused on large turbines for the developed world. However, most of the developing world needs small, less-complicated wind-turbine technology, similar to that which has been pioneered in Kotzebue, Alaska.[13] Such innovations offer opportunities for Arctic communities to develop patents and manufacturing systems to export technology to Asia and Africa. These small-scale technologies also offer the opportunity for local training, maintenance and the exportable development of "microgrids," which are small community electrical grids capable of operating successfully without connection to main, outside grids.

For years, the most powerful paradigm for economic development has been characterized by three main drivers: large non-renewal resource extraction projects; dependence on one industry; and bricks-and-mortar infrastructure, such as roads, ports and other projects designed to facilitate resource extraction. For the future Arctic economy, we will need to focus on infrastructure projects that permit local residents of the Arctic to stay in their communities while bringing in cash. Such infrastructure projects include the development of broadband networks linking Arctic communities to the rest of the world, creating universities and trade schools to attract regional students, and building small-scale infrastructure projects to support the value-added processing of high quality products from fish, forest and tundra.

Sustainability in the Arctic is possible through four key initiatives: 1) a worldwide and regional commitment to climate mitigation and adaptation; 2) continued support of subsistence economies; 3) import substitution, including a focus on food, energy efficiency and renewable energy; and, 4) development of local infrastructure projects that support both the knowledge-based economy and the export of innovative technology and value-added projects that are based on renewable resources.

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Views from Arctic Regional Communities

Denise Michels

Arctic communities face challenges to operate sustainably and enhance resiliency, faced with the opening of the Arctic Ocean and increases in Arctic shipping. This paper will provide examples of successes for Alaskan communities working on sustainability and resiliency, examine strategies that work, and look at examples of private sector policies in the Arctic that allow the Alaskan Inuit to continue our subsistence way of life.

There are existing modes of governance to help frame the needs and responses of resilient communities. First of all there needs to be strong leadership at the community level, to keep on task and shepherd engagement to improve community conditions. Governance among communities varies; for some, city government has a strong administrative capacity, and in other villages the tribal government is leading community investment in resiliency.

The Indian Reservation Act of 1934 as amended in 1936 for Alaska (IRA) specifically allowed Alaska Natives to organize tribal government constitutions under the IRA. "The use of the word 'traditional' simply refers to fact that the tribe is not an IRA tribe and has no relation to the traditional culture of the tribe."[1] This created a trust relationship with Alaska tribes for domestic government-to-government consultation.

The Indian Self-Determination and Education Assistance Act (Public Law 93-638) allowed tribes to enter into contracts with the Bureau of Indian Affairs (BIA) and the Indian Health Service (IHS) to operate programs and activities of those entities.[2] Tribes assumed the functions of the BIA and IHS. The 1988 amendments allowed tribes to compact to reprogram funds or resign federal programs without permission from the federal government. Kawerak, Inc., is one of the many tribal consortia that has created programs to meet the needs of the people in the Bering Strait Region.

President Bill Clinton issued Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments." Many federal agencies were not practicing true government-to-government consultation, and tribes expressed their desire for improvements to tribal consultation. Today, some agencies are better at tribal consultation than others. Some agencies simply check a box and other agencies continue to practice true tribal consultation. Successful agencies that we have worked with include the U.S. Coast Guard and the Federal Bureau of Investigation; both have created Tribal Liaison positions in Alaska.

The Marine Mammal Commission and the Indigenous Peoples Council for Marine Mammals, along with the Environmental Law Institute Ocean's Program, published a Handbook, *Model Alaska Native Consultation Procedures*, which aims to "provide Alaska Native communities with guidance on how they can design their own policies and procedures for government-to-government consultation with federal agencies," in order to ensure that federal action will not hamper Alaska Natives' access to subsistence activities. (January 2016)

Alaska has its own issues with public policy regarding tribal consultation and providing aid for resilient communities. These issues are based on "(2) demographics; (3) political culture; (4) the economy; (5) geography and the environment; (6) regionalism and the urban-rural/bush tensions; (7) a fragmented, often stymied policy process; and (8) the crucial influence of external political and economies forces."[3]

Alaskan cities are subdivisions of the State of Alaska. Tribes, on the other hand, sometimes are acknowledged by the governor but at other times are not recognized as a sovereign government. Governor Steve Cowper signed Administrative Order (AO) 123 on September 19, 1990 stating that, "Tribes exist in Alaska."[4] Governor Wally Hickel approved an Administrative Order 125 that revoked Governor Cowper's AO 123, instead stating that, "The policy of the State of Alaska is that Alaska is one country, one people. The State of Alaska opposes expansion of tribal government powers and the creation of "Indian Country" in Alaska."[5] In 2000, Governor Tony Knowles created the "Millennium Agreement Between The Federally Recognized Sovereign Tribes of Alaska and the State of Alaska" on April 11, 2001, establishing a framework for "government-to-government relationships and an implementation procedure to assure that such relationships are constructive and meaningful and further enhance cooperation between the parties."[6] Governor Bill Walker signed Administrative Order No. 277 establishing the Governor's Tribal Advisory Council to "identify areas of concern and opportunity shared by the State and Tribes and to suggest policy, programs and other means of methods for solutions and progress."[7] Alaskan Tribes, clearly, are at the whim of whichever party is in control of the governor's office.

The best model of governance to produce resilient communities is to build trust with full and open communication. This should be an ongoing conversation. Traditional knowledge is passed down from generation to generation. We are experts that study the weather, ocean, land, and migration patterns for survival. We are expert hunters and gathers and subsistence is our culture, tradition and way of life. Successful task forces have included federal, state, and tribal government representatives, as well as public experts, in order to address problems and come up with an implementation plan. This process was also used for Governor Sarah Palin's Climate Change Sub-Cabinet, the Northern Waters Task Force, the Arctic Policy Commission, the Immediate Action Work Group, the Rural Justice Task Force and the Arctic Waterway Safety Committee. As part of an internal review, any new administration should review the implementation plan to see if the process worked and adjust, if needed, the implementation plan. Unfortunately, many of the priorities in the implementation plan are not completed when a new administration takes over and priorities are shifted. We recommend that the implementation plan be fully funded until all the priorities are completed.

What has been successful on the international level is the Inuit Circumpolar Council-Alaska (ICC-AK), which is a permanent participant to the Arctic Council. ICC-AK consults with its members on Arctic Council projects and brings information back to the regions so that we can make informed decisions on policy recommendations and participate on baseline research from the initial concept. We have identified a gap in communication on projects with the United Nations (UN). Recently the UN Educational, Scientific, and Cultural Organization (UNESCO) published a report entitled Natural Marine World Heritage in the Arctic Ocean.[8] The report identifies global ecosystems that may be of outstanding value with the intent "to advance recognition and conservation of globally significant natural marine sites in the Arctic."[9] This includes the Bering Strait, which under the UN Law of the Sea is a international straight used for innocent passage. The report goes an additional step and identifies for further consideration the Chukchi and Beaufort Seas. The Bering Strait region was surprised by this finding, as this was the first time we had heard of the IUNC report. IUNC held a meeting in Nome in 2012 and the discussion included exploring options for the protection of ecologically and biologically significant areas, as well as the negative effects of shipping.

In April 2017 I met with Lisa Speer, one of the co-authors of the IUCN report, in Washington, D.C. and asked why there was no tribal consultation to follow the UN Declaration on the Rights of Indigenous Peoples resolution, and specifically Article 3, 4, 5, 19, and 20, among others. Our message was that the United States did not consult with Indigenous People of the U.S. Arctic. Ms. Speer's response was that they didn't have the funding available to hold consultation in hub communities. In June 2017, I met with Mayor Madeline Redfern of Iqaluit, Nunavut, Canada and mentioned the World Heritage Report to her. She provided me her email notes of March 6, 2016 where she met with project coordinators. In the notes, she wrote that, "Internal state (country, region, local) consultation has to happen re potential marine areas for UNESCO Heritage protection."[10] The project coordinators were informed that they needed to consult with indigenous Arctic peoples.

We have two solutions for the UN and the U.S. State Department to consider: First, create a U.S. Arctic Ambassador with procedures to consult and report to Indigenous Peoples of the U.S. Arctic. The second is for the State Department to consult with Indigenous People on various UN projects.

Our concern is that Alaska Natives are highly regulated by the Marine Mammal Protection Act, Environmental Protection Agency, State Department of Environmental Conservation, and the Alaska Department of Fish and Game with regards to subsistence activities and ensuring sustainable resource development in the region. We need a comprehensive list of other conservation laws and how they will affect our subsistence way of life, if our backyard oceans become a World Heritage site.

Communities in rural Alaska have a mixed cash economy. We subsistence hunt and fish. After all the food has been processed we use the remaining parts to create artwork, carvings, clothing (ruffs, slippers, parka) and tools (*ulus*) from the animals we depend on, then sell the artisanal products for cash to allow us to purchase goods (fuel, bullets, motors, etc.) and to continue to subsist on fish, game, birds, and other fauna and flora. Inuit cultural values include taking care of our family, children and elderly and sharing our subsistence bounty with our community. With climate change, some of our villages have experienced some hardships, and have had to rely on outside resources for our nutrition. For that, we are grateful.

Can Western businesses create policies and procedures that respond to the needs of a subsistence culture, and allow employees to hunt, fish, and gather—and still hold jobs? Can Western businesses create a policy body that reviews seasonal issues to allow migration patterns to happen safely? Yes! For example, Kawerak's Board of Directors allows 40 hours a year for an employee to take subsistence leave to hunt, fish and gather food, with approval from a supervisor. The Red Dog mine owner Teck created a committee of local hunters and leaders to analyze the caribou migration and mine operations, including use of the haul road, in order to ensure that caribou are safe and not spooked as they graze through those lands. Graphite One is also reviewing this process for moose, caribou, and reindeer near the mine site on the Seward Peninsula. In some parts of Europe, men are allowed to take paternity leave once their newborn arrives. In many parts of Europe, employees take up to 30 days paid holidays.[11] Western businesses wanting to operate in the Arctic have the opportunity to create corporate policies that respect our subsistence culture and way of life.

Climate change has created unpredictable conditions with weather and migration patterns. This has caused hunters to lose access to subsistence activities, and permafrost thawing has created problems for infrastructure foundations, including erosion and buckling of buildings. We are concerned that rising ocean acidity is harming our crabs and other species that we (and fisheries around the world) all depend upon for commerce and survival.

We are experiencing environmental threats to our communities from the changing climate, and villages are working to create hazard mitigation plans for evacuation. Communities that are identified as being under imminent threat from coastal erosion are creating sustainable management plans. To respond to threats arising from climate change, we continue to support the COP21 Paris Agreement. We are working to bring awareness of the "Sendai Framework for Disaster Risk Reduction 2015-2030"[12] for disaster planning. The conversation is just starting, as many of our villages are still trying to complete their hazard mitigation plans. Communities need training in incident command structures, in creating local emergency planning committees, and build a robust volunteer base to continue to drill for emergency planning. Some of our communities have this incident command system in place, but many are asking for training in emergency response.

The Alaskan Arctic poses challenges for human health and well-being, and we are working to address those stressors to promote wellness. According to the Alaska Bureau of Vital Statistics, "Alaska has the highest rate of suicide per capita in the country. The rate of suicide in the United

States was 11.5 suicides per 100,000 people in 2007. In 2007, Alaska's rate was 21.8 suicides per 100,000 people. The rate of suicide among Alaska Native peoples was 35.1 per 100,000 people in 2007."[13] Alaska supports the Arctic Council's "Rising Sun" initiative under the U.S. chairmanship. We urge the Sustainable Development Working Group to continue this effort with the Finnish Chairmanship. Bringing awareness campaigns and establishing community support systems is one of the steps the region is taking. Sitnasuak Native Corporation, an Alaska Native Settlement Claims Act village corporation, has a radio campaign to bring awareness to the Bering Strait Region. Norton Sound Regional Corporation's Behavior Health program has hired specialists in the region for people in need of aid to reach out. Kawerak's Wellness Program has traditional camps for teenagers to attend and provides prevention and awareness for healthy families.

There is a role for outside actors to support communities by reaching out to the regions and supporting our efforts to ensure we have positive societal benefits and gains in human health and wellness, food security, environmental, social and economic development, and opportunities. The UN's 2030 Agenda for Sustainable Development[14] is one of the best resources that communities and outside actors can use as models to create programs that address these and other issues.

In conclusion, with the U.S. success of the Arctic Council chairmanship, more attention has been given to Alaska, bringing increased awareness to challenges faced by Inuit. Today, various entities are recommending policy solutions. The Council on Foreign Relations' Arctic Imperatives[15] publication identifies recommendations for national security, as well as others specific to Alaskan communities and infrastructure needs. The National Intelligence Council's Global Trends: Paradox of Progress[16] has a section on the Arctic and Antarctic where they identify trends associated with climate change, including food security impacts for people of the high north. This brings new opportunities for outsiders to engage in Arctic policy governance for sustainable development, now and into the future.

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A Scientific Perspective

Gail Fondahl

"SUSTAINABLE" ARCTIC "COMMUNITIES": WHAT DO THESE WORDS MEAN?

In talking about Arctic *communities*, we are talking about a wide range of entities in terms of their demographic characteristics, physical settings, cultural make-up, and economic bases.[1] Much of the Arctic's population lives in urban places (cities and towns), although villages of fewer than 1,000 inhabitants make up the majority of Arctic settlements (Heleniak 2015; Rasmussen 2011). Medium and larger settlements are often dominated by administrative and educational activities, whereas smaller communities often depend much more on subsistence activities or resource extraction economies (or both). Populations of larger centers consist of in-migrants from surrounding rural regions as well as from more southerly parts of the country. More recently, many communities include a growing number of "newcomer" immigrants from non-Arctic countries. Arctic communities are increasingly interdependent with other communities both within and beyond the Arctic. Most are evolving more rapidly than ever before, due in part to the increasingly mobile nature, and thus ever shifting composition, of their populations. Thus, Arctic communities are heterogeneous entities that defy generalizations.

In talking about sustainability, we are talking about a process. Given the rapid socio-economic, cultural, political, and ecological changes facing all types of Arctic communities, resilience is now a key component of sustainability: communities need to be able to adapt continually and effectively to the evolving contexts within which they are embedded in order to remain viable (ARR 2016). For an earlier NPAC conference, then-President of ICC-Canada Duane Smith wrote that, "Community resilience is one of the most essential components needed to build and support sustainable, thriving Arctic communities" (Smith 2013:236). Sources of resilience, or adaptive capacity, include human capital (including knowledge capital), cultural assets and social capital, natural capital (resources), financial capital, and infrastructure (ARR 2016:166-7). To pursue sustainability requires collectively harnessing these various forms of capital/resources. Since communities are composed of individuals, they encompass divergent opinions on paths toward sustainability as well as on what sustainability itself entails. Moreover, individuals' ability and will to pursue adaptive strategies are influenced by power relations, which cut along axes of class and culture, gender and generation.

Community sustainability as a process is geographically contextual. It is shaped by the specific historical context of the community as well as the socio-spatial interrelations of the community, internally and externally. Arctic communities vary in terms of their internal dynamics and their relations to external processes, places and pressures. Research is needed on the diverse processes and paths of sustainability in the various types of communities that we find across the vast Arctic region.

The other papers in this session focus mostly on challenges to sustainability and resilience for Indigenous Arctic communities. While these are critical issues, I will use this opportunity to address three other important points: 1) the need to better understand the challenges that being embedded in larger governance systems pose to local approaches to sustainability; 2) the need to focus more on gender, generational and other axes of difference (as well as ethnicity/indigeneity) in research on pathways to Arctic community sustainability; and 3) the need to develop more robust and holistic indicators of Arctic community sustainability. I offer a few examples from the Russian North to illustrate my assertions, as it is the primary region where I have carried out research over the past quarter-century.

CHALLENGES TO COMMUNITY APPROACHES TO SUSTAINABILITY AND RESILIENCE FROM HIGHER LEVELS OF GOVERNANCE

> *"Resilience is best established from the bottom-up through the engagement, interaction and initiatives of individuals and organizations within communities. Locally driven resilience-building initiatives are the most effective because they tend to be culturally appropriate and address the communities' priorities." (Smith 2013:237)*

Such initiatives also will reflect locally generated understandings of what sustainability entails, rather than externally imposed definitions.

Locally driven approaches are more likely to enable the meshing of traditional and modern modes of governance, in communities where the former exist.

The *Arctic Resilience Report* indeed asserts that, "When Arctic resource-user communities have had wide latitude and capacity to organize their own livelihoods and institutions, they are able to be resilient regardless of their broader economic or political settings" (ARR 2016:116). Yet community initiatives to respond to sustainability challenges are not enacted in isolation, but are influenced by political, economic, and cultural interactions with other places. Challenges to local sustainability are multi-faceted, multi-scalar, inter-sectoral, and exceedingly complex (Shiroyama et al. 2012). The Arctic Resilience Report also observes that the "resilience of communities is… a function of decisions made at many levels, including the international, national, sub-national and local level" (ARR 2016:138) – decisions made both within and beyond the Arctic. The report goes on to note that self-organization is "not something that is only determined by local community. Governance institutions at 'higher' levels … can either degrade or enhance ability of local places to self-organize. In many places, the capacity of people to self-organize has been suppressed rather than enabled by rules, policies and governance" (ARR 2016:117).

As an example, rules regarding compensation payments for damages generated by industrial development to habitat upon which subsistence economies depend may determine whether such payments have beneficial or deleterious effects (or both) on the sustainability—cultural, environmental and economic—of those subsistence activities. Where rules dictate that compensation payments be provided to individuals, monies may be used to finance equipment and supplies needed to continue to pursue subsistence activities, supporting their sustainability. Alternatively they may be used to fund activities that may erode subsistence cultures, such as paying for children's education away from home villages. Meanwhile, community services may bear some of the burden of supporting individuals whose ability to pursue a sustainable livelihood based on subsistence activities has been compromised. Yet community governments responsible for delivering those services may receive no part of the compensation payments. The choice of which individuals or entities receive compensation payments is often decided with minimal input from the community or its individual members. This is just one example of where we need to better understand the impacts of regulations made at higher levels on locales, individually and collectively, in order to promote policy decisions that are more likely to have the desired outcomes of cultural, economic and environmental sustainability. This includes research on the cultural and cognitive factors that inform choices about who should receive payments and about the use of such monies, as well as on the gendered, generational and cultural variances in the definitions of sustainability that underpin the above (see below).

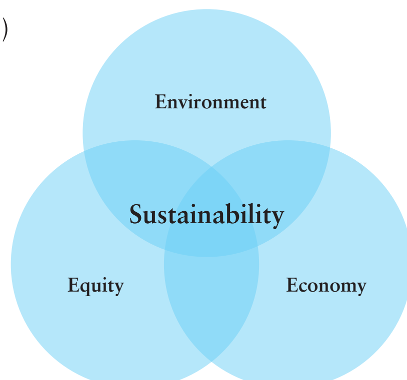
We also need to better understand how higher levels of decision-making can enhance or degrade local community resilience (see ARR 2016:122). As an example, in the Russian North, regional laws of the Sakha Republic (Yakutia), which tend to be more progressive than federal laws, offer some territorial protection from industrial development to local subsistence activities, in order to promote local sustainability. So do the local (municipal) interpretations and implementations of these laws. The ability to protect subsistence activities via such laws, however, may be eroded by the upcoming passage of federal laws that will supersede the regional laws.[2] The proposed federal laws are weaker than the extant regional laws. Whereas in some cases, the absence of national legislation may hinder pursuits of sustainability at the local level (ARR 2016), in others, it is not the lack of national legislation, but its very materialization, that may diminish progress toward sustainability. Even well-intentioned regulatory reforms, at any level, may undermine sustainability. Research on how decisions, regulations and laws—and their interpretation and implementation—can enable and facilitate, or obstruct and degrade, local community adaptations and resilience to evolving physical and social environments is of significant policy relevance (cf. ARR 2016:121).

Today Arctic communities are shaped by complex interactions of environmental change and socio-economic and political forces at the local, regional and global level. There are also increased societal expectations that a variety of actors, both local and non-local, have a right or at least a legitimate interest in being involved in setting the rules and actions that, inter alia, may affect community sustainability (e.g. Griffin 2010). Diverse individuals can contribute different types of knowledge, cultural capital and social capital to addressing sustainability challenges. Moreover, shared responsibility for making decisions can improve the effectiveness and justness of such decisions (Lawhon & Patel 2013). Although participation of a range of rights-holders and stakeholders, including those beyond the community, may enhance the adaptive capacity of communities (AHDR 2015), managing the roles of these actors itself demands the attention of policy and decision makers. Communities with limited capacity can be challenged to equitably participate in, and influence, such multi-scalar interactions (ARR 2016). This leads also to the issue of equity and (under) representation of key constituents of Arctic communities.

SUSTAINABLE ARCTIC COMMUNITIES: EQUITY ISSUES OF CRITICAL IMPORTANCE BUT RELATIVELY NEGLECTED

Research on sustainability in the Arctic has focused mostly on the pillars of the economy and the environment, with notably less attention given to the pillar of equity. We need to pay much greater attention to this facet of sustainability in considering Arctic community sustainability. As the second Arctic Human Development Report notes (2015:493), we should attend to the ways in which masculinism defines the very issues that national and international forums consider (and ignore), including those concerning Arctic community sustainability. Researchers have mostly failed to address gendered, generational, cultural and other differences in ways sustainability is envisioned, experienced and enacted in the Arctic (Petrov et al. 2016), with the exception of some (though still insufficient) attention to indigenous differences.[3] Yet we know that these differences play critical roles.

If research on gendered dimensions of Arctic community sustainability is in its infancy, existing studies indicate that understanding gendered differences is critical. Vinokurova (2015) documents the differing gendered and generational responses (and resilience) to flooding caused by climate change in the Russian North. Christensen (2017) examines the gendered dimensions and experiences of indigenous homelessness in the Canadian North, recording significantly different paths for women and men. Gendered out-migration from smaller Arctic communities, dominated in many areas by working-age women (Heleniak



2015), threatens the very viability of such communities. Research is needed on a whole range of policy-relevant issues, from the gendered impacts of industrial projects and transitions toward 'modern' economic activities, to gendered understandings and enactments of cultural vitality, to gendered preferences for, and commitments to, various governance structures that play a role in promoting sustainability.

Likewise, generational aspects of community sustainability are poorly understood. Fortunately, an Arctic Youth project[4] currently underway is looking at aspirations and priorities of youth in terms of cultural identities, education, occupations, and lifestyles—all critically important to the future of Arctic communities. This is a start; it is the kind of research that may have direct policy relevance in terms of, for instance, educational governance and investment decisions. Indeed, the future sustainability of many Arctic communities is contingent on the choices these communities' youth make regarding the mix of traditional/subsistence and other activities they pursue, the languages they choose to master and use, the educational trajectories they choose to pursue (and indeed what choices they have), and the cultural practices they choose to engage in or abandon (including traditional governance practices).

As many Arctic communities are aging, the evolving and potential roles of the elderly populations also need greater research attention (AHDR 2015). Members of older generations may play an increasingly active role in both the paid and volunteer sectors of Arctic communities and in their informal governance institutions, contributing to their sustainability. In communities with significant indigenous populations, the elderly may be key in maintaining and enhancing the use of traditional modes of governance and knowledge systems. Older and younger age cohorts bring differing knowledge, cultural and social capital to the table. Research on the desires, capacities and hindrances to the participation of older community residents, which is also sensitive to gender and cultural differences, may facilitate planning for their enhanced roles in pursuing sustainable futures for Arctic communities of various sizes.

We also need to better understand how racisms and other exclusionary practices within Arctic communities (AHDR 2015), performed against both long-time residents (including Indigenous Peoples) and newcomers, affect community sustainability (again with attention to gender and generational differences). This includes understanding how and why people are excluded from participation in community activities—not least in governance activities—and identifying what might be done to overcome such practices. Often neglected humanities fields, such as linguistics and communications, may provide important insights that have policy relevance (Petrov et al. 2016).

Attending to the ways in which multiple categories of dominance and marginality interact with each other ("intersectionality"), in place, will enhance our comprehension of the challenges to advancing the 'equity' pillar of sustainability in different Arctic communities. This relates intimately to the importance of including the full range of a community's varied perspectives on what constitutes sustainability in planning for a future that is indeed equitable for all. It relates to engaging the full range and diversity of local "human capital." Given the diversity of Arctic communities, we need to investigate variation in these issues across the rural-urban spectrum to understand what influences size of settlement and diversity of opportunities may play in accentuating or attenuating equity issues, and their implications for sustainability.

MONITORING ARCTIC COMMUNITIES' PROGRESS TOWARD SUSTAINABILITY

Policy makers will want to be able to track the progress of Arctic communities toward sustainability, including, ideally, the influence of various policy decisions. Arctic communities are themselves socio-ecological systems, as well as components of larger socio-ecological systems. To date our indicators for monitoring such systems, including their sustainability, are embryonic. We have made preliminary steps toward developing social indicators of Arctic human development (ASI 2010, 2015), but need much more work to formulate and operationalize them (Ozkan and Schott 2013). Moreover, we need to move on to the development of integrated social-ecological sustainability indicators (Petrov et al. 2017), informed by the initial work on social indicators. Indicators of sustainability need to be responsive to both evolving conditions (physical and social) and their cumulative impacts on communities, large and small. They need to be reflective of the diversity of Arctic communities' residents, experiences and definitions of sustainability. This is a challenging yet vital task. Arctic community members will ideally have (sustained) input into identifying key domains of importance for such indicators. Outsiders can provide expertise to integrate these domains and develop robust proxies for tracking social-ecological advances toward (or retreats from) more sustainable conditions. But their efforts cannot succeed without sustained engagement on the part of community members.

Notes

1. Arctic *communities* can be differentiated from Arctic *settlements* (see, e.g., Rasmussen et al. 2015). Here I use the word to gloss both the physical settlements and their populations (more or less interchangeably), while recognizing that many settlements, especially those of larger size, incorporate numerous communities, and some Arctic communities stretch beyond the boundaries of single settlements.
2. This is currently of special concern in the Sakha Republic (Yakutia), regarding both the Law on Ethnological Expertise (i.e. socio-cultural impact assessment), which currently only exists in the Sakha Republic (Yakutia), and the Law on Territories of Traditional Nature Use republican variant (both federal and republican laws exist). The latter law's federal variant is now under revision. Sakha Republic (Yakutia) has established a significant number of such Territories at the republican and local (municipal) levels, to protect indigenous lands, the protected status of which would likely cease under the proposed revision to the federal law.
3. Moreover, too often 'indigeneity' is portrayed as a single category. Much more research is required to understand the variances and divergences in conceptualizations and enactments of sustainability across the dozens of distinct indigenous cultures and their communities across the Arctic, as well as within indigenous communities, along such axes as gender and age.
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Perspective from the Russian Far East

Eduard Zdor

INTRODUCTION

Arctic coastal villages in Chukotka have traditionally been located on a spit or cape. The main criterion for choosing a place for settlement was that the migration routes of marine mammals should be in close proximity. This was necessary because in earlier times, human rowing power was required to propel boats. For hunters, it was ideal if hunts could begin right at the village. Even today, when powerful outboard engines have replaced muscle power, the price of fuel plays a significant role in the local economy, and proximity to the hunt remains important.

Traditional subsistence activities continue to play a significant role, both in the local economy and in the processes of preserving the identity of Chukotka's Indigenous Peoples. Thus, for coastal indigenous communities, their historical locations continue to retain their significance. An example of the significance of such traditional places of residence for Indigenous Peoples is the dramatic history of the ancient settlements of Naukan, Nunyamo, and Ungasik (Krupnik 1983, 2007). The relocation of people from traditional lands to different places separated clans and families, and ultimately contributed to the loss of language and traditions.

The changing structures and challenges facing Chukotka's modern Arctic communities emerged from a combination of processes that occurred during the Sovietization of the 20th century, continued during the dramatic socio-economic changes of the 1990s, and now reflect the pervasive process of 21st Century globalization. A short list of these changes includes the lack of private ownership of land and resources, paternalism that undermines the responsible approach that Indigenous People have demonstrated over time regarding their future, and the gap between generations in families that has eroded or destroyed their identity. On the other hand, Indigenous Peoples, passing through these dramatic upheavals, still continue their traditional way of life. Thus, a new type of Indigenous Peoples has formed, combining traditional ways of life with an emerging global standard. As a result of this ongoing process of acculturation, integration strategies predominate today in Arctic communities (Segall et al. 1990).

EVERYDAY LIFE OF ARCTIC COMMUNITIES

In this paper, I will describe some aspects of community life in the Arctic villages of Eastern Chukotka. Here, settlements of Indigenous Peoples are densely concentrated and are the largest on the Arctic coast. The high density of indigenous population in this part of the region became possible due to the stable seasonal movements of sea ice over the centuries. In turn, this moving sea ice has provided habitat for many species of marine mammals, as well as a temperature generator that promotes the propagation of krill, which is the foundation of the ocean food chain.

The use of marine mammals has provided for the long-term sustainable existence of indigenous communities of Chukotka. Incredibly, in the 19th century settlements such as Naukan and Unazik had up to 500 inhabitants. What follows is a list of modern villages and their population estimates as of January 1, 2017, moving from east to west: Uelen (632); Inchoun (361); Enurmino (285); Neshkan (614); Nutepelmen (161); and Vankarem (169) (Department of the Federal State Statistics Service for the Khabarovsk Territory, Magadan Region, the Jewish Autonomous Region and the Chukotka Autonomous District 2017). Approximately 80-90 percent of the population is comprised of Indigenous Peoples, of which the Chukchi are the majority. There is also a small number of Siberian Yupik and other Indigenous Peoples. The population composition, according to the All-Russia Population Census of 2010, includes: men 20-49 years (23 percent); women 20-49 (25 percent); children age 0-19 years (39 percent); and elders more than 50 years old (14 percent).

Daily Activities

In summer and autumn most of the villagers spend time outside the village, fishing, gathering, and (for some) hunting. Even those who have a job join the others after working hours and on weekends. Some of the workers take a special vacation during these seasons. Although there are frequent cases where Indigenous People prefer to spend their vacation time outside the region, some families in the villages still take traditional family holidays to visit relatives. Hunting communities observe several seasonal rituals.

Reindeer herding camps regularly dedicate their holidays to seasonal reindeer herding activities such as calving and mating season. It is also a time for outdoor sports, mainly volleyball. In the evenings, such games attract a lot of young people. From time to time, municipal authorities organize entertainment for villagers, such as Youth Day, Fisherman's Day, and so on. Twice a year the regional authorities organize holidays, based on traditional celebrations that have their roots in earlier times. Whaling rituals after harvests, which in former times did not happen often and were significant events, included conducting regattas using leather boats. In the spring, a regional dog sled race is held in the same way (Yashchenko 2013). In general, watching television and participating in social networks are the predominant ways that modern rural dwellers spend their time. This is especially true during the winter season.

Languages

The main everyday language in these Arctic communities is Russian. Many also use native phrases for small conversation such as greetings, talking about the weather, ocean conditions, and so on. Hunters usually use many more native words, mainly because the local language can be used to more precisely relate nuances of traditional knowledge relating to hunting and the natural world. For the most part, only people over the age of 50 are fluent in their native language. There is, however, also a small number of native speakers aged 30 to 50 years. These tend to be people who live in remote villages as well as in reindeer herding camps, in what have been called "language nests" (Yashchenko 2013). A distinctive feature of these "language nests" is a lack of access to the internet and television, combined with an active, traditional subsistence lifestyle. There are several theories explaining the disappearance of most of the languages on the planet, described in detail by linguists (Vakhtin 2010). In this paper, we need only establish that the majority of the population prefers to speak Russian. Children speak the language they hear on the street, at home, in kindergarten and school. There are almost no elders left who speak only their indigenous language.

Beliefs

After the collapse of the Soviet Union, there was a resurgence of some traditional ways. One result of the post-Soviet economic collapse in the

1990s was the destruction of government services that had provided the population's food, communal services, medical care and education. This forced inhabitants of Arctic villages to restore their traditional ways to manage and rely on nature to provide subsistence. This became possible in part due to a revival of traditional knowledge. However, despite the fact that traditional knowledge was almost completely restored, the restoration of the traditional beliefs systems of Arctic Indigenous Peoples was less clear. Many different religious organizations from Russia and the United States began to work with Indigenous People (Oparin 2015). The Russian government began to show great support for the Russian Orthodox Church, in part by exempting the Church from all taxes, including trade in alcohol and tobacco. The Orthodox Church began to resemble a state within the state (personal communication). Today many Indigenous People belong to different religions. However, most residents of remote Arctic villages practice a mixture of traditional beliefs, Soviet atheism and various branches of Christianity.

Food

Approximately 50 percent of the daily food intake of Chukotka coastal inhabitants is comprised of seafood: marine mammals, fish, poultry and benthos. From spring to autumn, the share of seafood in the diet of Indigenous People increases to 70 percent (personal communication). This mainly depends on the seasonal migration of marine life (Yamin-Pasternak et al 2014). A high level of dependence of Arctic Indigenous Peoples on seafood was formed by a thousand-year history of harmonious coexistence between humans and the Arctic web of life. In turn, the stable state of any healthy organism living in the Arctic is impossible without a traditional diet (Kozlov et al 2013). Changing the diet of Indigenous Peoples contributes to an increase in the number of cardiovascular, pulmonary and other diseases. Thus, the well-being and health of Arctic people are directly dependent on a healthy sea.

Clothing

Traditional clothing is still used in reindeer herding camps, because it is inexpensive and sewing traditions are still preserved (personal communication). Village residents and ocean-going hunters mainly use modern factory clothes; however, a few villagers still wear some elements of traditional clothing, especially in the winter. Due to Indigenous Peoples taking holidays in different regions, as well as tourist cruises coming to the villages, modernized elements of traditional clothing such as anoraks are becoming popular among residents.

Public Service

In each village there are housing and communal services, mainly for providing electricity, water and central heating to public buildings such as schools, hospitals, social services, and in large settlements also residential buildings. The average number of employees in these public sector jobs is between 40 to 60 (PromstroyNIIproyekt 2012).

Villages where the population ranges up to 300 people have about 120-150 children and about seven teachers. Villages with more than 500 inhabitants have about 250-300 children, and more than 20 teachers work there (PromstroyNIIproyekt 2012). Modern Russian education is in the transition period from the Soviet education system to Westernized standards. One of the features of Russian school education is the mandatory imposition of the Christian Orthodox religion and the propaganda of the state, headed by President Vladimir Putin.

Each village has a community center for cultural events, as well as a library. An average of about 10 workers work here (PromstroyNIIproyekt 2012).

In small settlements of up to 300 inhabitants, there is a medical assistant's clinic where there are one or two paramedics. Villages of more than 500 residents have a hospital for 5-10 patients and from 10 to 15 medical personnel, including at least one doctor (PromstroyNIIproyekt 2012).

To provide the population with food in each village there is at least one food store. This store is either municipal property, or has a contract that reimburses the costs of delivering food in order to control prices. As a rule, there are also one or two shops in the village that sell goods that are not sold by the municipal store. Prices are extremely high. Sometimes such stores compensate for the costs of delivering basic goods by also selling alcohol (personal communication).

Traditional Subsistence

A typical Arctic village consists of two categories of inhabitants: those who make a traditional subsistence living (hunters and reindeer herders); and those who provide services to the settlement, such as working at schools, hospitals, social services and communal services. In the Arctic communities of coastal Chukotka, the use of marine resources (sea mammal hunting and fishing) prevails. Reindeer herding today does not play as significant a role as it did during the Soviet era, since it completely depends on state support. For this reason, reindeer husbandry has only a municipal form of ownership, still using the management model adopted in the Soviet era. Sea mammal hunting is more traditional for the coastal part of Chukotka. In addition, this is partly an individual activity. Chukotka marine mammal hunting has existed over millennia. According to carbon dating analyses, stable hunting communities were formed approximately around 2000BA (Dikov 1988). For these reasons, a large number of villagers are still involved in hunting for mammals, and there are several categories of hunters.

MARINE MAMMAL HUNTING

Hunting Methods

Western civilization has drastically changed the life of Arctic communities. However, when it comes to traditional uses of nature, both in capitalist and in socialist regimes, the basic methods of hunting for marine mammals have remained unchanged (Bogoslovskaya et al. 2016, Zdor et al. 2010). As in ancient times, hunters first harpoon the marine mammals with a swivel harpoon, which was invented millennia ago, in order to hold the animals on the surface and then deliver them to shore. Arctic residents still go out on sea ice, search for the breathing holes that seals use, and catch them with nets invented thousands of years ago. Hunters still use *akyn*, a pear-shaped wood grapple, for hooking a killed seal on the surface of the sea. Nevertheless, changes are coming. Hunters have become mobile and fast, thanks to modern aluminum boats. Now they can range over a large area to search for marine mammals, and also tow more animals to the village.

Perhaps the most significant change affecting the preservation of traditional knowledge, however, is a change in the composition of hunter teams (Bogoslovskaya et al 2016). The number of hunters in a traditional hunting team depended on the size of the first leather boats, and then wooden boats, normally between seven and 10 hunters per vessel. One of them is the captain, who is usually also the helmsman. One is a harpooner, who is also the lookout and observer. The role of these two men is key, because their experience and skills influence the results of the hunt and the well-being of the community. Just a hundred years ago, other crewmembers were rowers. Then, when the use of motors became widespread, one crewmember had to be a mechanic, and the others became additional harpooners and spear-wielders. Their main duty was to be a sailor on the vessel, and also to slaughter the killed marine mammals. The age range in this type of crew was well balanced. Usually, one of them was an elder, one or two were young men, the other hunters were between 20 and 40 years old. The harmonious collection of different ages, and therefore experience, skills, strength, and endurance was an important factor in the success of hunting expeditions. For members of hunting teams, this activity became a kind of career that lasts throughout their lives.

This situation changed in the early 2000s, when 18-foot aluminum boats with more than 100 horsepower outboard motors appeared. This new type of boat does not require as much experience and knowledge to control. Hunters now have modern high-tech equipment to provide accurate weather forecasts and precisely determine their position at sea. There is less need to have a high level of traditional knowledge, which means that the elders and experienced hunters have become the minority. One of the 50-plus-years-old interviewees said, “Today, young hunters do not respect the elders, I can not teach them because they do not respect us. We lost the hierarchy, discipline, mainly because now the young hunters constitute the majority of the team.” Thus, new technologies have reduced the role of traditional knowledge in environmental management. Along with the loss of the role of traditional knowledge, radical sociocultural changes began to take place in the Arctic communities.

Modern Sea Hunters of the Chukotka Arctic

Historically, all adult men in the villages on the coast were engaged in sea hunting. Today, despite the fact that most of the coastal inhabitants still depend on what the sea gives them, only 30-40 percent of adult Indigenous People (eight percent of the entire village population) are active hunters (personal communication). Some hunters are still engaged in traditional subsistence activities all year round; some join in the autumn, and some villagers are only engaged in individual winter and spring hunts. In any case, the number of villagers who remain engaged in hunting still represents a significant figure.

The relatively high level of participation of modern rural residents in traditional hunting is determined by several factors. Obviously, this is the most accessible way to get traditional food and support traditional livelihoods. Most people cannot imagine a life without traditional food. Even those who, by will or circumstances, leave the coastal villages, yearn for their native food. Hunters love their profession, their way of life; they cannot comprehend life without the sea. Finally, self-identification is essential. People realize that this is their land and this is their way of life. Some in the younger generation, especially young women in search of a higher standard of living, do leave their homes. Nevertheless, most residents continue an updated version of their traditional way of life and consider this to be important for their people. The answer to the question of what the integrated option of sea mammal hunting in Chukotka looks like is an anticipated goal of my research.

The modern hunting community of Chukotka can be conditionally divided into three main groups:

Sovkhosniki/obshinniki ("Farmers/community members")

This first category entails members of registered hunting communities. These are members of registered "territorial-neighborly" or "family-clan" communities, entitled to state support. Not all communities can receive state funding. In fact, these communities are former Soviet state farms that have been reconfigured in the post-Soviet era. Such "state" communities or their branches exist in every coastal village. In this way, the state supports traditional subsistence in order to provide the population with traditional food products. One of the important goals of state support is to gain the loyalty of the population, thus ensuring success in political elections. Usually the community has 10-15 hunters and a couple of bureaucrats, such as a chairman, an accountant and a secretary. Legally, all property (boats, engines, weapons, boat stations) belongs to the communities, but in fact the regional authorities have control over the property. Thus, hunters in "state" communities are actually hired workers who receive hourly wages and annual bonuses for achieving planned targets of harvested marine mammals. Some communities are trying to save money, and therefore officially hire only a couple of hunters on a permanent basis. Such hunters are provided with medical insurance and other bonuses. Other hunters in the community are hired temporarily, only in the summer and autumn hunting season. They receive only hourly payments. "State" communities are completely dependent on regional financial support. Also, these communities have priority to receive quotas to hunt marine mammals.

In Chukotka, there was once a group of independent hunting communities that did not receive state support. The main reason that hunters belonged to this type of hunting community is that they wanted to provide themselves with traditional food in the difficult 1990s. Initially, these communities existed in almost every village, but eventually they ceased their activities and hunters moved to work in "state" communities. Today there is only one really active independent hunting community, in the village of Lavrentia.

Informal hunters

The second group is informal hunters. These are hunting teams, consisting of family members, relatives, neighbors or friends. As a rule, the number of crewmembers cannot exceed two or three people. The size of the team is limited by the carrying capacity of the boat and the cost of gasoline. These hunters have their own boat (usually no more than 15 feet), an outboard motor (40-60 horsepower), a snowmobile, ATV and weapons. The acquisition of boats and other gear is possible because hunters or members of their family have regular jobs, and the income allows them to buy hunting equipment.

It can be a group effort. One person may have a boat and a motor, another has a high-caliber gun, and the third has a quad bike or gasoline. These groups are organized mainly for hunting walruses that are migrating to the sea or resting on the sea ice. Walruses are big animals, and one hunter cannot cope with hunting and cutting the animals alone. Sometimes "informal" hunters join together in small groups known as *obshinniki*, most often when hunting for a whale, or during the mass hunt for walruses in the fall. Since this is a group effort, in such cases, obshinniki share fuel and ammunition with "informal" hunters. The "informal" hunter team is not large, averaging between three to five boats from the village.

Individuals

Individual hunters comprise the most numerous group within Arctic communities. These are village dwellers who do not have hunting gear, money to buy a boat, or a motor to go to sea. For hunting, they use only what they can make themselves from improvised materials as in ancient times (i.e., nets, harpoons, spears, dog sleds). Just like in ancient times, they hunt seals and polar bears mainly in winter and spring on sea ice. They also join the "community members" mainly in the key season of walrus hunting in the autumn at sea or coastal rookeries. Low temperatures contribute to a relatively economical way of storing walrus and whale meat and fat for the long winter.

Official Harvest and Consumption Statistics Regarding Marine Mammal Products

The official statistics regarding the marine mammal hunt only take into account the harvest recorded by the registered hunting community. In addition, official statistics do not take into account hunting losses. Severe Arctic conditions, including rough seas and bad weather all affect hunting success. Hunting losses average 10 percent, with maximum values up to 35 percent losses out of the number of marine mammals successfully delivered ashore (Kochnev 2010).

For a relevant comparison, I took official hunting statistics and a study on the consumption of marine mammals in 2010 by residents of Arctic coastal villages. In 2010, according to the Department of Agriculture of Chukotka, hunting teams (obshinniki) in Arctic villages collected 2,400 ring seals, 480 bearded seals, 582 walruses, and 39 gray whales. The total weight of meat from the delivered marine mammals was approximately 245,000 kilograms. This means that every resident of the Arctic village (out of a total of 2,200 Indigenous People, including babies) received about 111 kilograms of marine mammal meat per year, or 0.3 kilograms per day. In 2011-2012, in the villages of Chukotka, a survey was conducted to learn about the relationship of villagers to various aspects of their natural world. One of the issues studied was the amount of natural products consumed by the families of Indigenous People, including marine mammals, fish, game, reindeer, and other game animals. According to the research, each person (All-Russia Population Census of 2010) received 353 kilograms of marine mammal products, or 0.96 kilograms per day (Kochnev, Zdor 2014) for consumption in 2010. The difference of 240 kilograms between the official statistics of the number of marine mammals delivered ashore and the quantity of hunting harvests consumed is due to unaccounted statistics of individual hunting, as well as hunting in obshinniki.

REINDEER HERDING

The tradition of year-round reindeer breeding on the Arctic coast began at the time of Sovietization. Prior to the establishment of Soviet power, reindeer herders roamed the Arctic coast only in the summer. This allowed the reindeer to graze in comfortable and relatively low temperatures without mosquitoes, and to feed on seaside greens. In the winter, reindeer herders would move closer to the *taiga*, or forested zone. In the middle of the 20th century, Soviet authorities restricted the traditional nomadic routes of reindeer breeders. Several reindeer herding camps that spent the summer on the Arctic coast were forced to stay there. To replace the broken but successful tradition of long-distance travel, Soviet authorities offered the reindeer herders substantial incentives, including high wages, mechanized migrations, base camps on new shorter routes, and the service of veterinarians and livestock specialists. With the collapse of the Soviet Union, reindeer breeding was destroyed. The number of reindeer, as well as the number of reindeer herders, decreased dramatically.

Today in the village of Neshkan, there are three camps of reindeer herders. There are 42 reindeer herders and adult members of their families. They graze more than 10,000 reindeer (PromstroyNIIproyekt 2012). However, at least three more villages are closely connected with reindeer breeding camps. Residents of villages regularly go to help reindeer herders during important reindeer herding activities such as calving and seasonal migration. They also regularly exchange products of hunting and reindeer breeding, such as meats, fat, skins, and belts. Since 2000, regional authorities in Chukotka have been restoring the Soviet approach to support regional reindeer herding. This type of system cancels private ownership of reindeer and pastures, turning reindeer herders into employees of municipal enterprises. Reindeer breeders now receive an hourly salary and annual bonuses if they reach the development program goals. As in the Soviet era, reindeer herders use the ancient method of grazing and migrating the herd. But just like in Soviet times, reindeer-breeding camps receive tractors and cross-country vehicles for the delivery of store-bought food products and equipment. The state provides zootechnical and veterinary support. The Soviet approach of supporting reindeer husbandry, as well as limiting grazing only to the Arctic zone, exposes local reindeer husbandry to a high degree of risk of extinction.

CHALLENGES

The main challenge Arctic communities face is the fact that they have no legal right to land. Even the federal law that legally provides a right for Indigenous Peoples to use the territory for traditional subsistence provides only tenuous rights (IWGIA 2017), and the law rarely serves local communities well.

The continuing trend of melting sea ice creates additional threats to traditional existence. The spring migration of the walruses has shifted. Sometimes they pass so quickly that the villagers cannot hunt them (Zdor et al. 2010). In the summer, villagers can only get fish, as walrus head north to follow the sea ice. In combination with low incomes, this poses an additional challenge for rural residents. Autumn hunting for walruses has also become unpredictable and unproductive. This is due to the prolonged absence of sea ice, which forces walruses to concentrate in one or two places on the coast of Chukotka. The concentration of an animal in a small area creates two main problems: only a few villages have the opportunity to collect walruses to prepare food supplies for the winter, and the high concentration of marine mammals makes their population extremely vulnerable, increasing their mortality rate as a result of the activity of predators, including dogs and humans. Additional factors of concern arise from external factors: aviation, shipping, and offshore activities. Indigenous peoples are trying to respond to challenges by pooling their efforts; they write appeals to the authorities and the world community, take part in regional, federal and international meetings, work with the media, and/or create non-governmental organizations to protect their way of life.

Global climate change is creating new obstacles to provide for the healthy nutrition of Indigenous Peoples. Smelly whales (IWC 2012 Annual report: 24), unknown seal diseases (Kochnev et al. 2012), and the high mortality rate among walruses (Kochnev 2013) are all part of an incomplete list of problems facing Arctic communities.

Maintaining traditional subsistence activities of the Chukotka Indigenous Peoples is a key factor in the preservation of identity. Sociocultural practices serve as markers of belonging to the indigenous population, and contribute to the preservation of the basic values of the Chukchi and Yupik. Indigenous peoples of Chukotka historically possessed vast territories that were rich in natural resources and supported their culture. During the Soviet period, the authorities granted them “equal” rights with the majority of the country's population. As a result, however, Indigenous Peoples were deprived of their historic right to self-governance, and their rights to traditional territories and renewable natural resources were restricted and bureaucratized. Globalization has accelerated this process of alienation to such an extent that it threatens the identity of Indigenous Peoples.

PART IV

ARCTIC CHALLENGES AND OPPORTUNITIES FOR GLOBAL MARITIME INDUSTRIES

Challenges to the Future of Arctic Marine Operations and Shipping

Lawson W. Brigham

INTRODUCTION

A complex suite of forces and uncertainties drive Arctic marine operations and shipping. The Arctic Marine Shipping Assessment (AMSA 2009) identified this complexity using a comprehensive scenarios or plausible futures effort that revealed more than 120 factors that could influence the future of Arctic navigation. AMSA also showed that the continuing, profound retreat of Arctic sea ice provides for greater marine access and potentially longer ice navigation seasons. However, quantifying these changes in ice navigation seasons is a challenging task that is dependent on a host of economic factors in addition to environmental drivers.

Several key observations are important to evaluating the future of Arctic marine operations and shipping:

- The majority of Arctic marine traffic today is destinational. Trans-Arctic voyages are secondary and will be seasonal at best in the decades ahead.
- Independently operated icebreaking carriers are the norm for current and future Arctic marine operations during seasonal navigation. These Polar Class ships do not require icebreaker assistance, based on experience in select Canadian and Russian Arctic areas.
- Year-round navigation along the western Northern Sea Route (NSR) to the Yamal Peninsula is well-established (linking natural resources to Murmansk and Europe). However, the length of the navigation season along the eastern reaches of the NSR and into the Pacific has yet to be determined and will be dependent on icebreaker escort and the severity of future ice conditions.
- Shorter navigation distances in the Arctic Ocean between the Atlantic and Pacific are often touted by a host of writers on this theme. However, it is ship speeds that are critical along all potential Arctic marine routes. Contending with the vagaries of Arctic sea ice and

weather are critical factors in analyzing the viability of trans-Arctic voyaging and reducing voyage times between viable markets.

- A huge Arctic marine infrastructure gap remains, whatever the mode of marine transport in the Arctic Ocean. Investment will be required for ports, charting & hydrography, SAR response, environmental response, aids-to-navigation, communications, salvage, and more.
- The implementation and enforcement of the IMO Polar Code will be a crucial task for flag and Arctic port states.

COMPLEXITY AND ECONOMIC DRIVERS

AMSA used a scenarios-based approach to highlight the complexity of future Arctic marine navigation and to determine key driving forces and uncertainties out to 2050. Select and highly influential factors included: global oil prices; a stable international legal regime in the region (framework is UNCLOS); the safety of global trade routes; world trade patterns and changes in global trade dynamics; a major shipping disaster in the Arctic; limited windows of Arctic marine operations (seasonal impacts on shipping economics); new, Arctic natural resources discoveries; the marine insurance industry; conflicts between indigenous uses and commercial navigation; global shits in nuclear energy; new non-Arctic states (China, Japan and Korea) becoming active Arctic maritime nations; global governance structures (IMO agreements on Arctic ship rules and regulations (IMO Polar Code); and Arctic maritime law and code enforcement. The complexity and global connections of these factors can fundamentally influence future Arctic marine use. Two primary factors were identified in the AMSA scenarios process: resources and trade (the level of demand for Arctic natural resources and trade); and governance (the degree of relative stability of rules and standards for marine use both within the Arctic Ocean and internationally). Climate change and Arctic sea ice retreat were considered important factors, and both contributed to improving marine access throughout the Arctic Ocean. However, Arctic sea ice is likely to be more mobile and navigation conditions may not always be less difficult than in past navigation seasons.

Economic factors and uncertainties were identified in AMSA as hugely influential in the future of Arctic marine navigation. Arctic natural resource development (as observed in the Russian Arctic today), connections to global markets, and global commodities prices are deemed the primary drivers of Arctic marine operations and shipping. A likely outcome, especially along the Northern Sea Route, is an increase in the number of bulk carriers, tankers and LNG carriers plying Arctic marine routes. Most of these ships will be on destinational voyages carrying natural resources out of the Arctic to global markets. Potential trans-Arctic voyages may take place within niche markets but the economic viability of such markets has yet to be determined. Also, the length of the navigation season for effective, economically viable trans-Arctic passages is under study. In summary, future Arctic marine operations and shipping will be driven by two key factors: one, the economics of the global shipping enterprise; and two, global demand and commodities prices for Arctic natural resources.

THE IMO POLAR CODE, BOUNDARIES AND POLAR SHIP TYPES

The IMO Polar Code is a new governance regime for polar waters addressing marine safety and environmental challenges for ships operating in remote and sometimes extreme conditions and where marine infrastructure is limited or non-existent (IMO 2016). The IMO sought to create a uniform and non-discriminatory set of amendments to existing IMO safety, environmental protection, and watchkeeping requirements. For the maritime industry, this uniformity would create a level playing field for all marine operators planning to voyage in polar waters. The Polar Code establishes binding or mandatory international standards for new and existing commercial carriers and passenger vessels operating in Arctic and Antarctic waters; the Code applies to all of these vessels 500 tons and higher (IMO 2016).

In summary, the Polar Code includes a range of new and key requirements for ships operating in polar waters:

- Ship structural standards for Polar Class ships.
- Marine safety equipment designed for operation in polar environments.
- Training and experience of the ships' officers and crew.
- *A Polar Ship Certificate* issued by the flag state administration or an authorized representative (ship classification society).
- An onboard *Polar Water Operational Manual* that is unique to a given ship and includes operational capabilities and limitations.

- Environmental rules regarding the discharge of oil, noxious liquids, sewage and garbage (IMO 2016).

The Polar Code is applicable to all commercial carriers and passenger vessels (500 tons or more) in all Antarctic waters south of 60 degrees South. This boundary in the Southern Ocean around the Antarctic continent corresponds to the northern boundary of the Antarctic Treaty. The Polar Code boundary in the Arctic includes adjustments due to the nature of the warmer waters in the North Atlantic and the location of the seasonal sea ice extent in the region. In the Bering Sea, the Polar Code boundary is 60 degrees North to provide measures of environmental protection to its world-class fishery. This boundary corresponds closely to the seasonal maximum extent of winter sea ice in this seasonally ice-covered sea (much like the Baltic Sea). In the Atlantic the boundary moves slightly south to include all of Greenland and then runs northeast along the east Greenland coast and north of Iceland until it intersects with the Russian Arctic coast in the Barents Sea (IMO 2016). The waters around Norway and the Kola Peninsula in northwest Russia are not within the Polar Code area since they are ice-free year-round (Brigham 2015).

The commercial carriers and passenger vessels to be certified are now required to obtain a *Polar Ship Certificate* from the flag state and will also be required to carry onboard a *Polar Water Operational Manual*, unique to any given polar ship. This *Polar Ship Certificate* will classify a ship for operation in polar waters as one of three ship types:

- Category A—Ships designed for operations in at least medium first-year ice, which may include old ice inclusions (Polar Class 1 to 5 or equivalent, the highest ice class ships).
- Category B—Ships for operations in at least thin first-year ice, which may include old ice inclusions (Polar Class 6 to 7 or equivalent, the lowest ice class ships).
- Category C—Ships designed for operations in open water or in ice conditions less severe than those in categories A and B (ACCESS 2015).

These categories were designed to provide a measure of flexibility in the Polar Code, since not all ships are intended for operation in the same ice conditions and importantly, the same navigation season. Many ships will operate in the summer in ice-free conditions, but they will operate within "polar waters" as defined by the Polar Code boundaries. While Category C ships are not required to have additional hull strengthening (as they normally operate in open water), other requirements of the Code such as enhanced marine safety equipment, navigation and communications equipment, and mariner certifications are mandatory, as are the Polar Ship Certificate (indicating the category of the ship and ice class, if applicable) and the *Polar Water Operational Manual;* the MARPOL environmental regulations are also mandatory after 1 January 2017 in all polar waters defined by the Polar Code.

KEY CHALLENGES TO THE IMO POLAR CODE

A number of key challenges await the full implementation, enforcement and overall administration of the IMO Polar Code and this new polar maritime regime. The commitment of the flag states, Arctic states (as port states), and global shipping enterprises (including marine insurers and ship classification societies) will be tested throughout a lengthy process of making these specialized polar rules and regulation effective safety and protection measures. The following are significant challenges in this process, some of which have a range of marine policy implications.

Tight Implementation Timetable—With the Polar Code coming into force for certain elements (including new ships being constructed) on 1 January 2017, the maritime industry faced new challenges for summer 2017 operations in Arctic waters. On 1 January 2018 older ships must comply with the Code and on 15 July 2018 the new STCW Polar Code training and experience requirements will come into force. Will the maritime states have sufficient time to implement the Polar Code in their national legal and maritime administrative systems in a relatively short period of time? Fortunately the Code is not a new and comprehensive maritime convention, and the requirements of SOLAS, MARPOL and STCW are well known and refined. However, the administrative challenges of the new Polar Code may add considerable workload to the flag-state maritime organizations. The issuance of *Polar Ship Certificates* will likely be conducted by key ship classification societies working on behalf of the flag states. How the Arctic coastal states, perhaps under port state control measures, will enforce the Polar Code will be a new challenge for these states during the early years of the Code's implementation transition period.

Polar Mariner Training and Experience—There are few, fully qualified polar mariners in the global maritime workforce of 2017. It will take years for the flag states to recruit and train new cadres of mariners capable of operating ships safely in polar waters. Also key, the requirements for mariner experience and mandatory training remain under development. There are existing ice navigation training centers (in Russia, Sweden, Canada, Norway and the United States), but several flag states may elect to develop their own training facilities in the decades ahead. However, during the next decade a majority of ice navigation training will be conducted in a handful of specialized facilities operated in the Arctic states. The human dimension of the Polar Code is, again, the most critical component of the Polar Code. Strict adherence to the new set of training and polar experience requirements for certification and licensing by the flag states is crucial. International cooperation among the Arctic states as well as all flag states will be required to train more qualified polar mariners as marine operations expand in polar waters.

Enforcement Issues—An early question asked about the IMO Polar Code, especially by environmental groups and coastal communities, is if it is possible to effectively enforce the diverse elements of the Code. Most certainly the responsibility for enforcement falls primarily to the flag states, and in certain circumstances in the Arctic, to the port states. The flag states will have a lead role in insuring that ships meet the new standards for ship construction, and they also meet crucial requirements for manning these ships with trained and experienced personnel. The ship classification societies will have a large role in certifying that polar class ships meet the new rules, and play key roles advising the national maritime authorities on the technical details of the Code. The new *Polar Ship Certificate* will likely play a central role in enforcement. If a ship sails north toward polar waters and reaches a port inside or outside the Polar Code boundaries, the port state officials would certainly make a request of the captain to see the ship's Certificate. Without an up-to-date Certificate, the maritime authorities will not allow a voyage to continue into polar waters. The mandatory *Polar Water Operations Manual* will also be scrutinized by maritime enforcement officials to determine if the manual is ship specific and focuses on how well the ship systems operate in cold environments and if the ship's crew can respond to an emergency event. The mandatory *Polar Ship Certificate* could become an effective and influential vehicle for international enforcement of the Code. Those Arctic states with port-state control authority can feasibly become *regional gateways* for the control of ships entering the Arctic boundary of the Polar Code. The licensing and certification process for polar mariners by the flag states will also provide another layer of broad enforcement. International lists of qualified polar mariners by the flag states could be made available to port states for use in mariner identification and enforcement operations.

Monitoring and Tracking—The importance of ship monitoring and tracking of commercial ships voyaging in remote polar waters is ever increasing. For all commercial carriers and passenger vessels subject to the Polar Code, each ship is required to have Automatic Identification System (AIS) equipment mandated by a 2002 IMO SOLAS agreement. The purpose is to have electronic identification of IMO classed ships with type ship, cargoes, and continuous position, course and speed information. This information could be shared among the Arctic states (the flag and port states) but this may require a new agreement among the maritime administrations, in a form of operational or consensus agreement. Such a sharing of Arctic ship traffic information within (and perhaps outside) the Polar Code boundaries in the Arctic region and in real-time would provide valuable data on the effectiveness of the Polar Code and how the maritime industry is adjusting to this complex set of new rules and regulations. The traffic information would also indicate how the Polar Code has been applied within different national waterways and marine safety regimes, and within regional seas such as the Bering Strait region. An agreement on marine traffic data exchange among the Arctic states would enhance marine safety and environmental protection and adhere to the basic tenets with the IMO Polar Code.

Arctic Marine Infrastructure Context—AMSA considered the lack of basic marine infrastructure in most regions of the Arctic (the exceptions are the Icelandic coast, the northern coast of Norway, and, the northwest coast of Russia—all regions that are essentially ice-free) as one of the fundamental issues for building safe and effective Arctic navigation and operations (AMSA 2009). The development and adoption of a mandatory Polar Code should be considered a key component of 'Arctic marine infrastructure' since it addresses both required marine safety equipment and the requirements for mariner training and experience. The necessary polar maritime training and education facilities are also considered integral to the broader Arctic marine safety system. The IMO Polar Code focuses solely on ship safety and marine environmental protection, and does not address any needs for search and rescue (SAR) or emergency response. The Code does not address a host of other infrastructure requirements such as charting, ports, salvage, aids to navigation, navigation and communication systems (that are not shipboard), environmental response capacity, and shore side pumping facilities for wastes. A huge infrastructure gap or deficit remains throughout much of the maritime Arctic despite the adoption of the Polar Code. Only through future investments by the Arctic states and new public-private partnerships, as well as cooperative agreements between national authorities and private sector investors, will significant funding be applied to these essential infrastructure needs in response to increasing Arctic marine operations and shipping.

Passenger Vessel Requirements—The global cruise ship industry, specifically companies operating large passenger vessels that will be Category C ships under the Polar Code, will encounter significant challenges to meet the higher standards of marine safety equipment as well as the near-term requirements for mariner training and experience. Although these ships will not normally be operating in ice-covered waters (either fully or even partially ice-covered), they will be sailing in polar waters defined by the Polar Code. It remains unclear how many of the large passenger vessels that have operated safely in the past off the west coast of Greenland and in the Antarctic will be modified (or provide alternative measures) to meet the higher safety standards of the Code. It is plausible that only newly built ships, perhaps specially built expeditionary ships, will be able to comply fully with the Code's marine safety, equipment and mariner requirements for Category C ships. From the outset of the Polar Codes development more than two decades ago, it was widely recognized that a primary concern of the flag states has been the increasing numbers of large passenger vessels that are sailing in remote Arctic and Antarctic waters. The complete lack of marine infrastructure available for emergency response and the lack of hydrographic information for modern charts in these polar areas pose significant safety and operational challenges for the cruise ship industry. The industry has intended to expand in these markets that are remote and frontier polar regions. Again, even with the adoption of the Polar Code, Arctic (and Antarctic) marine infrastructure gaps remain and the operation of large passenger vessels in polar waters continues as a vexing, practical challenge for flag-state maritime agencies. This challenge is particularly onerous for the Arctic coastal states, but also for all flag states with citizens aboard the vessels operating in Arctic and Antarctic waters during short summer navigation seasons.

Arctic State Leadership and Uniformity—The Arctic states in the AMSA recommendations affirmed their consensus that mandatory IMO polar ship rules and regulations were required as soon as feasible (AMSA 2009). Following AMSA's release, individual Arctic state delegations to IMO, and the Arctic states together, helped to establish a process for development of a Polar Code within the IMO's committee structure. Now that the Polar Code is operational, the Arctic states (and the Antarctic Treaty nations) share the responsibilities and challenges of providing proactive, visible leadership during the Code's implementation phase. The Arctic states, perhaps using the voice of the Arctic Council forum, could collectively articulate to a wider global community the importance of implementing these new international ship safety and environmental protection rules. The Arctic states should cooperate and even coordinate their Polar Code implementation strategies so that a potential result includes the creation of a truly uniform maritime regime. Such actions would mark the initiation of a process recommended in AMSA for uniformity of Arctic shipping governance and a possible harmonization of Arctic shipping regulatory regimes within their own areas of jurisdiction consistent with UNCLOS. The IMO Polar Code is a framework for such uniformity and harmonization of existing national regimes.

Marine Insurers and Ship Classification Society Roles—The roles of the marine insurance industry and ship classification societies will be vital to the successful long-term implementation of the Polar Code. The IMO has provided both industries with a set of uniform international rules and regulations. The Polar Code can be considered a broad policy framework for enhancing polar marine safety and environmental protection that will be key to evaluating the future risks of polar marine operations. However, many of the technical details of the Code, specifically those that detail ship construction standards, remain to be developed by the individual classification societies and their representative body, the International Association of Classification Societies (IACS). There is ongoing work, particularly in developing the detailed requirements for the Polar Ship Certificate, one of the key new devices for Polar Code compliance and enforcement. The flag state maritime authorities and the ship classification societies must work closely together to firmly establish this unique requirement.

CONCLUSIONS AND THE FUTURE

Future Arctic marine operations and shipping will be primarily driven by Arctic natural resource developments and global commodities prices. Arctic marine access will continue to increase with the retreat of Arctic sea ice. On a summer date perhaps before mid-century, all multi-year ice will disappear, leaving the entire Arctic Ocean covered by seasonal (first year) ice. Navigation seasons will be potentially lengthened along the Northern Sea Route using icebreakers and ships in convoys. Destinational voyages will dominate as natural resources are moved out of the Arctic to global markets, and summer marine tourism will potentially increase with the use of expeditionary vessels designed specifically for polar waters. Trans-Arctic voyages will remain seasonal and niche markets may become economically viable, adjusting to seasonal navigation opportunities along the Northern Sea Route. Throughout most of the Arctic, independently operated icebreaking carriers, including tankers, LNG carriers and bulk carriers, will sail without icebreaker support.

The IMO Polar Code should be considered a key, historic framework agreement and a work in progress. In many respects the Polar Code is a seminal advance in the international governance of polar waters. However, this international instrument is only the beginning of a long process to protect those who live in the Arctic and protect polar waters in an era of expanding marine operations in northern seas. The new Polar Code is not as comprehensive as many would wish and does not in its current form address issues such as black carbon, heavy fuel oil use (in the Arctic, as heavy fuel oil use is already banned in the Antarctic), stack emissions (a potential Arctic emissions control area), ballast water discharges, and more. All of these issues will be addressed in the future after some time is given to properly implement and enforce the many new measures of the Polar Code. During this transition period much will be learned about each of the SOLAS, MARPOL and STCW amendments within the Polar Code, the initial boundaries delineated (within the context of profound Arctic sea ice changes), and the types of vessels not now under the Polar Code (such as fishing vessels in operating polar waters, many of which do have MARPOL certificates, and tug-barge operations). It is important for the IMO, the Arctic coastal states, and the international maritime community to gain experience in the adoption of the Polar Code and operating an array of ships under its broad mandate.

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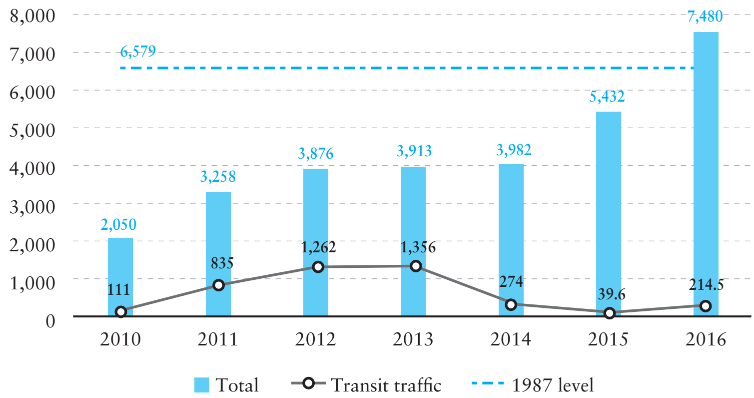
Economic and Political Perspectives on the Development of the Northern Sea Route

Andrei Zagorski

INTRODUCTION

The volume of cargo traffic along the Northern Sea Route (NSR) continuously increased during this decade and, having reached 7.5 million tons in 2017, surpassed the 1987 historic maximum (Figure IV.1). This trend is set to increase significantly in the years to come, primarily in destination shipping, including international import and export operations as well as domestic coastal shipping (cabotage). The major driver of the increase is and will remain the development of terrestrial deposits of mineral resources in the Kara Sea basin: hydrocarbons (oil, liquefied natural gas, gas condensate); coal; and ores. Recently, shipping on the NSR was largely determined by the supply of construction materials, modules and equipment (both from within Russia and abroad) to major construction sites. However, in the years to come, delivering extracted minerals to domestic and especially to external markets is expected to play an increasingly prominent role. NSR transit traffic[1] and particularly international traffic with commercial ships not calling at ports along the NSR is unlikely to play an important role in this development. In the future, the growth of vessel traffic on the NSR will remain constrained, however, not only by harsh geo-physical conditions but also by the underdevelopment of the coastal infrastructure, underinvestment, shortage of icebreakers and other obstacles.

This paper addresses several aspects of NSR development. It begins with a general review of expected changes in the length of navigation seasons and potential sources of growth of the NSR traffic, and continues by discussing more specific issues, such as economic constraints for further development of the NSR, security considerations, expected changes in the management of NSR vessel traffic and the implementation of provisions of the Polar Code.



Sources: *Информационно-статистический бюллетень «Транспорт России» Министерства Транспорта Российской Федерации январь-декабрь 2016 года [Statistical information bulletin "Transport of Russia" of the Ministry of Transport of the Russian Federation, January-December 2016]*, Moscow: The Ministry of Transport of the Russian Federation, April 5, 2017, p. 10; *Возрождение Северного морского пути – главная забота российских полярников [Revival of the Northern Sea Route is the main concern of Russian Polar workers], Redkie Zemly, June 1, 2016, available at: http://rareearth.ru/ru/pub/20160601/02203.html; Северный морской путь стал на 30 процентов оживлённее [Northern Sea Route got 30 per cent more intensive], Geopolitika*, January 27, 2017, available at: http://geopolitica.info/severnyy-morskoy-put-stal-na-30-protsentov-ozhivlyonnee.html; Transit Statistics, Centre for High North Logistics, CHNL Information Office, available at: http://www.arctic-lio.com/nsr_transits.

Figure IV.1 Annual Cargo Shipping on the NSR

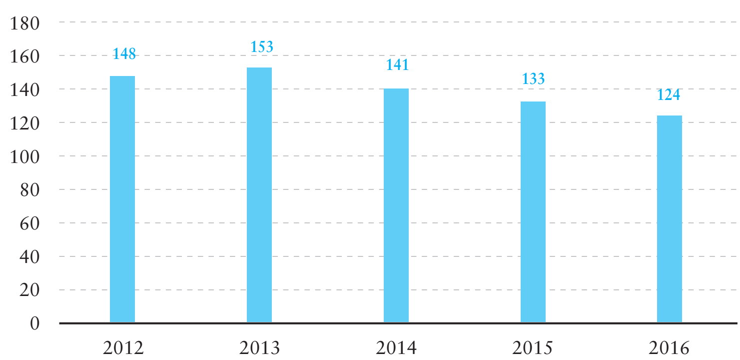
GENERAL OBSERVATIONS

This section addresses two questions that provide important background for understanding near- and longer-term Russian NSR policies: expectations related to the effects of climate change on the navigability of the Northern Sea Route; and major motives and targets for investing into its further development. This part of the paper argues that the navigability of the NSR is not expected to improve dramatically due to climate change in the years to come. This is one reason why Russian investment into its northern maritime infrastructure and capabilities concentrates primarily on the development of accessible terrestrial mineral resources in the Kara Sea basin and their marine shipment to diverse markets.

Geophysical Conditions

Conditions in the Arctic seas along the Russian coastline continue changing, albeit unevenly, in different waterways. These changes, combined with technological advances, are expected to improve the navigability and extend the length of the navigation season on the NSR, although not dramatically in the near- and mid-term. Russian climate scientists project that the disappearance of the multi-year ice cover in the Arctic Ocean is highly probable by the middle of the century.[2] The debate is not about whether this is going to happen but when.[3] However, Arctic waters are expected to remain covered by seasonal first-year-ice for most of the year, which might fully recede only for short periods at the end of the Arctic summer or in the early autumn. As a result, conditions for vessel traffic in Arctic waters are expected to remain harsh.

Projections of extended navigation on the NSR by 2025-2030 by Russian and non-Russian scientists seem to be compatible, although they are based on different criteria pertaining to ice concentration. The Obuk`hov Institute of the Physics of the Atmosphere of the Russian Academy of Sciences projects that, by 2025, the period of ice concentration of no more than 25 percent on the NSR routes may extend to three-to-five months—not much longer than the current navigation season (see Figure IV.2). The period of ice concentration of no more than 15 percent would be respectively shorter.[4]



Source: Northern Sea Route use became 30 percent more intensive.

Figure IV.2 Length of Navigation on the NSR

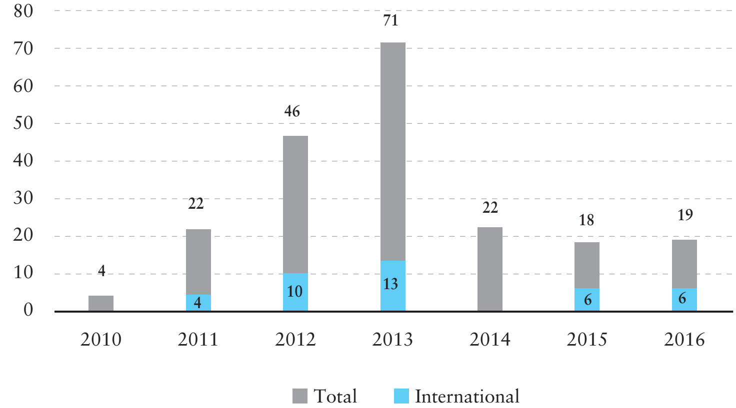
This projection corresponds to the U.S. Navy assessment, which builds upon the projection that the period during which the ice concentration on the NSR would not exceed 10 percent may extend to nine weeks a year by 2030, while the shoulder periods with ice concentration of up to 40 percent may add another five weeks before and five weeks after that navigation season.[5]

Even with the slightly extended navigation season, weather and ice conditions in Arctic seas will continuously present a challenge to vessel traffic. Those challenges include seasonal ice that blocks straits even when the ice cover generally recedes, movement of ice, increased danger from icebergs, storms, a high probability of icing, low visibility, remoteness, poor coastal infrastructure, and others. For this reason, the importance of enforcing safety provisions of the Polar Code and that of providing sufficient icebreaker assistance is expected to increase, rather than decrease. There also may be recurring periods with worsening navigation conditions on the NSR, as exemplified by the last five years when those conditions have worsened rather than improved. In 2016, the navigation season was the shortest since 2012 due to difficult weather and ice conditions and lasted for 124 days, compared to 148 in 2012 (Figure IV.2).

Motivation

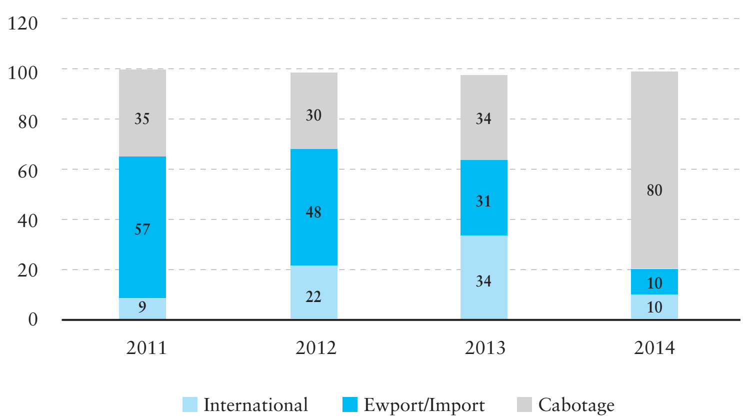
The vision of the NSR as an international shipping route connecting Europe with North America and particularly North East Asia—increasingly competing with existing global maritime routes—is an important part of the public Arctic discourse in Russia. This vision often supports expectations that providing relevant services to the NSR, particularly icebreakers and ice pilots assistance, may turn into a profitable business.[6] Such rhetoric has become a matter of political prestige for the Russian government and is promoted by respective stakeholders, particularly Rosatomflot (the provider of nuclear-powered icebreaker escort on the NSR), which lobbies for the idea of enhancing and expanding the Russian nuclear icebreaker fleet in order to ensure year-round navigation throughout the entire NSR.

However, the rationale behind practical decisions pertaining to the development of the relevant infrastructure and capabilities for the NSR, including the building of new icebreakers, is more pragmatic. The objective of promoting international transit vessel traffic does not seem to be a significant motive for current and future investment.[7] Lower tariffs established in 2011 for nuclear icebreakers assistance resulted in making experimental international transit on the NSR more attractive and partially explains its growth in 2011-2013. However, there is little or no financial rationale behind it.[8] International export and import shipping, as well



* data for 2010 and 2014 not available.
Source: *Transit Statistics*, Centre for High North Logistics, CHNL Information Office

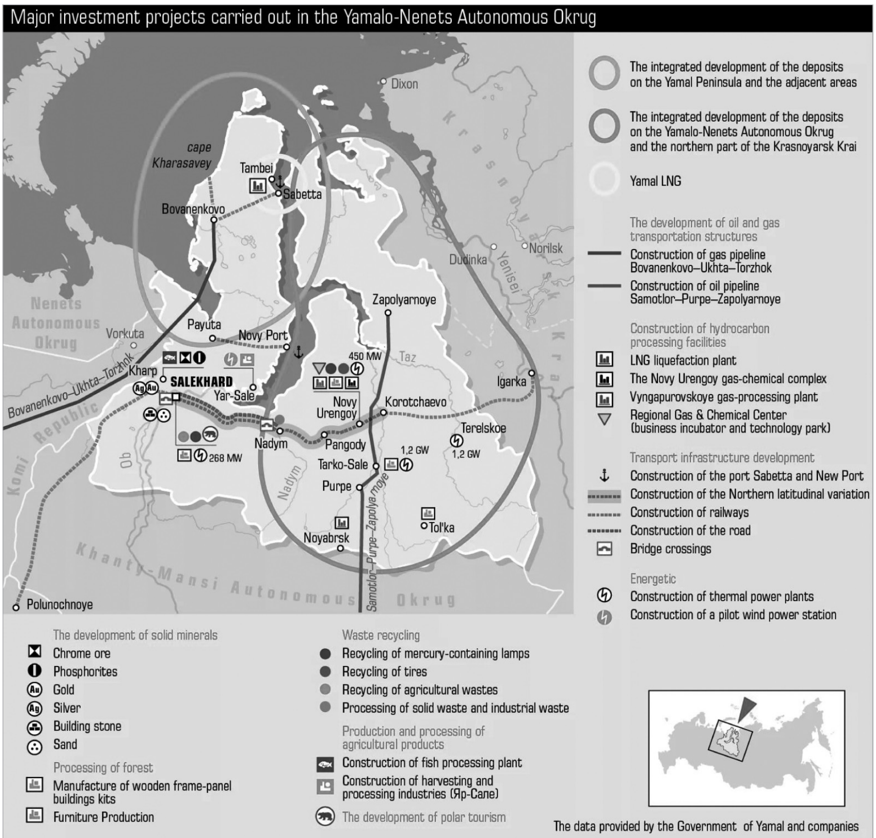
Figure IV.3 *Number of Transit Voyages through the NSR**



Source: *Структура транзитного грузопотока по характеру перевозки, [Structure of transit cargo shipping by type of traffic]*, Regnum, available at: https://regnum.ru/pictures/1997179/3.html.

Figure IV.4 *Structure of NSR Transit Shipping (percent)* as domestic 'long cabotage' between Russian ports outside the NSR area clearly outnumbered international transit voyages between ports outside the Russian Federation even at the peak of transit shipping in 2012 and 2013 (Figures IV.1, IV.3 and IV.4). For Rosatomflot, assisting ships on trans-Arctic voyages is not the major source of its revenues.[9] Furthermore, currently developed icebreaker capabilities will be kept increasingly busy with assisting growing destination traffic, minerals exploration, scientific research and naval activities in the Arctic, and there likely will not be sufficient spare capacity for assisting international transit voyages.

All strategic public and private investment decisions made in Russia in recent years clearly serve the purpose of facilitating marine shipment of



Source: Government of Yamal data.

Figure IV.5 *Kara Sea Basin Map*

mineral resources currently being extracted or proposed to be extracted in the Kara Sea basin. Those investment decisions include in particular (see map in Figure IV.5):

- Building by Novatek of an LNG plant in the Northeast of the Yamal Peninsula, which is expected to go on stream later in 2017 or early in 2018.
- Building a brand new deep-water port in Sabetta (already in operation) next to the Novatek plant.
- Purchasing a fleet of Arc7-class LNG carriers with the first one having been delivered in 2017.
- Constructing the Novy Port terminal in the Ob' Bay by Gazpromneft (already in operation).
- Building three new nuclear-powered icebreakers to replace two out of four currently in operation, now due to be phased out early in the next decade.
- Expanding the capacity of the port of Murmansk (the export oriented major maritime hub on the Kola Peninsula outside the NSR).

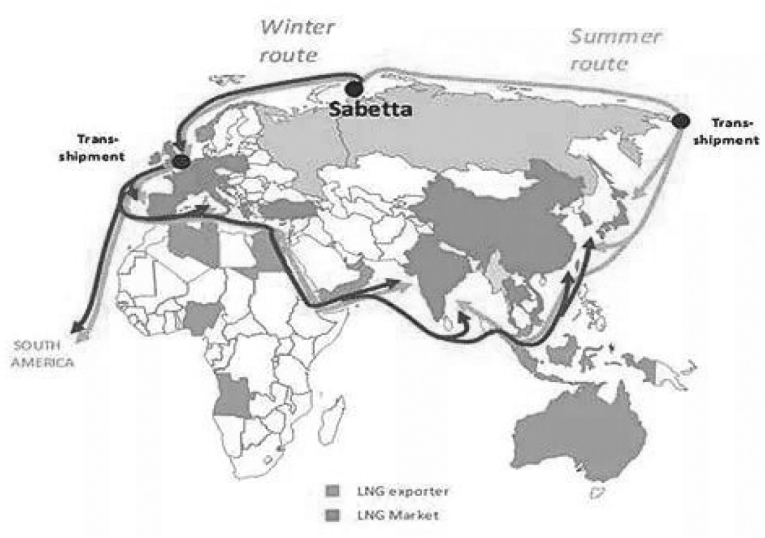
As Minister for Natural Resources and Environment Sergey Donskoy puts it, the need to ensure transportation of natural resources from the Yamal Peninsula was the single most important reason for those investment decisions.[10] The recent increase of cargo traffic on the NSR was largely due to the shipment of construction materials and modules and equipment, including from Europe and North East Asia, for the construction of the port of Sabetta and of the nearby LNG plant. The shipment of materials for the intensive program of building defense locations on islands and along the Russian Arctic coastline added some 10 percent to the recently shipped volume (700 thousand tons in 2016[11]). Those decisions are supposed to be supported by building rail connections between Bovanenkovo (an oil and gas condensate field on the Yamal Peninsula operated by Gazprom since 2012) and Sabetta, as well as between Dudinka port in the mouth of the Yenisey river and Salekhard in Yamal.

At the end of this decade and particularly in the 2020s, cargo traffic on the NSR is expected to increase, notably by the shipment for export of mineral resources from the Kara Sea basin. After the beginning of the operation of the Yamal LNG plant at full capacity, the volume of cargo traffic from the Kara Sea basin is expected to increase to more than 30 million tons, including shipment of LNG production from the port of Sabetta, oil from Novy Port, and the increasing volume of ore from Norilsk through Dudinka[12] alone.[13]

The revival of the nuclear-powered and diesel-electric icebreakers fleet is no less critical for ensuring year round west-bound and seasonal east-bound shipment of those resources from the Kara Sea basin (see Figure IV.6) and for the provision of port services and operations in the Ob' Bay (as well as in the Pechora Sea).[14] The icebreaker fleet will remain crucial despite the fact that the currently built fleet of Arc7 class LNG carriers may not necessarily need their assistance, particularly during the navigation season on the NSR.

Most prospective development projects are also concentrated in the Kara Sea basin and are supposed to be at least partially facilitated by the recent investment decisions. Those projects include in particular:

- Building another LNG plant (Arctic LNG-2) by Novatek based on Utrennee (Salmanovskoe) gas field on the *Gydan Peninsula*; shipping LNG from that plant would require the construction of an additional



Source: *Поставки СПГ из порта Сабетта начнутся в 2017 г. [LNG shipment from Sabetta port will begin in 2017]*, Pro Arctic, August 5, 2013, available at: http://pro-arctic.ru/05/08/2013/news/4259.

Figure IV.6 LNG Shipment Routes from Yamal Peninsula

LNG terminal across the Ob' Bay from Sabetta.
- Developing the Payakhskoe oil field by the Independent oil and gas company.
- Developing coal deposits in the West of the Taymyr Peninsula by the Arctic mining company which will require the construction of a coal terminal at the modernized port of Dixon with the capacity for a turnover of 10 million tons annually.
- Developing zinc and lead ore Pavlovskoe deposits on the southern island of Novaya Zemlya by Rosatom would add a modest 65-70 thousand tons of bulk cargo but will also make necessary the construction of a port facility on the island.[15]

Should those projects mature over the next decade, they are expected to add another 30 million tons of cargo shipped across the Kara Sea annually.[16] However, they have yet to mature. Shipment of terrestrial mineral resources from other Arctic regions of Russia on the NSR is also being considered, particularly from Yakutia. However, apart from the costs entailed, their marine shipment would only be possible during the relatively short navigation season. Making east-bound year-round shipment possible would require a significant increase in nuclear-powered icebreaking capabilities and infrastructure development.

For this reason, the Kara sea basin is likely to remain the single most important driver of the development of the NSR infrastructure that will drive a significant increase of cargo shipment (both export and import) over the next decade. It is generally assumed that this increase may also encourage more active use of the NSR for international ship transits. However, the projection is that no less than 80 per cent of vessel traffic on the NSR would be destination shipments.[17]

This vision suggests the need to reconsider recent projections of a substantial increase in transarctic vessel traffic. Those expectations are based on projections of a substantial growth of international full transit traffic with ships not calling at ports along the NSR. However, the emerging pattern of international shipping along the NSR is distinct from those projections. The prevailing trend is not transarctic but *destinational* traffic aimed either at supplying construction sites on the Yamal and Gydan peninsulas or marine shipment of resources from the Kara Sea basin to external markets. Both represent *international* vessel traffic without crossing the entire NSR area. As a result, they are not captured by the definition of full transit. The port of Sabetta will remain the focal point of international marine shipping operations in the Russian Arctic for years to come, supported by a few terminals in the Ob' Bay (see Figure IV.5).

Recent statistics of commercial traffic in the Russian marine Arctic confirm this trend. With 25.63 million tons turnover in the first six months of 2017, Murmansk port (located outside the NSR) remains the major Russian Arctic deep water non-freezing maritime hub followed by the Varandey oil terminal in the Pechora Sea (outside the NSR) operated by Lukoil (4.41 ml t), *Sabetta* (2.69 ml t), Arkhangelsk (outside the NSR, 2.03 ml t), Dudinka servicing Norilsknickel (0.59 ml t), and Kandalaksha outside the NSR (0.59 ml t). The total turnover of the rest of the Russian Arctic ports is less than one million tons. The port of Murmansk operates 71 percent of the total turnover in the northern basin, followed by Varandey (12 percent) and Sabetta (8 percent), with the latter set to grow significantly particularly after 2018.[18]

CONSTRAINTS FOR FURTHER DEVELOPMENT OF THE NSR

The current phase of development of the NSR infrastructure concentrated around the Yamal LNG and the port of Sabetta seems to be set. Plans for any further development linked to projects to be implemented during the next decade, however, remain vague or may be delayed for several reasons that include insufficient funding (both public and private), domestic industrial capacity, and technological advances. Traffic on the NSR will also remain constrained by insufficient icebreaker capacity. While offshore exploration seems to be more strongly affected by low oil prices than by Western sanctions, the latter seem to represent an important challenge for the development of terrestrial Arctic projects and NSR infrastructure. While forcing Russia to increasingly rely on its own resources, particularly with regard to financing and technological solutions, it forces both the government and the private sector to reconsider their priorities for Arctic projects—including delaying their implementation.

Financing Challenges

Companies engaged in the development of mineral resources in the Russian Artic can no longer rely on heavy governmental investment into relevant infrastructure, as was the case during this decade when there was heavy public investment into the port of Sabetta and the construction of three new 60 MW "Arktika"-class nuclear icebreakers. Instead, governmental support of Arctic projects is set to shrink dramatically.

Reportedly, following objections from the Ministry of Finance, the Ministry of Economic Development has agreed to substantially reduce the scope of financing the implementation of the State program for development of the Russian Arctic from 210 billion rubles ($3.6 billion) to 51 billion ($0.9 billion).[19] The major sacrifice seems to be the development of a powerful 120 MW "Leader"-class nuclear icebreaker capable to break ice up to four meters thick that was supposed to assist LNG carriers on the NSR.[20] This decision indicates that ambitious plans to make year-round east-bound vessel traffic from the Kara Sea basin are delayed at best.

Further cuts affect expansion of capabilities for the Ministry of Interior, allocations for recovering wrecked nuclear assets, and investment in several environmental and scientific projects proposed by the Ministry of Natural Resources and Environment.[21] Due to problems with funding, the program to reconstruct civil airports in the Russian Arctic has been reduced from eight to two airports.[22]

What reportedly remains in the program includes the further development of the ports of Sabetta and Dixon, the development of the deep water port of Arkhangelsk (outside the NSR) that is important for northern supply and offshore exploration, as well as building of a number of rail connections in the North in areas between Arkhangelsk and Dudinka.[23]

The revival of the port of Dixon may enable the development of coal mining in the West of the Taymyr Peninsula. Novatek, which received a license for the exploration and development of hydrocarbon resources on the Gydan Peninsula in June 2017, has yet to ensure sufficient investment into its Arctic LNG-2 project. That includes building a $10 billion plant by 2023, a deep-water terminal in Ob' Bay, and a module-building yard in the Murmansk region.[24] The intention of the company to localize the production of most if not all necessary modules and equipment for its second Arctic LNG project seems to represent a challenge no less than that of ensuring the project's funding, particularly since, while building the first plant on Yamal, almost no Russian technologies or equipment were used.[25]

The government of Russia did not fully abandon most of the previously developed plans, including those of developing the powerful nuclear powered "Leader" icebreakers, building eight new diesel-electric icebreakers, and reconstructing a total of 18 airports in the Arctic zone.[26] However, those plans are now being reassessed, and their implementation is moved to a more distant future, as the government, confronted with the deficit of financial resources, reconsiders its priorities while discussing budgetary appropriations through 2020.[27]

Construction Delays

The implementation of projects required to enable marine shipment of resources from the Kara Sea basin has been repeatedly delayed for various reasons. This is particularly true with regard to building new "Arktika"-class nuclear icebreakers.

The finalization of the construction of the first "Arktika" icebreaker by the *Baltiyskiy zavod* (a Baltic shipyard in St. Petersburg) has been postponed from 2017 to later in 2019. The main reason for the postponement is the failure of the "Kirov-energomash" plant, a subcontractor in the project, to deliver the steam turbine in a timely manner (scheduled for completion in 2015, the turbine was not yet ready at the beginning of 2017). The Baltic shipyard also postponed the handover of a new powerful diesel-electric icebreaker *Viktor Chernomyrdin* to later in 2018 (initially scheduled for 2015). Although there haven't been any reports of delaying the construction of two other "Arktika"-class nuclear icebreakers *Sibir* and *Ural* (the construction of both began in 2016), their delivery may well be postponed, too, particularly since the delivery of the steam turbine for *Sibir* is also delayed.[28]

Technical problems are given as a major reason for delays in implementing the program to build new icebreakers for the Arctic. Funding for these new vessels is generally considered secured, but financial problems obviously play a role here as well. This is indirectly confirmed by reports that Sberbank will open a credit line for the Baltic shipyard until the end of 2019, in order to ensure the finalization of the construction of the first of the three new nuclear icebreakers.[29]

The deployment of a network of "Arktika" satellites that is designed to facilitate comprehensive monitoring and communications in the Arctic region, including monitoring of ice conditions and providing navigation assistance to ships on the NSR, is significantly delayed, too. The first satellite of that series was scheduled to be launched in 2013, while the deployment of the entire system was supposed to have been finalized in 2014-2015. The beginning of the deployment is now expected in 2018-2019. Reportedly, the postponement was due primarily to the effect of sanctions that have restricted the supply of components for the Russian space industry from the West. This supply problem necessitated substantial changes in the design of satellites. However, since the deployment was initially scheduled for the period before sanctions were introduced, insufficient financing and continuous reshuffling in *Roskosmos* (the Russian space agency) may well have provided important reasons for the delay.[30]

Insufficient Icebreaking Capabilities

Any stable development of resources projects in the area of the Northern Sea Route and particularly in the area of Ob' Bay (on the Yamal and Gydan Peninsulas) critically depends on the availability of nuclear-powered icebreakers to ensure year-round shipment to markets. The program to build three, 60 MW new-generation icebreakers is projected to be sufficient to support the transport of the volume of minerals from projects currently operating (Norilsk, Novy Port) or scheduled to be coming online soon (Yamal LNG). These capacity projections take into account the prospective phasing out, between 2019 and 2021, of two medium 35 MW nuclear icebreakers of the "Taymyr" class capable of operating in the relatively shallow waters of the Ob' Bay.[31] The delivery of new icebreakers was initially scheduled for 2018, 2020, and 2021 to close the gap that would occur after phasing out of 'Taymyr' class ships in a timely manner.[32]

Nuclear icebreaker capabilities on the NSR are already strained as manifested by long waiting time for icebreaker escort services that are otherwise engaged. In 2013, the peak year of international transit on the NSR, half of the vessels on full transit had to wait up to one week for an icebreaker. Almost 60 percent of vessels in coastal cabotage traffic had to wait even longer: up to two weeks.[33] As the delivery of new icebreakers is delayed further, the difficulty of Rosatomflot's job to provide enough assistance will only become more acute. When the Yamal LNG plant reaches full capacity, Rosatomflot's projected capabilities will hardly suffice the needs to escort LNG carriers through the NSR, planned at 245 voyages a year. It is for this reason that Rosatomflot has persistently lobbied for the design and construction of at least three 120 MW "Leader"-class icebreakers—plans that are currently being delayed.[34]

Development of new natural resource projects in the Kara Sea basin, and particularly plans to ship up to 10 million tons of coal from the port of Dixon will further raise the demand for icebreaker assistance. According to estimates, the transportation of coal from the West of Taymyr Peninsula would require the construction of at least two more 60 MW “Arktika”-class nuclear icebreakers to begin without delay after the first three icebreakers of this series will have been delivered.[35] Even then, Rosatomflot would barely have sufficient spare capacity to assist transit voyages trough the NSR.

Other Constraints

Without expanding in detail, it is important to note that navigation in the NSR area requires substantial improvement and permanent pursuit of hydrographic research and mapping of the bathymetry and coastlines, meteorological services, the development of sea ports along the route, and adequate search and rescue capabilities. All these tasks are summarized in the *Comprehensive Project for the Development of the Northern Sea Route*, adopted by the Russian government in June 2015.[36] However, as general funding for the program to develop the Russian Arctic is being substantially reduced, it is to be expected that the investment into addressing these issues will be reduced as well. One likely result is that the infrastructural development will concentrate even more on the Kara Sea basin, while projects for the Arctic seas further to the East will be postponed.

The worsening demographic situation in Russia and in the North in particular, which includes a lack of a reliable labor force and particularly skilled labor needs, must be added to a list of constraints with regard to the development of the NSR.

NSR AND RUSSIAN SECURITY INTERESTS

Due to a high concentration of both offensive and defensive strategic assets, the Arctic was given a prominent role in Soviet/Russian security considerations.[37] However, those are only partially related to the NSR. Although the level of strategic military activities in the region significantly declined after the end of the Cold war, major concerns remain related to ensuring defense of the Russian territory from a hypothetical nuclear strike from the United States, including strategic air strikes, and ensuring the survivability of submarine nuclear missile carriers deployed with the Northern Fleet from an attack by U.S. submarines and anti-submarine assets. More recent concerns pertain to a hypothetical possibility that U.S. submarine forces patrolling in Arctic waters can perform a conventional first strike against Russian nuclear forces by cruise missiles,[38] and the prospect of the deployment of U.S. naval ballistic defense assets in the Northern seas, albeit far from NSR waters.

From that perspective, Arctic deployments are given a preeminent role in the Russian policy of maintaining "strategic stability" vis-à-vis the United States. This explains the focus on maintaining a strong Northern Fleet, as well as on providing robust early warning, air- and antisubmarine-defense capabilities.[39] The latter is particularly related to American submarines that may patrol the NSR area.

More recently, non-strategic and non-military security concerns with regard to the NSR area play an increasing role in the Russian posture. Those pertain primarily to the need to protect economic interests and sovereign rights of Russia on the Arctic continental shelf, develop adequate disaster relief, augment search and rescue capabilities, ensure maritime safety, assist navigation, minimize the impact of expanding economic activities on the Arctic environment, and to prevent and prosecute illegal transnational activities by non-state actors, including terrorist activities.[40] These tasks are supposed to be performed by different agencies, including by the armed forces, border guards and coast guard, ministry of civil protection and the Ministry of Transport, which together are in charge of ten comprehensive rescue centers being built in the North.[41]

The Arctic is given a prominent role, among other things, in the most recently approved *Fundamentals of the State Policy of the Russian Federation with Regard to Naval Posture until 2030*.[42] Among the challenges and threats that confront Russia, the document refers to the policies of the U.S. and of its allies seeking domination and overwhelming superiority in the world oceans, including in the Arctic, as well as increasing competition among states for access to and control of hydrocarbon resources in the Middle East, the Arctic and the Caspian Sea.[43] In order to meet these challenges, Russia seeks to ensure its presence in remote areas in the Arctic and the Far East by developing dual-use infrastructure supporting the deployment of civil ships, naval capabilities and of capabilities of other security agencies. These tasks are primarily linked to the objective of protecting Russia's economic interests.[44]

At present, apart from developing 13 locations on the islands and coasts of Arctic seas, Russian naval activity in the NSR area is limited to annual seasonal patrols and exercises. Due to the difficult weather and ice conditions during the navigation season, this task is splinted between the Northern Fleet, which extends infrequent operations through the Laptev Sea to the Novosibirskiye Islands, and the Pacific fleet which extends infrequent operations into the Chukchi and East Siberian Seas (primarily supplying locations on the Wrangel Island, Cape Schmidt and Pevek). The organization of the Border and Coast Guard services in splinted in a similar way between two northern headquarters, located in Murmansk in the west and Petropavlovsk-Kamchatskiy in the east. Although defense locations in particular are spread along the Russian Arctic coast, defense and security assets are mainly concentrated on the Kola Peninsula in the west (the main base of the Northern Fleet), and in the Kara Sea basin – the major area of growing mineral extraction activities and marine shipment of natural resources.

MANAGEMENT OF THE NSR AND IMPLEMENTATION OF THE POLAR CODE

Management of the NSR

The low efficiency of NSR management has been subject of debates both in Russia and abroad for the past several years.[45] As of this writing, a decision has been made to (again) reshuffle the existing organization.[46] Russia's President Vladimir Putin has tasked the government to elaborate respective details that have yet to be finalized and are subject of inter-agency bargaining led by the Ministry of Transport, in order to be approved by the government at a later date.

The basic idea of the reorganization is to consolidate the functions of the NSR Administration (currently including processing of permissions to enter the NSR, providing meteorological assistance, weather and ice conditions forecasts, and communicating with ships' masters), and the responsibility for various aspects of the comprehensive development of the route, including infrastructure development, hydrographic works, maritime safety, and various other services into one overarching authority.[47]

It is yet unknown whether the NSR Administration's competencies will be expanded to include additional functions and responsibilities or, rather, it will be integrated into a new institution yet to be established. It is also obvious that the new authority will not replicate the early predecessor of the NSR Administration—Glavsevmorput—that was established in the 1930s and operated as a ministry responsible for all aspects of the territorial development of the Russian North. The delineation of responsibilities among federal agencies and regional and local governments has yet to be drawn. As of now the trend seems to be, as confirmed by sources within the Ministry of Transport, that the responsibility for icebreaker assistance and operations is most likely to be consolidated within this new authority, including the transfer of the relevant assets from Rosatom to the new NSR authority.

Polar Code Implementation

The implementation of the Polar Code in the Russian Federation required measures on two paths: one related to survey and certification of ships according to a specific ice class; and the other to incorporate provisions of the Code into the rules of navigation in the NSR water area.

In 2016, the Russian Maritime Register of Shipping (RS)—the Russian classification society member of IACS—presented guidelines to the industry for the implementation of provisions of the Polar Code which were elaborated, on the one hand, as an instrument to help to identify which particular provisions are applicable to a particular ship,[48] and, on the other hand, to delineate safety and environmental requirements as well as procedures for surveying eligible ships and issuing Polar Ship Certificates. It also presented guidelines for the development of manuals for the navigation in Polar waters. The RS was authorized by the Russian Ministry of Transport, as well as by maritime authorities of eleven other flag states to conduct respective surveys and issue Polar Ship Certificates.[49]

As far as the NSR is concerned, the principal measure was to amend the rules of navigation on the NSR in order for them to comply with the Polar Code provisions by including the requirement of a Polar Ship Certificate and the Polar Water Operation Manual on the list of documents to be submitted when applying for NSR navigation permission.[50] For this purpose, in January 2017, the Ministry of Transport of the Russian Federation issued an Order on amendments in its Navigation Rules in the Waters of the Northern Sea Route, which entered into force on March 7, 2017 upon the registration by the Russian Ministry of Justice. As a result, if the Polar Code rules apply for a vessel, a copy of the Polar Code Certificate is required for the issuance of navigation permission by the NSR Administration.[51]

To understanding these two measures, it is important to bear in mind that the Polar certification of ships and the requirement to have such a Polar Ship Certificate for a voyage on the NSR are not identical measures. First, the area of application of the Polar Code is much larger than that of the NSR rules, so that eligible ships on voyage outside the NSR, including in the eastern part of the Barents and in Pechora Seas (both outside the NSR) when their waters are covered by ice, need the certificate.

Second and, probably, more importantly, only a tiny portion of ships on voyage on the NSR routes will need a Polar Ship Certificate. As described above in Section 1 of this paper, most of the vessel traffic on the route is coastal and "long" cabotage, and does not fall under the provisions of the Polar Code while not undertaking international voyages. In general, about 95 percent of ships operating on the NSR so far do not need a Polar Ship Certificate,[52] but they still need permission from the NSR Administration on grounds fairly compatible with the Polar Code safety rules. The share of ships voyaging on the NSR may grow in the future with the increasing shipping of Kara Sea basin resources to international markets, but the picture is unlikely to change dramatically.

While the immediate issues of the implementation of the Polar Code were the focus of Russian authorities in 2015 and 2016, there seem to be some signs in Moscow of an eventual opening toward further improvement of its environmental provisions. The Russian government was not prepared to accept a mandatory ban on the use of heavy fuel oil in Arctic waters during the negotiation of the Polar Code or thereafter, primarily for economic reasons. However, Moscow's attitude seems to have become somewhat more flexible in 2017. According to the Ministry for Natural Resources and Environment, it is considering supporting "Green Shipping" projects in the Arctic by promoting the construction of new ships using liquefied natural gas fuel instead of heavy oil, as well as the respective modernization of the existing fleet. This policy enjoys considerable support from Russian gas companies.[53]

Although Moscow supported a Canadian proposal on heavy fuel submitted in the IMO in 2017, the Russian government has not made a final decision on this issue as of this writing. Hesitations in Moscow are linked not least to the current suspension of the implementation of all projects related to the promotion of "Green Shipping" with the World Bank.[54]

CONCLUSIONS

Vessel traffic and cargo volume on the NSR are set to increase significantly with more destination traffic in the years to come. The major driver of this trend is the development and prospective marine shipping of mineral resources, primarily from the Kara Sea basin.

Based on this development, the emerging pattern of international commercial shipping in the Russian Arctic is distinct from the recent projections of increased transarctic traffic. This development is not appropriately captured by the current definition of international commercial traffic in the Arctic, which is exclusively focused on the less relevant "full transit" of ships without calling at ports on the NSR. The definition of international commercial vessel traffic in the area should therefore be extended to include the destinational international (import- and export-oriented) traffic to and from ports within the NSR, but not crossing the entire route.

While the implementation of key investment decisions to develop the NSR infrastructure seems to be secured, its further development to ensure shipment of increasing volumes of mineral resources is constrained by a number of factors, among them by shrinking public and private investment resources, repeated delays in the implementation of already secured investment decisions, and insufficient icebreaker capacity.

Most of the military security concerns of the Russian defense establishment do not directly relate to NSR development. However, particularly due to the currently strained relationship between Russia and the United States, the impact of security considerations on the promotion of international vessel traffic on the NSR is more prominent than a decade or two ago.

Russia approaches another reshuffling of the organization and management of the Northern Sea Route. Although its details are not yet agreed among relevant governmental agencies, the general trend points toward a consolidation of responsibilities for the development of the NSR and for providing navigation assistance and services, including icebreaker support, in a single, new NSR authority with expanded expertise and responsibilities.

The provisions of the Polar Code have been incorporated into the Russian system of survey and certification of ships, as well as into the NSR navigation rules. Russia is also gradually opening toward addressing the challenge of heavy fuel oil in Arctic waters, implying the prospect that the forthcoming modernization of its Arctic fleet may follow the "Green Shipping" concept and thus significantly reducing the risk of oil spills from ships.

Notes

1. The NSR water area does not include the entire Russian Arctic coastline. It excludes particularly the Barents and Pechora Seas. Full transit through the NSR includes only voyages with the departure and destination points being located outside its area, whether in Russia or abroad. It thus includes voyages not only between European and North East Asian or North American ports but, also, between Russian ports outside the NSR (i.e. 'long cabotage' between Murmansk and Vladivostok), or between Russian ports located outside the NSR and foreign ports (i.e. voyages between Murmansk and Shanghai, Busan or Yokogama). At the same time, international commercial voyages not crossing the entire NSR (such as those between European or North East Asian ports and the new port of Sabetta on the Yamal Peninsula) are not included in transit statistics. Prospective east- and west-bound shipping of LNG and other commodities from Sabetta will thus fall under the definition of destination and not of the transit traffic despite being international in nature.

2. Pavlova T.V., Katcov V.M., *Площадь ледяного покрова мирового океана в расчетах с помощью моделей CMIP5 [The extent of the ice cover of the Global Ocean in calculations based on CMIP5 models], Trudy Glavnoy geofizicheskoy observatorii im. A.I. Voeykova [Works of the A.I. Voeykov Main geophysical observatory]*, Vol. 568 (2013), p. 22; Alekseev G.V., Radionov V.F., Aleksandrov E.I. et. Al., *Изменения климата Арктики при глобальном потеплении [Arctic climate change under global warming], Problemy Arktiki i Antarktiki [Problems of Arctic and Antarctic], 2015, no 1, p. 36; Katcov V.M., Pavlova T.V., Ожидаемые изменения приземной температуры воздуха в Арктике в 21-м веке: результаты расчетов с помощью ансамблей глобальных климатических моделей (CMIP5 и CMIP3) [Expected changes of the near the earth air temperature in the Arctic in the 21st century: findings of calculations based on assembled global climate models (CMIP5 and CMIP3)] Works of the A.I. Voeykov Main geophysical observatory*, Vol. 579 (2015), p. 7-21.

3. Katcov V.M., Pavlova T.V., *Арктика в контексте «гранд-вызовов» климатической*

науке [The Arctic in the context of the 'grand challenges' of the climate science], Works of the A.I. Voeykov Main geophysical observatory, Vol. 579 (2015), p. 74.

4. Mokhov I.I. et. al., *Диагностика и моделирование особенностей арктического климата и его изменений [Diagnostics and modelling of the specifics of the Arctic climate and its changes]*, Russian Academy of Sciences, *Pilot fundamental scientific research in the interest of the development of the Arctic zone of the Russian Federation* for 2014, p. 9, available at: http://www.ras.ru/FStorage/Download.aspx?id=469997d8-f446-4316-803b-96fa72172111.
5. *The United States Navy Arctic Roadmap for 2014 to 2030*, Washington, Chief of Naval Operations, 2014, p. 11.
6. See for instance: *Сообщение Аркадия Дворковича о комплексном проекте развития Северного морского пути [Information by Arkadiy Dvorkovich pertaining to the Comprehensive project for the development of the Northern Sea Route]*, Government of the Russian Federation, June 8, 2015, available at: http://government.ru/news/18410/; *Сообщение Дмитрия Рогозина о работе Государственной комиссии по вопросам развития Арктики [Information by Dmitriy Rogozin concerning the work of the State commission on the development of the Arctic]*, Government of the Russian Federation, June 8, 2015, available at: http://government.ru/news/18411/.
7. *России для освоения шельфа надо опираться на свои мощности [By developing its shelf, Russia must rely on its own capacities], Vlast*, 2014, no 48 (8 December), p. 19.
8. *Возрождение Северного морского пути – главная забота российских полярников [Revival of the Northern Sea Route is the main concern of Russian Polar workers], Redkie Zemly*, June 1, 2016, available at: http://rareearth.ru/ru/pub/20160601/02203.html.
9. Moe A., Brigham L, *Organization and Management Challenges of Russia's Ice breaker Fleet, Geographical Survey*, 2017, Vol. 107, no 1, p. 52.
10. *By developing its shelf, Russia must rely on its own capacities*, *ibid* p. 19.
11. *Мониторинг социально-экономического развития Арктической зоны России. Информационный бюллетень [Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin]*. 2017, no 3 (1-15 March), p. 14.
12. As a result of phasing out of the nickel plant in Norilsknickel, increasing amounts of semi-processed ore will be transported to Murmansk for further processing in the region. This will increase the volume of shipped cargo from current levels to 1,3 to 1,5 million tons. *Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin*, 2017, no 3, pp. 2-3, 14.
13. Data from: *Ледокольное обеспечение крупнейших национальных углеводородных*

проектов [Icebreakers support of largest national hydrocarbon projects], Rosatomflot presentation, April 13, 2016, p. 3.

14. It was the development of the nuclear icebreaker fleet which, in the 1970s, made the year round traffic in the Kara Sea (although not further to the east) possible. The single most important reason for this was to make possible the transportation of the production of Norilsknickel through the Dudinka port.
15. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 3, pp. 2-3, 5; no 4 (16-31 March 2017), p. 8; no 5 (1-15 April), pp. 12-13.
16. *Icebreakers support of largest national hydrocarbon projects*, p. 3.
17. *By developing its shelf, Russia must rely on its own capacities*, *ibid* p. 19.
18. *Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin*, 2017, no 11-12 (1-31 July), p. 13.
19. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 7-8 (1-31 May), p. 2.
20. *Ibid*.
21. *Ibid*.
22. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 4, p. 7.
23. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 7-8, p. 2.
24. *Novatek Looks to Build Second Arctic LNG Plant*, The Maritime Executive, March 29, 2017, available at: http://www.maritime-executive.com/article/russian-firm-looks-to-build-second-arctic-lng-plant; *Yamal-Nenets government approves Salmanovskoe field development project for Arctic LNG-2, The Arctic*, June 23, 2017, available at: http://arctic.ru/resources/20170623/638869.html.
25. *Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin*, 2017, no 11-12 (1-31 July), p. 6-8.
26. *Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin*, 2017, no 13-14 (1-31 August), p. 3-5.
27. *Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin*, 2017, no 11-12, p. 3.
28. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 3, p. 3; no 4, p. 5; no 7-8, p. 5; no 11-12, p. 8-9.
29. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 7-8, p. 4, 5.
30. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 5, p. 10-11; no 7-8, p. 4-5.

31. Rosatomflot presentation at IMEMO-SIPRI Arctic conference, November 13, 2014, p. 14.
32. *Ibid*.
33. Kotlyar V., I*cebreaker assistance in Northern Sea Route for safe navigation of vessels under foreign flags: legal framework and established practices, Russian International Affairs Council*, October 12, 2015, available at: http://russiancouncil.ru/en/northernsearoute#kotlyar.
34. *Russia needs at least three Leader icebreakers for Northern Sea Route*, TASS, Russian News Agency, June 20, 2016, available at: http://tass.com/economy/952358.
35. *Monitoring of socio-economic development of the Arctic zone of Russia*, 2017, no 3, p. 2-3.
36. *Справка о Комплексном проекте развития Северного морского пути [Background information on the Comprehensive project for the development of the Northern Sea Route]*, Government of the Russian Federation, June 8, 2015, available at: http://government.ru/orders/18405/. See also: *Information by Arkadiy Dvorkovich pertaining to the Comprehensive project for the development of the Northern Sea Route; Bobrova J., The Northern Sea Route: National Regime in the Changing International Context*, RIAC Policy Brief, 2016, no 9. P. 6.
37. See, inter alia, Arbatov A.G., Dvorkin V.Z., *Военно-стратегическая деятельность [Strategic military activities]*, A. Zagorski (ed.), *Международно-политические условия развития Арктической зоны Российской Федерации [International Political Environment for the Development of the Arctic Zone of the Russian Federation]* – IMEMO RAS, Moscow: Magistr, 2015, pp. 163-177.
38. See, inter alia, Miasnikov Y., *Precision-guided conventional weapons*, A. Arbatov, V. Dvorkin (eds.), Nuclear Reset: Arms Reduction and Nonproliferation, Moscow: Carnegie Moscow Center, 2012, pp. 432–456.
39. For an overview of Russian posture in the Arctic see: Zagorski A., *Нестратегические вопросы безопасности и сотрудничества в Арктике [Conventional security and cooperation in the Arctic]*, Moscow: IMEMO RAS, 2016, pp. 74–83.
40. *Ibid*, pp. 73–74.
41. For an overview of non-military capabilities see: *ibid*, pp. 92–95.
42. *Основы государственной политики Российской Федерации в области военно-морской деятельности на период до 2030 года* [Fundamentals of the State Policy of the Russian Federation with regard to naval posture until 2030], endorsed by the President of the Russian Federation on July 20, 2017, Konsortsium Kodeks, available at: http://docs.cntd.ru/document/436750744.

43. *Ibid*, paragraphs 24a and 27*a*.
44. *Ibid*, paragraph 29*в*.
45. Moe A., Brigham L, *Organization and Management Challenges of Russia's Ice breaker Fleet*, pp. 60–61.
46. *Russia to organize special company to manage Northern Sea Route*, TASS, Russian News Agency, June 30, 2017, available at: http://tass.com/economy/954203.
47. *The Arctic: Territory of Dialogue International Forum*, President of Russia [this is the title of the web site], March 20, 2017, available at: http://en.kremlin.ru/events/president/news/54149.
48. Particularly safety provisions of the Code don't apply to commercial ships not on international voyage or under 500 t., nor to small passenger ships or fishing vessels, leisure boats etc.
49. *РС представил Руководство по применению положений Полярного кодекса для судов // PortNews. 11 октября 2016 (http://portnews.ru/top_news/227708/).*
50. Bobrova J. *The Northern Sea Route: National Regime in the Changing International Context*, p. 8.
51. *NSR Rules update. The Polar Code Certificate required to get Permit for NSR navigation, SHNL Information Office*, March 16, 2017, available at: http://www.arctic-lio.com/node/266.
52. Zagorski A. 'Perspective', O.R. Young, J.D. Kim, Y.H. Kim (eds.), *The Arctic in World Affairs. A North Pacific Dialogue on the Arctic in the Wider World. 2015 North Pacific Arctic Conference Proceedings*, Busan; Honolulu: KMI; EWC, 2015, p. 223.
53. *Monitoring of socio-economic development of the Arctic zone of Russia. Information Bulletin*, 2017, no 11-12, p. 3-4.
54. *Ibid*.

What Role Can The Marine Insurance and Classification Societies Play in Enhancing Safe Ship Operations in the Arctic?

Frank J. Gonynor

INTRODUCTION

Marine insurers and classification societies both serve and support the marine shipping industry, in connected yet different ways in their approach to the problems of potential risk of ships operating in the Arctic. These organizations have different roles and proceed in different vectors, with intersecting paths at several points.

Particularly for Gard, a large maritime insurance company based in Norway, the problems of cold-weather shipping have always been a core interest of the organization. From Gard's earliest days, it has insured ships embarking on whaling expeditions in the polar regions. In contemporary times, it supports vessels in oil and gas exploration in the Arctic.

Arctic trade represents only a fraction of global seaborne commercial traffic. Thus, insurance is provided at a relatively low cost for the small volume of the activities underwritten, particularly in view of the high potential risks and claims from Arctic operations.

The conference theme contains a key word, "sustainable," which overlaps with a central tenet of Gard as a marine insurer. Voyages and operations at sea are inherently risky. The moving vagaries of the sea itself and associated inclement weather, the remoteness of ships from land and population centers, the potential for failure of equipment and the errors of personnel—all mean the possibility of accident and catastrophe is always present. Such causative factors are magnified in the Arctic, where the conditions are even harsher, the isolation at its most acute, and the odds that accidents will occur are higher due to the presence of ice in various forms.

SUSTAINABILITY

To be "sustainable" as an insurer over time, the underwriters' rating risks must be prudent in assessing and deliberating over all of the known factors that can lead to a marine casualty. They must attempt to account for unknown or unarticulated risks, and then properly calculate a premium payment to amortize that risk properly across the entire pool of assureds.

This task is succinctly described in Gard's stated core purpose: to help our members and clients in the marine industries to manage risk and its consequences.

At Gard, we take a broader view of "sustainability," which includes external factors such as the environment, impacts on people and human rights, and an ethical approach to all our business dealings, as set forth below:

Sustainability—what does it really mean?

- Environment
- People and Human Rights
- Business Ethics
- Responsibility for communities and global society
- Business sustainability and resiliency over time
- Creating long-term financial value

"P&I" AND THE MARINE INSURANCE INDUSTRY

For Gard and most other insurers offering liability insurance for marine casualties (known in the shipping industry as "protection and indemnity insurance" or, more simply, "P&I"), the responsibility to its assureds is even more profound. This is because it is a "mutual" insurer in its organizational set-up, meaning that the company is actually entirely owned by the assureds themselves (this is why they are called "members," and also why mutual P&I insurers are known colloquially as "clubs").

Thus, all of the "members" enrolled in a "P&I Club" like Gard share collectively in the risks taken on by Gard. In benign years, premiums are kept low. In years where there are many claims, members receive higher premium bills. This mutuality has the practical effect of the Club and its members acting to self-police, in order to ensure that ships and ship owners operate at the highest levels of prudence and safety, and avoid accidents if possible. Such accident avoidance translates into lower claims numbers for any given year, and this positively affects the insurance costs borne by members for that

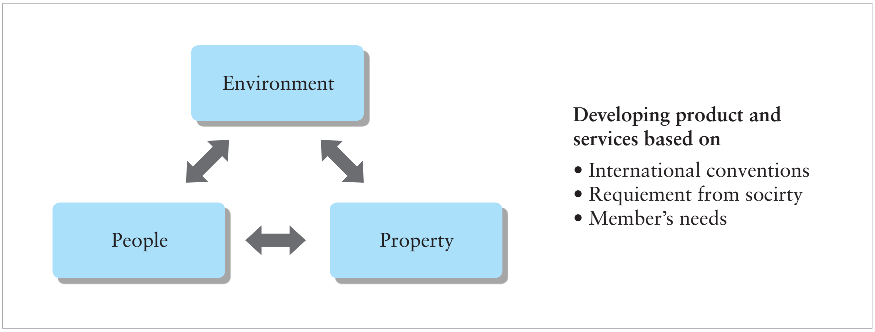


Figure IV.7 Integrating Sustainability in Business through Prevention and Casualty Handling

period. The collective financial interest acts as a powerful impetus.

This mutuality character of P&I Clubs is the prime influence molding these organizations into entities that offer a high level of specialized service to its membership at the lowest possible cost. But unlike regular insurance companies, P&I Clubs do not make "profits" per se, but instead aim to only take in revenues slightly more than the cost of claims plus the organizational overhead. Any excess money, either reaped through investment gains of the received premium revenue and/or surplus due to lower than predicted claims costs, are then set aside in an account as "free reserves." Such reserve funds can be drawn upon in the future in the case of large unanticipated claims, thus buffering the impact of such unpredicted events and contributing to long-term financial stability. In addition, P&I Clubs also purchase reinsurance policies that provide outside insurance payments to them for the occasional very large claims. These extraordinary claims would otherwise fully consume the reserve amounts and cause fiscal instability in the mutual financial arrangement.

Therefore, loss prevention is a key element to the operation of a P&I insurer, since it can lead to significant overall cost reduction for the members, who face unceasing commercial and financial pressures in a competitive business. This activity translates into assisting members with best practices and procedures in order to be efficient, safe, and cost effective —three things that can, and should, coexist.

This manifests itself in a high level of service and interaction between the Club and an assured member, much more so than is found in shore-based commercial insurance relationships.

It should be noted here that P&I insurance covers the legal liabilities that might arise from injuries made to third parties or the environment. Any damage to the ship's own structure or equipment as a result of a marine accident would be covered by the insurer providing Hull & Machinery ('H&M') insurance, which is usually procured on a fixed premium, term basis from a different insurer. In the case of a casualty, H&M insurance usually cooperates with P&I, working together to address the issues of the vessel(s) involved in the accident (sometime the H&M insurance is also provided by the P&I insurer; Gard does this quite frequently). It is important to understand that in most situations involving a vessel in distress, it is the H&M insurance that handles the salvage arrangements to return the ship to a normal operating status/location.

How is marine insurance contributing to sustainability, in Arctic trade and elsewhere?

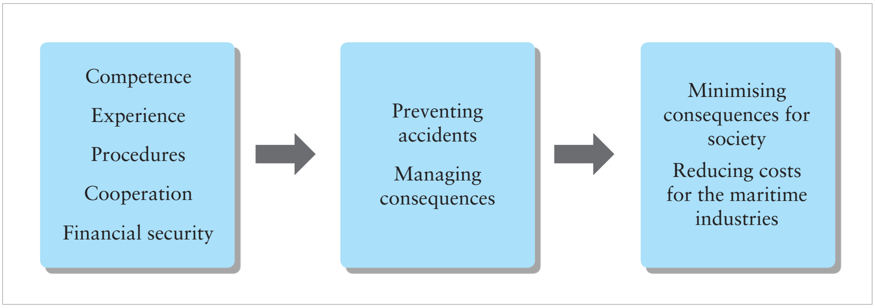


Figure IV.8 Answer: By Reducing the Footprint of Global Trade

In reducing the overall "footprint" of global marine shipping, "sustainability" is made possible in various ways by the organizational structure of P&I Clubs:

- For their members: reducing their costs; preventing the need for duplicative operational regulations that can increase operating expenses; and allowing them to be permitted to operate in all of the oceans, lakes, and rivers of the world, because they are viewed as responsible actors with low impact to the environment.
- For the marine insurer itself: by keeping accident rates low and

thus allowing for more predictable risks and premium demands; by being seen by governmental and non-governmental organizations as entities that assist in the protection of the marine environment; and by preserving reserved capital so that it can be designated and used to cover increasing or new marine trades and activities.

- For governments and general society: generating a positive view of marine shipping as an industry; allowing for inexpensive distribution of goods worldwide and fostering prosperous trade patterns in a world economy; and demonstrating that the shipping industry can be a steward of the seas, rather than only seen as solely an exploiter.

MARINE INSURANCE AND SOCIETY

The diagram above illustrates the relationship between the marine insurance

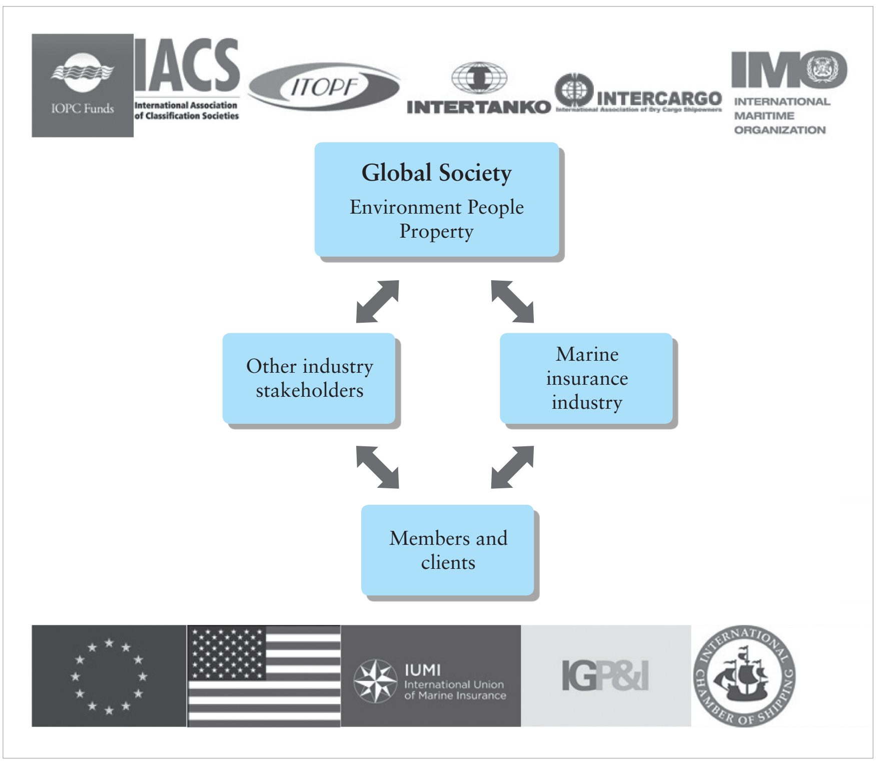


Figure IV.9 Integrating Sustainability in Cooperation with Members and Society industry and the world outside that industry, including other organizations, both governmental and non-governmental, that enhance the mission of the P&I Clubs, furthering their collective reach.

It should be noted that one of the organizations listed in the diagram is the International Association of Classification Societies (IACS), a key partner of longstanding with P&I Clubs, and deserving of separate attention and discussion. Almost all ships entered with Gard are likewise entered with a classification society that is a member of IACS.

CLASSIFICATION SOCIETIES

Classification societies came into being as the marine insurance industry became a uniform activity in the mid-1700s. Underwriters insuring vessels needed a source of reliable information and assessment as to the level of seaworthiness of the ships they were insuring. In 1760, the first classification society, Lloyd's Register, was established (and still exists today). This classification society rated the shipping fleet in England regarding the condition of each vessel, and designated the level of fitness with letter/number designator labels. These ratings are easily understood by the insurance community, and continue to be relied upon to answer the key question for the marine underwriter: How risky is a particular ship?

Soon thereafter, classification societies sprung up in many countries around the world, including France, Norway, Germany, Italy, Japan, and the United States. Today there are more than 100 classification societies. The larger, well-known organizations are members of IACS.

Classification societies are not guarantors of the safety of a ship or how it is operated. Instead, these groups examine and certify, through a set of "rules." These rules assure that the design, construction, and materials used and/or the equipment of a particular ship meet technical standards of strength and integrity at the time of inspection. This objective and independent evaluation is relied upon not only by marine insurance underwriters, but also governments, financial institutions, shipbuilders, repair yards, and other entities, as credible evidence of a soundly planned and built vessel. Many governments utilize the ship inspection reports of classification societies as reports of "Recognized Organizations," lending quasi-governmental recognition to the work of the classification societies, since many governments lack the technical nautical knowledge possessed by the classification societies.

Classification societies are not “pure mutuals” like P&I Clubs. They embody dual aspects, by carrying out both non-profit inspections and rules-related activities, and then also offering for-profit analysis and design services to ship-owners. This means that they are more “commercially minded” organizations, although it must be said that societies within the IACS take measures to separate, and have as independent, the non-profit rules-related services and the for-profit businesses that they also have established.

To have such a system of self-regulation of the shipping industry by such entities, classification societies must be wholly independent of ship owners, and be unbiased and uninfluenced in their technical assessments and decisions about ships and their condition.

As they are viewed as “Responsible Organizations” by many national governments, this shows that classification societies have for the most part succeeded in occupying a unique role and position in the shipping world—as a respected, credible source of technical advice and judgment in nautical practices and procedures. Classification societies are also forward looking, developing standards for new ship designs and construction methods, as well as new types of ships for new types of trade.

With regard to Arctic operations, classification societies have had a long involvement in setting design and material standards to apply to ships wishing to operate in the Arctic, particularly in light of the special hazards of navigating through seaborne pack ice and fast ice that is adjacent or attached to land.

The operations of ships in Arctic regions necessitate specialized engineering: strengthening the ship’s hull and associated framework structure; installing protective devices for the rudder and propeller; a more robust design; the heating of fluids and fuels; and other measures.

Classification societies began to assess vessels and develop standards using the experiences of ships in “first-year ice” in the Baltic Sea area. Simply put, first-year ice is ice that forms annually and then disappears on the sea in any given area. By contrast, “multiyear ice” in the Arctic region is ice that forms and does not disappear annually and builds over years, making it much harder and usually thicker than first-year ice.

With regard to the Arctic, classification societies have developed “Polar Class” design and construction standards, which are meant to harmonize with the operational standards for such areas developed by the International Maritime Organization, a U.N. sponsored international body relating to maritime ship operations and policy. However, individual classification societies, somewhat confusingly, developed their own individual classification regimes and protocols for rating ships for Arctic service.

These confusing sets of varying standards was finally harmonized by the International Association of Classification Societies in 2007, when it issued the first set of guidelines, the IACS Unified Requirements for Polar Class Ships.

The Polar Class levels are as follows:

Table IV.1 Class Descriptions

POLAR CLASS GENERAL DESCRIPTION	
PC 1	Year-round operation in all ice-covered waters
PC 2	Year-round operation in moderate multi-year ice conditions
PC 3	Year-round operation in second-year ice, which may include multi-year ice inclusions
PC 4	Year-round operation in thick first-year ice, which may include old ice inclusions
PC 5	Year-round operation in medium first-year ice, which may include old ice inclusions
PC 6	Summer/autumn operation in medium first-year ice, which may include old ice inclusions
PC 7	Summer/autumn operation in thin first-year ice, which may include old ice inclusions

Note: Ice descriptions follow the WMO Sea-ice nomenclature.*
*http://www.jcomm-services.org/

Such classes primarily rank vessels on whether they can operate in the presence of first-year ice and/or multi-year ice, and can do so with or without being accompanied by an escorting icebreaker, and the maximum thickness of that ice. Ships that are strong enough in power and construction to be operated freely in any icy waters can be assigned the additional label of “icebreaker.”

The combination of ice-classification of ships by classification societies and the practices and procedures set forth by the IMO in its Guidelines for Ships Operating in Polar Waters, establish a manner of operating ships that is safer and sounder environmentally, but certainly does not entirely eliminate risks that arise from navigating in that area of the world. Such dangers are still present.

THERE IS ALWAYS RISK: ACCIDENTS CAN AND DO HAPPEN

By following sound procedures, even vessels not especially ice-classed have operated safely in Arctic waters. For example, in 2016, the cruise ship *Crystal Serenity* (Finnish Ice Class 1C), made a 32-day voyage from Seward, Alaska to New York City, using the Northwest Passage route around Alaska and across the northern region of Canada. It was accompanied by an escort icebreaker, and was fitted with special ice detection equipment. There was a reprise of the voyage in 2017, arriving in New York on September 16th after 32 days of sailing, on schedule and fortunately without incident.

On the other hand, underestimating the incessant risk posed by the harsh conditions of the Arctic regions can constitute hubris by a vessel operator. Sudden changes in weather and sea conditions, coupled with lack of redundancy in case of equipment failure, can result in serious consequences. There is little margin for error, even with the best of planning.

One example of that would be the grounding of the drilling vessel *Kulluk* on the Alaskan coast in January 2013, on Sitkalidak Island, Alaska, a remote area of the Aleutian Island chain. The official U.S. Coast Guard

Figure IV.10 The Crystal Serenity on Its 2016 Northwest Passage voyage

Figure IV.11 The Kulluk as Seen Grounded on Sitkalidak Island, Alaska, in January 2013.

investigation of the incident indicated that a chain of errors, including the misapprehension of possible storm effects, some errors in planning, the lack of redundancy, and equipment failures all contributed to the accident, which fortunately did not result in any significant injury or damage, and no pollution occurred. Interestingly, the incident occurred not at the time of perceived high risk in the operation zone in the Chukchi Sea, but instead much further south, demonstrating that the zone of higher Arctic risks extends over a wider, larger operational area and is not confined to within the Arctic Circle.

THE POLAR CODE—A WAY FORWARD

In January, 2017, the Polar Code went into effect. Created by the U.N. International Maritime Organization, the Polar Code applies to all commercial shipping in the Arctic and Antarctic regions. This Code, incorporating the IACS Polar Class rules mentioned above, creates a detailed set of regulations regarding structural and machinery requirements, high-latitude navigation, and special or unique operational, search and rescue, and environmental considerations. Ships will earn a special certificate for meeting these standards, and carry aboard with them a Polar Water Operation Manual ('PWOM') with which to comply.

This Code is considered the culmination of the work of industry and the classification societies regarding the peculiar conditions and problems posed by Arctic and Antarctic conditions, integrating it into the other IMO regulatory codes.

At Gard, we see the Polar Code as a definite step in the right direction, addressing the unique risks in the Arctic.

CONCLUSION

For centuries, the Arctic has offered the lure of commercial success for those ship operators intrepid enough to brave the unique conditions there. This engrained courage in the shipping world to go to the Arctic has been facilitated by the twin entities of marine insurance and classification societies, which have intertwined roles.

Marine insurers have assessed the risks and calculated how to cover them, allowing ship operators to pay a sum certain in premium, thus quantifying the amount of risk they are willing to take over a 12-month term. Classification societies have worked to formulate technically based rules for the design, construction, and operation of ships that can safely operate in the Arctic, based on a certain set of conditions.

As a result, this system has had an indirect influence on societal decisions regarding the permitting of Arctic operations within certain risk parameters. This does not mean, however, that things cannot go wrong. From time to time things have indeed gone wrong, but to date without major loss of life or environmental harm. Will that luck hold over time?

There is always a residual risk, no matter how well operated or planned a voyage to the Arctic might be. As this activity increases, the odds of an incident of magnitude there increases. Indeed, the trend towards increased activity occurring in the Arctic is clear: oil and gas exploration, navigation on shorter trade routes, and tourism to the Arctic, have all increased significantly in the last few years.

At Gard, we see the potential for ongoing Arctic activity impacts to increase, not particularly due to the periodic transits of that region (NSR, NWP), but due to increasing impacts from oil and gas exploration, such as the activity supported by the Port of Sabetta, as well as more activity in the Norwegian zone in the Barents Sea.

As for transits along the Northern Sea Route, the use of a convoy system and the provision of free salvage services by the escort fleet of Rosatomflot is essential to the scheme to use that route. Currently there is almost no salvage infrastructure available nearby, and the conditions confronting outside help to reach that area are rough and unpredictable.

It is for governmental policy makers and the public constituencies they represent to decide the question: how much, and what kind, of commercial marine activity in the Arctic can be allowed in the years to come? While marine insurers and classification societies can exercise some limited influence on such decisions, they mainly follow the pathway set by the enlargement of shipping activity by ship-owners. Then, insurers and classification societies take action to try to ensure this new activity is being done responsibly and in a sustainable way.

Proposal to Mitigate Arctic Shipping and Logistics Risks Utilizing Fourth Industrial Technology

Sung Woo Lee

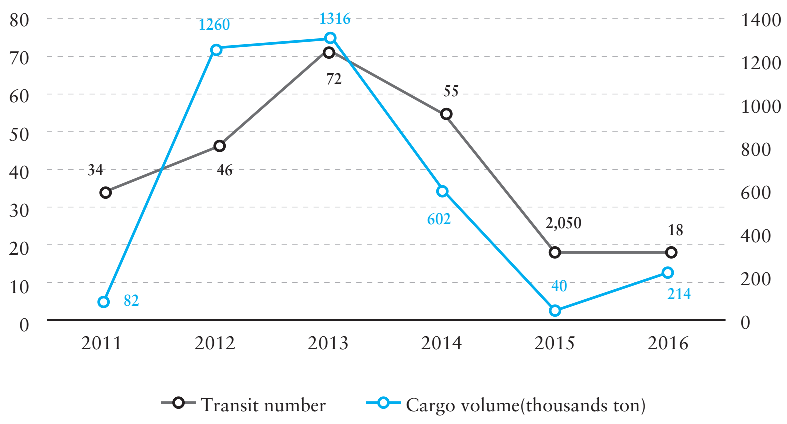
CHALLENGES AND OPPORTUNITIES TO INCREASED NAVIGATION OF THE NORTHERN SEA ROUTE

Global warming persists and seasonal ice cover along the Northern Sea Route (NSR) is gradually shrinking, fueling the possibility of the route being used for commercial purposes. As shown in Figures IV.12 and 13, however, the frequency of the NSR being used for transits and the quantity of goods being transported drastically dropped after a peak in 2013—and has not recovered much since then. The major reasons for this stagnancy include a decline in the quantity of trade triggered by sanctions imposed by Europe on Russia, a reduction in the amount of goods imported and exported by Russia due to lower prices for energy resources, and lackluster performance of shipping companies caused by weak global demand.

There are other reasons as well. Although ice cover generally is declining, the melting ice does not necessarily stabilize the route for shipping. As ice melts, lumps of melted ice join one another, forming solid pack ice that is highly mobile. This floating pack ice moves rapidly and creates larger risks to cruising vessels. In addition, rapid thawing produces significant effects on the atmosphere, generating unstable navigational conditions, such as storms. We are learning that the rapid disappearance of Arctic ice doesn't necessarily lead to a rush for more commercial shipping along the NSR.[1]

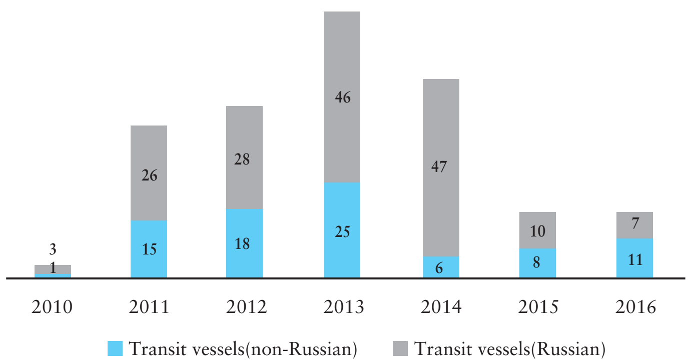
It is important to find a way to gradually respond to these changing conditions, while recognizing all of the previously mentioned risks arising from transiting across the NSR. It is also important to understand and respond to the associated environmental and economic impacts resulting from these dynamic changes.

The growth of the NSR as an international trade route has recently been stagnant. Intra-national navigations in Russia across the route consistently



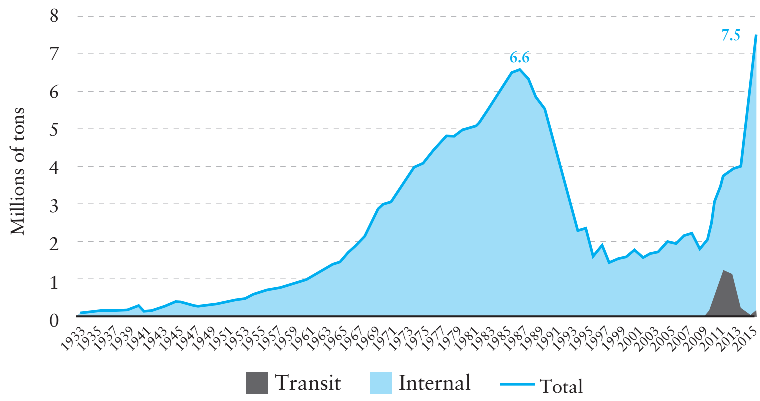
Source: Northern Sea Route information office in CHNL (Centre for High North Logistics) * These data are based on the Northern Sea Route Information Office in CHNL.

Figure IV.12 Transit Numbers and Cargo Volume of Shipping through NSR



Source: Nataliya Marchenko, *Northern Sea Route: Modern state and challenges*, San Francisco 2014, Northern Sea Route Information Office (CHNL) data from each year

Figure IV.13 Number of Russian and Non-Russian Transit Vessels



Source: Plaksiy, Mikhailichenko, NSRA, analysis of GECON

Figure IV.14 *Volume of Cargo Using NSR: Transit and Internal*

declined after a peak in 1985, when the quantity of transported goods stood at 6.6 million tons. However, it rose to a record 7.5 million tons in 2015[2] as shown in Figure IV.14, signaling yet another recovery of NSR function. Russia is making its utmost effort to facilitate the proactive utilization of the NSR, as users weigh the risks and possibilities that the route poses.

STATUS AND CONCERNS REGARDING THE NSR ROUTE

In terms of the frequency of the use of the NSR by Northeast Asian countries, China has navigated the route five times (including two transits), whereas South Korea has passed three times (with one transit) since 2013. Despite the potential of the NSR, many shipping companies do not use it frequently for the following reasons.

These could be divided into the two categories: temporal factors, which center on current global economic conditions; and more fundamental reasons that will be challenging to overcome.

The temporal factors arise from the current economic situation that shipping companies face, what might be called the companies' internal barriers[3]. Global shipping companies capable of navigating the NSR are enduring the worst time in their history, as evidenced by the bankruptcy of South Korea's Hanjin Shipping, a company once ranked 7th in the world. Shipping companies in South Korea, China, and Japan are experiencing similar difficulties. China is attempting to execute an integration and M&A of local companies centered around its state-owned shipping company COSCO, and Japan will soon merge three national shipping companies. For a shipping company and its CEO to explore new routes, they must be willing to make an investment and ensure that the company is equipped with a stable financial structure; currently it is difficult to find such shipping companies in the global market.

Other than the problems inherent to the current financial picture of the shipping sector, there are fundamental problems posed by the NSR that cannot easily be ignored.

First of all, there are risks arising from navigating the route, which include weak demand for icebreakers, high-risk management needs in case of an accident (such as a collision with a glacier), and shortages of experts for ship management. Second, there are factors relevant to transported cargo, which include an imbalanced quantity of transported goods between East Asia and North Europe, the difference in types of transported goods (bulk vs. container), limitations on the types of cargo allowed in extremely cold regions, and, at least at present, few options to add additional cargo at calling ports. Third, there are cost-related factors. It is possible to save 40 percent in transit time using NSR, but additional costs must be considered, such as fees for using an icebreaker or an ice class ship, tolls for passage, and insurance premiums. Lastly, there are infrastructure-related factors. In order for ships to make long-distance transits, they require cities with calling ports in between, and available ports to stopover for collision prevention, rescues, and supplies. Furthermore, infrastructure relevant to logistics, every-day living, safety, and sanitation should be installed to connect cities with calling ports and the hinterland. There are, of course, political factors to consider as well, such as the adoption of international laws and governance issues.

RECOGNIZING THE NEED FOR A GRADUAL APPROACH TO FUNDAMENTAL PROBLEMS

More thought should be given to the overall environmental impacts arising from the use of the NSR. Marine transportation currently accounts for 3.3 percent of total global emissions of carbon dioxide, a key driver of global warming. For this reason, global shipping companies are making an effort to reduce their CO_2 emissions by 20 percent to 60 percent by 2050. Under the circumstances, the utilization of NSR could possibly serve as a major environmental improvement, as it could result in less fuel consumption and 40 percent less CO_2 generation.[4] Meanwhile, there is a growing awareness of the environmental sensitivity of the Arctic. Any release of contaminants, such as black carbon or an oil spill, could be substantially more dangerous and destructive than in lower latitudes. With that in mind, in order for the route to be used, environmental considerations should be paramount.

Second, there is a correlation between the demand and the cost. Studies indicate that the NSR could decrease traveling distance and time by 7,000 km and 40 percent, respectively, compared to crossing through the Suez Canal from Northeast Asia to northern Europe.[5] This is significant: the route with the largest proportion of trade in the world could be made 40 percent shorter. Let's say there are 100 ships crossing the Suez Canal. If the route were switched to the NSR, just 60 ships would meet the demand. In the end, shipping companies could face situations where decreased demand will reduce their business opportunities by an amount commensurate to the decrease in shipping time. In addition, most of the vessels currently being used may not be employed, and instead will be replaced by ice-class ships. This could lead to a massive reorganization of the shipping industry, where only the companies that rapidly adapt their business structure to this new environment will survive, notably ones that develop expertise in navigating the NSR. In this case, northern European and Russian shipping companies, which have more experience in the Arctic region, will have an advantage. The possibility of an intentional delay in the use of NSR cannot be ruled out for this reason. Until the currently assumed risks are confirmed to be non-existent or manageable, NSR users are highly likely to refrain from big commitments. That is one reason why more business opportunities involving new cargo being loaded midway should be created, rather than simply relying on the NSR to solve all of the issues mentioned above.

On the other hand, countries and consigners are always looking for cheaper resources. If those resources are located further away, the costs of transporting those resources must be considered, as well as the risks of transporting those resources to markets—for purchasers and shipping companies alike. Shipping companies generally profit more when there is a price hike in resources. But a higher oil price also prompts companies to aggressively seek the shortest traveling distance from source to market. Lee & Song's (2011) study estimated that the higher the oil prices go, the more costs are reduced when NSR is employed as the transportation route. If demand for the NSR by shipping companies grows due to higher resource prices, these companies would make an effort to secure resources around the Arctic. Even if their own costs would increase due to higher oil prices, a shorter route between Asia and Europe would help offset those burdens. It is perhaps counter-intuitive that cheap resources cause weaker demand and therefore supply, blunting the competitive edge of shipping companies and resulting in a restrained interest in using the NSR. In conclusion, if higher resource prices coincide with a growth of demand for marine transport and of transportation costs, the need for companies to choose the NSR is bound to magnify.

WHAT APPROACH DO WE NEED NOW?

All relevant risks, such as supply and demand, cumulative environmental effects, navigation risks, and political factors, do not exist independently. They are intertwined in a very complex manner, fueling the need for a comprehensive and gradual approach for a thoughtful and enduring resolution.

A gradual approach should be sought, based on reducing risks by minimizing the use of the route and securing available cargo close to the Arctic, for which technologies developed in the Fourth Industrial Revolution[6] are likely to play a major role.

First of all, in order to navigate the NSR, it is advisable for a ship to travel only part of the route at first. The entire transit poses larger risks, and shorter trips will allow ships and crews to gain experience they can later apply to full transits. In north Europe, many trips are underway that connect Russia and other European areas, whereas East Asian companies have rarely embarked on Arctic trips. To solve this, the adoption of NSR should be gradually carried out, starting with links among East Asia, Far East Asia, and East Siberian regions.

Another way to further promote a secondary route is for ships to stop at various ports to load and unload cargo before they reach their final destination. Throughout the NSR today, there are few if any ports of call, and they serve only very limited functions. These issues should be settled so the route can become economical, and to increase the safety and reliability of the route. In this case, technologies detailed in the Fourth Industrial Revolution, such as interrelated computing devices known as the “Internet of Things” (IoT), automation, and big data, may provide some solutions.

Third, it is required that an emerging shipping structure that utilizes the NSR creates opportunities for new cargo transport, as well as the creation of a simple logistics network. If it were possible to collect, process, and export minerals and forest resources dispersed throughout the Siberian region to the NSR via canals, such as the Lena, Yenisei, and Ob Rivers, it would go a long way toward generating cargo currently lacking along the route. This will require assistance from emerging technologies and new infrastructure. While it is advantageous to employ canals to gather and process resources, there would be additional advantages if these passages could simultaneously serve multiple roles as factories, warehouses, and ports, by utilizing facilities such as a Prompt Port Facility (PPF),[7] If this comprehensive idea is employed, the target to open the NSR will be met earlier with lower costs.

A NEW APPROACH TO PROMOTE THE NSR

Russian Siberia has ample resources distributed across the region (Figure IV.15), but their development is constantly being postponed due to the absence of logistics networks that connect the north and the south.

Currently, Russia only has a logistics network at its southern end that connects the east and the west via the Trans-Siberian Railway (TSR). Only the aforementioned three rivers connect Siberia, with its rich resources, to ports on the shore of the Arctic Ocean. Heavy cargo has been transported several times through the NSR-Ob River-Kazakhstan route, with the Ob River in between (see Figure IV.16). The Lena River, located closest to East Asia and extending well into Siberia, is 7,040 km long, including tributaries. It meets Lake Baikal at its southern end and Tiksi Port at its northern end. Although the river is only open to shipping for 160 days a year, it is still possible for resources in this area to be seasonally transported through the NSR, assuming the utilization of currently existing ports such as Yakutsk and Osetrovo.

Secondly, there are issues relevant to logistics infrastructure and

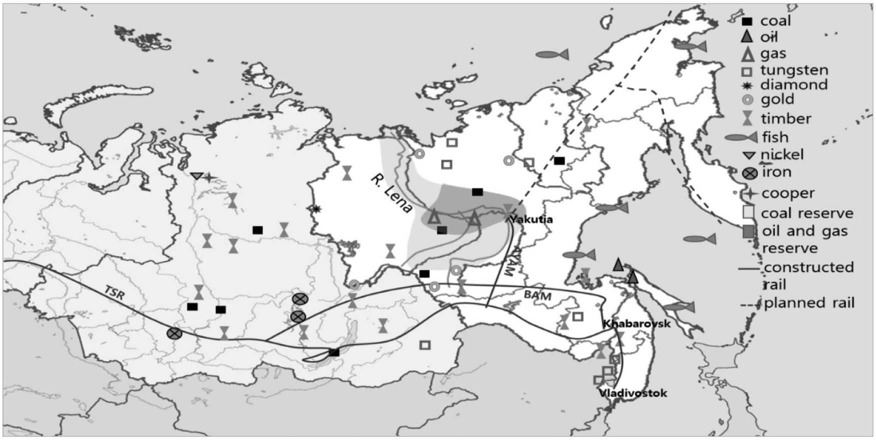


Figure IV.15 Natural Resources in Russian Siberia

Figure IV.16 Transportation Route for Heavy Cargo via OB River and NSR (2016)

operations in extremely cold areas. Prompt Port Facilities can be used to facilitate transport across the Lena River, process resources, and supply necessary power and living accommodations. The movement of goods to a coastal port on the Arctic Ocean and the operation of a terminal can be conducted with the operation of unmanned trucks and automated unloading equipment. Furthermore, ships using the NSR have yet to be commercialized, but unmanned ships[8] are available. In addition, underwater drones[9] also can be put to use to minimize the risks of NSR navigation. Figure IV.17 shows these technologies.

There are no specific plans or clear directions being implemented yet, but adopting technologies from the Fourth Industrial Revolution

Figure IV.17 Products of 4^{th} Industrial Technology Applying to Use NSR

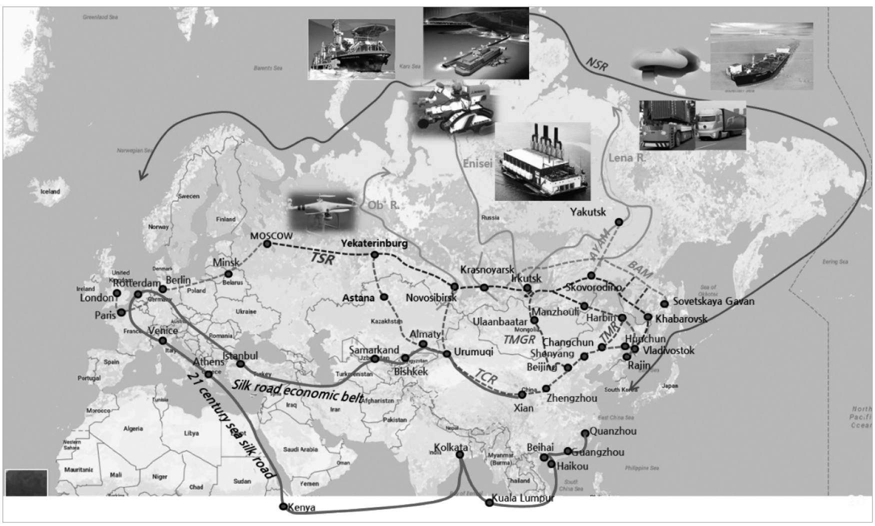


Figure IV.18 Possible Complex Logistics Network in Eurasia Linked to NSR and relevant application technologies that respond to the challenges of operating in the unique Arctic environment will resolve many problems currently being discussed. The application of these technologies may answer the following questions very easily: how can people live in an Arctic port area; in what ways should crews be trained to sail in the NSR; how they can detect suddenly approaching ice in advance; and how best to move cargo from the frozen Siberian continent to markets in the south?

Figure IV.18 shows how the logistics map of Eurasia would look when logistics and infrastructure issues are addressed with the help of technologies from the Fourth Industrial Revolution. In the near future, we will be able to utilize the NSR by integrating with a new Eurasian logistics network based on advanced technology and sound business principles.

Notes

1. In the past ten years as ice melting has been more evident due to global warming, ice has become highly mobile, leading to the formation of ice objects, which cause ships to be damaged and submerged. (Yevgeny A., et al., *On the future navigability of Arctic sea routes: High-resolution projections of the Arctic Ocean and sea ice*, Marine Policy, vol 75, 2017, p.313).
2. The analysis on the GECON data conducted by Plaksiy, Mikhailichenko, NSRA in Russia indicates that the quantity of goods domestically transported in Russia using NSR amounted to 7.5 million tons and has continuously increased since 2009.
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accommodations, etc.

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9. The National Oceanography Centre in the United Kingdom is planning to operate Boaty McBoatface, an underwater drone that the center has developed with capabilities of going as deep as 6,000 m in order to traverse the deep sea of the Arctic Ocean and to investigate requirements for iceberg management on the ocean.

Perspectives on the Northern Sea Route from Japanese Maritime Parties

Natsuhiko Otsuka

INTRODUCTION

Arctic sea ice cover continues to decline. The second smallest September sea ice extent occurred in 2016, following the record low set in September 2012. In parallel with this sea ice retreat in the Arctic, international shipping between Asia and Europe via the Northern Sea Route (NSR) started in 2010. Since then, two tankers, two LNG carriers, one bulk carrier and three refrigerating ships have shipped their cargo to ports in Japan via the NSR (Table IV.2). Among these shipping activities, at least one was completed after the consignee requested to use the NSR. The rest of the shipments were completed after the consigner arranged to sail through the NSR. Meanwhile, some heavy lift vessels carrying cargo to the Yamal LNG project also have called at ports in Japan for resupply or crew change on their way to the Sabetta port.

Table IV.2 NSR Shipping to Japan

Year	Ship name	Ship type	Ship size	Cargo	Origin	Destination
2012	Ob River	LNG tanker	84,682 DWT	LNG	Hammerfest	Tobata
2013	Propontis	Oil products Tanker	117,055 DWT	Naphtha	Mongstad	Mizushima
2013	SCF Yenisei	Tanker	47,000 DWT	N/A	Murmansk	Iwakuni, etc.
2013	Arctic Aurora	LNG tanker	73,920 DWT	LNG	Hammerfest	Futtsu
2015	Winter Bay	Reefer	2,050 DWT	Whale meat	Iceland	Osaka
2016	Winter Bay	Reefer	2,050 DWT	Whale meat	Troms	Osaka
2017	Winter Bay	Reefer	2,050 DWT	Whale meat	Iceland	Osaka
2017	Tian Le	bulker	37,994 DWT	feed	Norway	Tomakomai

JAPAN'S POLICY ON THE NORTHERN SEA ROUTE

Overview of Japan's Arctic policy

As a result of growing global interest in the Arctic, China has participated in the Arctic Council as an ad hoc observer since 2007. In 2008, China officially expressed its intention to become a permanent observer, and South Korea was approved as an ad hoc observer in 2008. However, Japan's Ministry of Foreign Affairs still hesitated to take part in the activities of the Arctic Council. The Ministry's approach was to maintain its readiness to respond if the maritime sector made a strong request for the government to become more involved in Arctic issues. This policy was re-evaluated in 2009 after China and South Korea decided to apply for permanent observer status in the Arctic Council. Correspondingly, Japan decided to apply for permanent observer status in July 2009. Eventually Japan, China and South Korea each had to wait four years before becoming permanent observers in 2013.

Since becoming an ad hoc observer in 2009, Japan has tried to expand its Arctic activities mainly through scientific cooperation and fostering sustainable use of the Arctic. A conference that included representatives from different ministries and agencies involved in Arctic issues, which was organized in 2013, paved the way for the release of Japan's Arctic Policy in 2015. This policy paper included input from the fields of diplomacy, national security, environment, transportation, resource development, information and communication, and science and technology from a multidisciplinary perspective, and envisioned contributions from industry, academia, and the government. As far as the commercial sector was concerned, the policy aimed to coordinate economic and social compatibility with climate and environmental changes. Furthermore, it recognized the economic possibilities related to the use of the Arctic Sea Route and to the development of natural resources[1].

NSR-related Policy and Scientific Research in Japan

Among Asian countries, Japan has a long history of polar research. Japan's polar research activities go back to the International Geopolitical Year (IGY) in 1957-1958. Since then, various Japanese universities and research institutions have carried out Arctic research. Japan has also been a member of the International Arctic Science Committee (IASC) since 1990.

The Ship and Ocean Foundation (SOF, Japan), the Fridtjof Nansen Institute (FNI, Norway) and the Central Maritime Research and Design Institute (CNIIMF, Russia) started a six-year international joint research project called "the International Northern Sea Route Programme

(INSROP)" in 1993. The project covered wide areas of shipping, shipbuilding, international law, social and political systems, and the Arctic environment. Besides the INSROP, SOF also carried out a collaborative domestic research project called the Japan Northern Sea Route Programme (JANSROP), which included an experimental voyage between Japan and Norway through the NSR. This voyage was made by a Russian ice-class cargo ship and launched to examine the commercial feasibility of the NSR.[2]

While participating and contributing to the activities of the Arctic Council, Japan initiated the five-year "Arctic Climate Change Research Project" in 2011. This initiative was carried out within the framework of the GRENE (Green Network of Excellence) Program funded by the Ministry of Education, Culture, Sports, Science and Technology-Japan (MEXT).[3] The four research targets of the project were: 1) Understanding the mechanism of warming amplification in the Arctic; 2) Understanding the Arctic system with respect to global climate and future change; 3) Evaluating the impacts of Arctic change on weather and climate on Japanese marine ecosystems and fisheries; and 4) Projection of sea ice distribution and Arctic sea routes.

The Arctic Sea Route is regarded as an important issue in terms of the sustainable use of the Arctic, as well as a target for the social implementation of scientific research on the Arctic.

This early initiative was succeeded by a new national flagship project called "Arctic Challenge for Sustainability," or ArCS. ArCS is funded by MEXT and runs from September 2015 to March 2020.[4] This project aims to elucidate changes in the climate and environment, clarify their effects on human society, and provide accurate projections and environmental assessments for internal and external stakeholders. ArCS also intends to include research on the NSR, focusing on the following:

- Enhancing navigational safety by forecasting sea ice, weather and ocean conditions, and developing navigation support systems.
- Investigating economic development of the Arctic (in particular, resource development and the NSR), focusing on costs and benefits in a broad sense—including the interaction between the natural environment and the preservation of the human social environment.

NSR Policy of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

MLIT is responsible for the development of ports, maritime transport, and other maritime issues in Japan. MLIT began to analyze the feasibility of the NSR in 2013 and organized a NSR council, which holds conferences twice a year and includes representatives from the government and private sector.[5] The purpose of these conferences is to share the latest information on shipping activities, navigation rules, icebreaker support, movement of cargo owners and shipping companies, and the international situation related to the NSR. In addition, MLIT has incorporated NSR-related issues into the agenda for the "Japan-Russia Working Group on Transport" since 2012.[6,7] However, MLIT does not provide subsidies or other financial incentives, such as tax reduction, to port and shipping sectors to support utilization of the NSR.

In terms of the maritime transport sector, the most important issue for MLIT is to secure Japan's position in the international trunk line network with Europe and North America. In this regard, the basic policy of MLIT is to follow the moves of the other NSR-user countries and to ensure that Japan does not to lose its position as an important part of the international transport network that is spreading to the Arctic. However, the actual utilization of the NSR is ultimately dependent on the private sector.

Recent Activity by a Regional Government to Utilize the NSR

Hokkaido, which is the northernmost region in Japan, has showed interest in the NSR in recent years. Hokkaido, which is Japan's second-largest island, is located at the intersection of the Japan Sea, Okhotsk Sea and Pacific Ocean, which are connected with each other via the Soya Strait and Tsugaru Strait (Figure IV.19). Most ships that head for the NSR from East Asian countries have to sail through these two straits or sail along the Pacific coast of Hokkaido. In taking advantage of its geographical position, the Hokkaido government and private sector actors have proposed plans to develop shipping activities between Hokkaido and European economies via the NSR. In other words, Hokkaido is striving to become a new hub port for transshipment activities between Asia and Europe (Figure IV.20). In 2016, the vice governor of Hokkaido and business leaders visited Murmansk and Helsinki in order to discuss and exchange information with

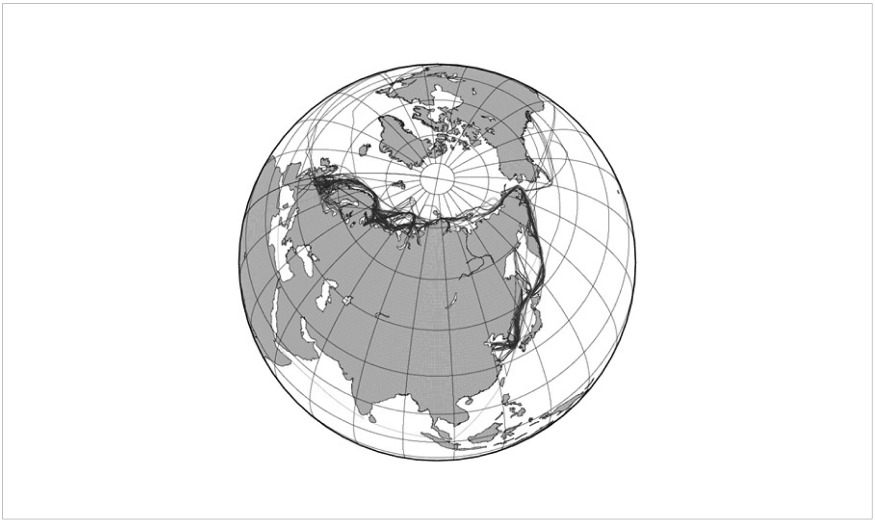

Figure IV.19 Trajectory of Ships That Sailed the NSR in 2014

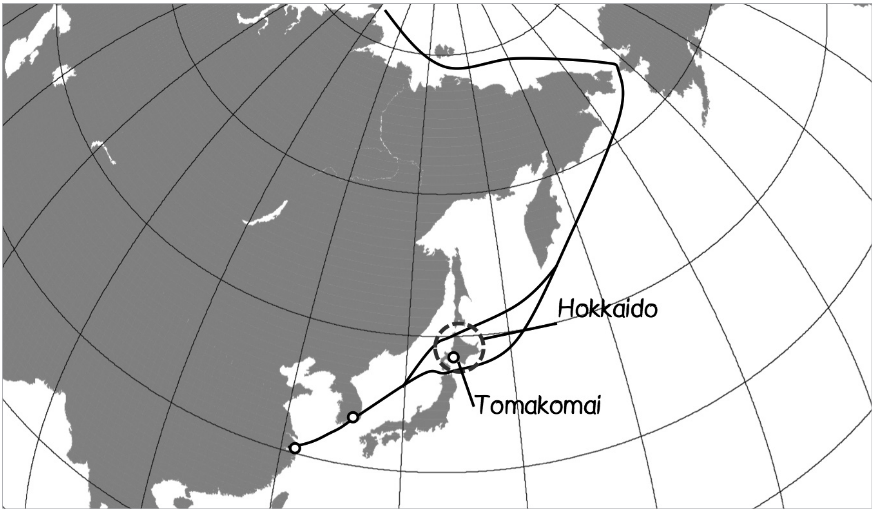

Figure IV.20 Location of Hokkaido

representatives of local governments and the business sector concerning collaboration and utilization of the NSR.[8] Furthermore, representatives of COSCO Shipping, which has been engaged in NSR shipping services since 2013, visited the port of Tomakomai on the way to visit Hokkaido University in July 2017.[9,10]

PRIVATE SECTOR PERSPECTIVES AND THE ATTITUDE OF THE PORT SECTOR

Shipping Companies

Japanese shipping companies have gradually started to enter the Arctic shipping sector in recent years. Mitsui O.S.K. Lines became one of the owners of the icebreaking LNG carrier for the Yamal LNG Project. Mitsui O.S.K's first ship will be delivered in 2019. To serve the Yamal LNG Project, NYK Line has shipped Yamal LNG project cargo to the Sabetta port in the Yamal Peninsula. Furthermore, according to the Fairplay report, NYK Line has showed interest in investing in the LNG carriers for Yamal LNG.[11] Japanese shipping companies also have expressed interest in the destination shipping of bulk cargo to the Russian Arctic coast.[12] However, the shipping companies have also identified various difficulties such as the seasonal limitation (inability to operate year-round), the lack of ports along the route, the risks concerning punctuality, low temperature, the lack of ice-class ships and so on. Therefore, they do not consider that they are in a position to tackle the problem of Arctic liner shipping at the present time.

Cargo Owners

Cargo owners and trading companies are gradually expanding their awareness and access to information concerning the characteristics and possibilities of the NSR. Therefore, it would appear that cargo owners could be ready to support the utilization of the NSR if the transport sector could provide reasonable prices and reliable schedules. In fact, whale meat, liquid bulk, and feed have already been transported to Japan via the NSR, and these shipments did not cause any negative reaction from cargo owners.

Port Sector

The container liner service between Japan and Europe is currently facing difficulties. Container volume between Japan and Europe has showed sluggish growth in recent years. There are only two trunk line services (weekly) between Japan and Europe. As a result, the port sector in Japan has been trying to keep and increase cargo handling volume and sustaining trunk line services. Therefore, it is neither feasible nor acceptable for the Japanese port sector to redirect existing trunk line cargo from current ports to ports that are more conveniently located vis-à-vis the NSR. Thus, additional cargo needs to be found if the NSR is to be utilized as a route for container shipping. Taking this situation into account, some port sectors that are interested in the NSR are preparing a long-term plan for the utilization of the NSR, which is related to the wider development of economic activities between Europe and Japan.[13]

CONCLUSION

At present in Japan, the NSR would be utilized by tramp liner service for bulk cargo when circumstances permit, including ice-class ship availability, weather risk of cyclones and typhoons, Suez Canal fees and current freight markets. Simultaneously, project cargo shipping to the Russian Arctic coast seems to be the first step to utilize the NSR. On the other hand, shipping between Japan and Europe via the NSR is still on a trial basis. If the future shows positive developments with regard to NSR utilization, the major trading companies that own many types of cargo could be the first regular users of the NSR. If shipping services between Asia, including Japan, and Europe via the NSR are provided annually in summer, the total cargo volume and number of users would gradually increase.

ACKNOWLEDGEMENTS

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Can Future Arctic Shipping Networks Reconcile Local and Global Needs?

Mia Bennett

INTRODUCTION

Arctic shipping routes are often discussed with breathless anticipation. In the media, at least, there is a perception that shipping routes will open as soon as the last vestiges of Arctic sea ice melt away. Ask a person on the street about Arctic climate change, and they may very well respond with a comment about the new Arctic shipping routes that are appearing. Compounding matters, a mistaken presumption is often that *all* of the Arctic's sea ice is going to disappear within the next few decades, rather than just summer sea ice.

In recent history, most of the fervor relating to a supposed new era of Arctic shipping can be traced back to approximately 2007. That year, sea ice extent reached a record low and a deep-draft passage opened across the Northwest Passage's McClure Strait for the first time in recorded history (Lasserre 2011). In the years that followed, an increasing number of bulk carriers transited the Northern Sea Route (NSR), which follows Russia's northern coast. China's state-owned shipping company, COSCO, sent the first multi-purpose vessel, *Yong Sheng*, through the NSR in 2013. That same year, *Nordic Orion* became the first bulk carrier to transit the Northwest Passage. For a while, it seemed like Arctic shipping could only go up, especially in Russia, where many hoped for a return to the peak Soviet levels reached in the 1980s. In 2011, Russian President Vladimir Putin suggested that the NSR could soon rival the Suez Canal (Bryanski 2011).

The excitement surrounding the sudden boom of Arctic shipping in a short span of time ignored two facts. First, smaller-scale maritime activity has been taking place for more than a thousand years in the Arctic Ocean and northern rivers and waterways. Second, the creation of a polar shortcut between Europe and Asia has repeatedly been believed to be just around the corner, well before the scientific community had extensively documented the sources and implications of climate change. A few decades ago, for instance, it was thought that new technologies like icebreakers would make regular Arctic shipping possible. In part, that was the official motivation for the controversial voyage by the USS *Manhattan* through the Northwest Passage in 1969: to find an economical route to ship newly discovered Alaskan oil to Europe (Borgerson 2008).

Even with climate change making Arctic shipping somewhat more feasible thanks to diminished sea ice extent and thickness, fully-fledged maritime industries in the circumpolar north have yet to become reality. New regulations like the International Maritime Organization's Polar Code have been enacted to govern a future of Arctic shipping that hasn't really reached full speed. Over the past few years, the numbers of ships making trans-Arctic voyages has dropped considerably, too. 71 ships transited a part of the NSR in 2013, but only 15 made a full international transit of the route beginning and ending in a non-Russian port (Moe 2017). In 2016, 19 vessels transited a part of the NSR, carrying a total of 214,500 tons—a little over 10% of the volume in 2013 (Northern Sea Route Administration 2016). Furthermore, only a reported six vessels made full international transits. On the Canadian side of the Arctic, although the government does not officially release statistics for the NWP, Hedlund (2014) estimates 18 transits in 2013, three between 2013-2014, and ten in 2014. South of the NWP, the Port of Churchill on Canada's Hudson Bay was shuttered last summer by its private operator—a bad omen for the future vitality of Arctic maritime networks.

Still, Arctic shipping deserves attention because even if it does not promise to dramatically reshape global trade networks or compete with the Suez Canal in the near future, its development could have major impacts on the northern communities close to ports, search and rescue centers, and shipping lanes, particularly in places where northern peoples hunt and fish for sustenance. The growth and decline of shipping networks anywhere in the world affects coastal settlements, but the consequences are arguably larger in a place like the Arctic, where people live in small communities of often only a few hundred to a couple thousand people and have close ties to the land, sea, and ice.

Thus, discussions of the future of Arctic maritime industries should consider both the changing geopolitics and geo-economics of the region along with the more localized impacts of polar shipping on northern communities. On the one hand, the demilitarization of the Arctic and growing international recognition of climate change has spurred the rise of global governance in the region. Countries from outside the region, such as China, South Korea, and the United Kingdom, to name a few examples, now play active roles in various forums discussing Arctic shipping, which often take place outside of the Arctic within organizations such as the International Maritime Organization. Many countries are not only interested in using Arctic shipping routes as a shortcut but also as a means of reaching northern natural resources, whether natural gas on Russia's Yamal Peninsula or iron ore in Canada. On the other hand, the Arctic is now a place where local actors are increasingly empowered. In much of North America, the recognition of indigenous land claims since the 1970s has enabled them to benefit, to varying degrees, from industrial development. The same cannot fully be said of Russia (Osherenko 1995). Yet against the backdrop of growing political power comes arguably weakening economic power as market forces, rather than governments, increasingly decide which locations in the Arctic will be connected to global shipping networks.

This brief paper attempts to address some of the five framing questions laid out at the beginning of our discussion. I first break down the different categories of Arctic shipping before recasting them in terms of their local impacts and global connections. I then illustrate how various actors on the ground, namely Arctic Indigenous Peoples, perceive the effects of changing sea ice. Finally, I propose some policy-relevant research questions for understanding the past, present, and future of Arctic shipping.

RECASTING ARCTIC SHIPPING IN TERMS OF ITS LOCAL IMPACTS AND GLOBAL CONNECTIONS

Arctic shipping is usually categorized into two categories: trans-Arctic shipping and destinational shipping (Buixadé Farré 2014). Yet the Arctic Marine Shipping Assessment (Arctic Council 2009) draws attention to two other important categories: intra-Arctic shipping, which takes place between two or more Arctic states, and cabotage, which is marine transport within a single Arctic state. These four types of Arctic shipping have differential impacts on local communities and also relate differently to global markets.

Trans-Arctic shipping involves moving cargo between Europe, Asia, and North America via the NSR or NWP. In future decades, it is possible that an over-the-pole shipping route could open up in summer, too. By 2040-

2059, Polar Class 6 vessels may be able to sail the so-called Transpolar Sea Route in September, when ice cover is at its lowest (Smith and Stephenson 2013). Other predictions estimate that all general cargo vessels could sail across the North Pole as early as 2030-2039 (Aksenov et al. 2017).

Regardless of the route taken, trans-Arctic shipping does not promise much to local communities. Similar to how high-speed rail bypasses many smaller communities between its endpoints, the idea behind trans-Arctic shipping is not so much to stop within the Arctic as to use it as a shortcut between the world's major markets. The benefits of shorter shipping routes will largely accumulate to the port cities at each end of Arctic shipping routes rather than the places in between. At the same time, ships cutting across the north could leave behind pollutants like heavy fuel oil and black carbon, which negatively affect local communities and exacerbate climate change (Corbett et al. 2010).

Destinational shipping has a much longer history in the Arctic and involves moving goods either to or from the region. For instance, minerals might be exported out of the Arctic by ship, while fuel and canned goods are imported by barge in return. Viking voyages to Greenland and Iceland in search of walrus ivory in the 9th and 10th centuries (Frei et al. 2015) fit into early versions of this practice. So did the Pomor trade, which endured between northwest Russia and northern Norway from the 18th century until the Russian Revolution. Pomor traders living around the White Sea delivered much needed grain from the Volga River basin to markets in northern Norway in exchange for salted cod and furs (Schrader 1988). Arctic destinational shipping of the past was arguably less exploitative than its iterations today, which see vast amounts of minerals dredged out of the tundra in exchange for cash that mostly flows to southern corporate headquarters. Typically, only a small proportion of revenues trickle down to local communities, where residents are more or less trapped in a situation where they must pay exorbitant prices for groceries that are flown up from the south, or barged or trucked in when possible. A further complication now is that while governments forcibly settled people into permanent communities in places like the Russian and Canadian Arctic in the twentieth century, they are no longer as politically willing or financially able to support the riverine and ocean-going cabotage networks that keep these communities afloat. For example, the disintegration of the Soviet economic system in the 1990s led to a reduction in the provisions provided to communities and industrial sites in the Russian North, which the former command economy had supported (Ragner 2000).

Intra-Arctic and cabotage shipping is rarely discussed, for state and corporate interests primarily seek ways to connect the Arctic to global markets rather than ways to foster connections between Arctic states, let alone between small and remote Arctic communities. Yet movement between northern communities has a storied past both at sea and along rivers. Records of indigenous maritime networks within the Arctic show how the Inuit in North America sailed the waters in and around the NWP, going as far west as Alaska by kayak or umiak and as far south as the Great Slave Lake on annual dogsled journeys (Sperry 2005, in Aporta et al. 2014). In Russia, Cossacks conquered Siberia from the Urals to the Pacific by moving along river portages that connected the Ob, Yenisey, and Lena rivers (Forsyth 1994). Sea otter pelts and other furs were sent via shipping routes in the North Pacific that linked northern North America and China from the 18th century onward (Orchard 2007).

Today, certain cabotage routes are in jeopardy as market forces determine which communities obtain resupplies. For instance, in 2016, Northern Transportation Company Limited, which operated crucial sealifts from Yellowknife to 12 communities in Canada's Western Arctic for 80 years, declared bankruptcy (Weber 2016). The Government of the Northwest Territories purchased the company's assets, including its shallow-water barges, for $7.5 million. Minister of Finance Robert McLeod explained, "It is the role of government to ensure that essential services are provided to residents and that the costs for providing these services are affordable...Purchasing NTCL assets was good value for money and makes sure that the marine transportation sector in the NWT will be sustained" (Government of Northwest Territories 2016). In fact, government services are often the only way that small northern communities can be sustained in the absence of market interest. If sealift were not even possible, then air shipments, which are estimated to cost 8-11 times as much in the Arctic (Department of Community and Government Services 2014), will clearly not be economically viable. The need to continue annual sealifts throughout much of the Arctic is cause for determining the appropriate role for local and regional governments in supporting cabotage shipping, along with whether interest by multinational corporations and foreign governments in fostering trans-Arctic shipping can somehow be complementary to these local needs.

MELTING ICE: A VIEW FROM THE ARCTIC

As the ice melts, year-round shipping becomes increasingly possible and corporate interest in the activity grows. While trans-Arctic shipping is not taking off as some predicted it would earlier this decade, destinational shipping is still growing as new resource deposits are developed in the North for export to southern destinations. In recent years, Norway's Goliat oil field, Russia's Prirazlomnoye oil field, and the Mary River iron ore mine in Canada have all become at least semi-operational. More natural gas and mineral deposits in Russia and Canada are slated to begin production soon, too, all of which will have to be shipped out due to a lack of railroad or road infrastructure.

The maritime industry and national governments often tout the growth of destinational shipping in the Arctic as delivering big benefits to Arctic communities. Ports can bring new jobs, both during their construction and afterwards during day-to-day maintenance and operations. More reliable supply chains may also promise more regular, cheaper delivery of goods to remote communities on the shores of the Arctic Ocean. Yet Arctic destinational shipping, especially when carried out year round, can have detrimental effects on both indigenous peoples and the environment. The Mary River iron ore mine on Baffin Island, Nunavut, Canada demonstrates how local concerns are sometimes set aside in favor of global shipping priorities. When the mine's developer, Baffinland Iron Mines Corporation, was applying for permits and licenses from the Nunavut Impact Review Board in 2007, community members were asked to submit their comments as part of the environmental review process. One resident of Igloolik, where walrus hunting provides an important source of food, drew attention to how ship noise could scare away the hefty marine mammals (Nunavut Impact Review Board 2008). His warning illustrates how the growth of Arctic destinational shipping can undermine community resilience. Noise pollution from shipping companies can deplete the availability of marine mammals such as whales, seals, and walruses, which are a vital source of protein for many coastal Arctic indigenous peoples (Lambden et al. 2007). Thus, melting ice not only complicates hunting and affects diets among Indigenous Peoples like the Inuit (Wesche and Chan 2010), but its shrinkage also makes possible an increase in industrial activities like shipping that further erode northern subsistence hunting.

In many Arctic communities, especially those where rights to land, resources, and consultation are recognized, residents yearn to foster economic growth. In theory, industrial and resource-based development can create jobs that provide wages, which under the right conditions allow Indigenous Peoples to continue their subsistence activities in their spare time as part of a mixed economy (Wolfe and Walker 1987; Poppel and Kruse 2009). When industrial development precludes the ability to continue traditional practices, however, then it follows that local support for expansion of the maritime industry can be expected to be low.

POLICY-RELEVANT RESEARCH: CONNECTING LAND, SEA, AND ICE

Arctic shipping routes are often conceived as lines that will seamlessly traverse the NSR and NWP. In some cases, ports and search and rescue facilities are brought into the planning process. There is scarce forethought, however, on how to actually develop infrastructural networks that connect the terrestrial and maritime Arctic in a way that benefits both communities and global capital, which so often provides the financing for major projects. Undertaking such an initiative requires thinking simultaneously at the local and global scales, bringing together major plans like China's Belt and Road Initiative, which recently incorporated the Arctic as one of its three maritime routes (Xinhua 2017) into discussion with community views regarding the economy and environment. From this point of departure, some potential research questions that have relevance for policy-making are:

1. What policies can enable Arctic communities to physically connect to one another and to global markets? Are there examples from history of Arctic communities that formed important hubs in vibrant maritime networks?
2. How can the growth of the polar cruise industry be directed so that it also helps to meet the needs of Arctic communities? For instance, the Norwegian Hurtigruten line ferries tourists between northern and southern Norway while also delivering mail and supplies to coastal communities. Would it be possible to replicate this across longer distances with the increasing number of cruises sailing through the Northwest Passage, for instance?
3. How can market interest in cabotage shipping in the Arctic be

encouraged or developed? Are there possibilities for public-private partnerships in this area, perhaps with indigenous corporations?

4. Now that China has officially incorporated the Arctic into its Belt and Road Initiative, how can local communities and governments make the most of possible Chinese investment into maritime infrastructure? In other words, how can those living in the Arctic make China's interest in the region work for them rather than just for Beijing?

In seeking answers to these questions, it will be important to engage stakeholders at multiple scales, from the local to the global. Public, private, and non-profit sectors should be brought into discussions, too. Scientists also have an important role to play, since their projections and models can indicate how much time policymakers have to act, whether to stabilize a port around eroding shorelines or to prepare for a seasonally ice-free Arctic Ocean.

While climate change does not make the development of a vibrant Arctic maritime industry inevitable, it does make it more possible. If shipping and other associated industries in the region grow in a haphazard, boom-and-bust way without the consultation of local, national, and global stakeholders, communities in the Arctic will likely be the ones that bear the brunt of poor planning. For the future of northern societies and environments, which are resilient but also vulnerable to rapid change, policy-relevant research that seriously considers both their needs and the demands of modern shipping is crucial. If the two sides can somehow be reconciled so that both benefit, then this would be all the better.

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PART V

ENHANCING DIALOGUE BETWEEN PRACTITIONERS AND ANALYSTS

Korean Perspectives

Jong Deog Kim and Jeehye Kim[1]

INTRODUCTION

The harsh natural environment of the Arctic has restricted human access from the south, even as the region supported an indigenous population that has been living there in relative isolation for thousands of years. As a result of this north-south isolation, there is very limited understanding about the interactions and impacts between the Arctic natural environment and various human activities, especially compared to other regions on Earth. Thus, expanding understanding and knowledge about the Arctic natural environment and its effects on human activities, and vice versa, will be very important not only for addressing current Arctic challenges but also for the sustainable future development of the Arctic.

This paper will examine how scientific capacity, which has a central role in building knowledge-based systems, is reflected and built within the Arctic Council and Arctic-related decision-making processes. We also examine Arctic scientific cooperation in Korea, and recommend ways to promote scientific and policy cooperation into the future.

ARCTIC COUNCIL AS A VENUE FOR THE DIALOGUE

There is no question that the Arctic Council is currently the most influential and effective inter-governmental forum on Arctic issues. There are six working groups within the Arctic Council, which are mandated to make recommendations and discuss action plans in their respective areas of expertise in environmental conservation and sustainable development. At the beginning of every new chairmanship, each of the working groups puts forward a working plan for the next two years, setting the agenda for particular challenges the working group plans to address. Apart from some of the projects that are led by the working group secretariat, most of them are voluntarily proposed and participated by Arctic states and permanent participants. Some projects also include participation by Observers on a limited basis.

Below is a list of 75 projects being carried out by Arctic Council Working Groups. According to the author's evaluation, many of these projects require the direct participation (H) and support (M) of scientists. In particular, there appears to be a very high need for linking scientific research with projects of ACAP, AMP, and CAFF, all of which are working groups that deal with environmental pollution, climate change and ecosystem issues arising in the Arctic.

Table V.1 Projects of Arctic Council Working Groups in 2017-2019 Work Plan[2]

WG	Project	ESEL[3]
ACAP (14)	Black Carbon Case Studies	H
	Black Carbon and Methane Emissions in the Russian Arctic – Mapping and Mitigation including Mitigation of Black Carbon and Methane emissions from APG flaring	H
	Mitigation of Methane Emissions – Syktyvkar Dyrnos Landfill Project, Russian Federation	H
	Phase out of ozone-depleting and fluorinated greenhouse gases: Fish and seafood processing factories, Murmansk Oblast, Russian Federation	H
	Pilot project for reducing CO^2 and SLCP (including black carbon, HFC) emissions on the rivers of the arctic zone of the Russian Federation	H
	Demonstration of environmentally sound destruction of obsolete pesticides (Phase III)	H
	Demonstration of management and destruction of 250 tons of PCB in transformers: Phase III	M
	Rapid Environmental Assessment	H
	Assessment and mitigations of risks from a municipal solid waste landfill in permafrost areas	H
	Promotion of decrease of Barents region pollution by introduction of best available technologies (BAT)	M
	Projects related to reduction of dioxins and furans	H
	Project related to reduction of mercury	H
	Circumpolar Local Environmental Observer (CLEO) Network for Traditional and Local Knowledge	M
	Community-Based Black Carbon and Public Health Assessment Project	M
AMAP (4)	Addressing Climate Issues	H
	Addressing Contaminants and Human Health Issues	H
	Supporting Adaptation Actions	M
	AMAP Implementation Issues	H

WG	Project	ESEL[3]
CAFF (10)	Actions for Arctic Biodiversity 2013-21: Implementing the recommendations of the ABA	M
	Continue implementation of the Circumpolar Biodiversity Monitoring Program	H
	Implementation of the Arctic Migratory Bird Initiative (AMBI)	H
	Implement the Arctic Invasive Alien Species strategy and Action plan 2017-21	H
	The 2nd Arctic Biodiversity Congress	M
	Community Observation Network for Adaptation & Security (CONAS): interim report	M
	Mainstreaming Arctic biodiversity	H
	Arctic Flora and Seabird expert groups	H
	Follow-up on the Arctic Council cross-cutting initiatives	M
	The Arctic Biodiversity Data Service (ABDS) development including cooperation on the Arctic Spatial Data Infrastructure (SDI)	M
PAME (22)	HFO Phase IV(a) – Collect and report information on use of HFO in the Arctic	M
	HFO Phase IV(b) – Collect, report and/or review information about on-shore use by indigenous peoples and local communities of HFO	M
	HFO Phase IV(c) – Prepare an information paper summarizing PAME's work on HFO	M
	HFO Phase IV(d) – Explore the environmental, economic, technical and practical aspects of the use by ships in the Arctic of alternative fuels	M
	Supporting harmonized implementation of the Polar Code	L
	Collect and summarize information on Arctic State safe and low impact marine corridor initiatives	M
	Compendium of Arctic Shipping Accidents	L
	Engagement with Observer States	M
	Update of PAME's shipping priorities and recommendations	L
	Operationalization of the Arctic Shipping Traffic Database (ASTD) System	L
	Operationalization of Arctic Shipping Best Practices Information Forum	L
	Develop an Implementation Plan for the ARIAS Strategy and Action Plan	H
	Desktop Study on Marine Litter including Micro plastics in the Arctic (Phase I)	H
	AMSP Implementation Status Report 2017-2019	M
	Preparation of Guidelines for EA/EBM Implementation in the Arctic	H
	Integrated Ecosystem Assessment of the Central Arctic Ocean	H
	Expansion and Refinement of the PAME MPA-network Toolbox	M
	Meaningful Engagement of Indigenous Peoples and Communities in Marine Activities project (MEMA) Part II Report	L
	Resource Exploration and Development Expert Group Information gathering	L
	Follow-up on the Framework Plan on Oil Pollution Prevention	H
	Good Practice Recommendations for Environmental Impact Assessment, EIA, and Public Participation in EIA in the Arctic	H
	Capacity building, information outreach and collaboration	M

WG	Project	ESEL[3]
EPPR (12)	EPPR MOSPA Exercise Planning	L
	Development of recommendations for future exercises and workshops based on the assessment of lessons learned and best practices from previous events	L
	Development of recommendations for training focus areas and training opportunities, which are listed on the EPPR website Training Portal as openly available training opportunities	L
	Follow-up activities to the Response Viability Analysis	L
	Follow-up activities and implementation of use of the Pan-Arctic Database	L
	Evaluation of exercise reports and identify lessons, develop mitigation recommendations and communicate these to the appropriate bodies	L
	Support for complementary operational forums in their action oriented efforts, such as SAR exercises	L
	Collaboration with other bodies, forums, working groups, and academia to compile, identify, analyze and disseminate pertinent recommendation and needs related to Arctic SAR issues	M
	Follow-up on the Framework Plan on Oil Pollution Prevention (FP-OPP)	H
	ARCSAFE	L
	Safety Systems in the Implementation of Economic and Infrastructural Projects	L
	Arctic Rescue	L
SDWG (13)	The Arctic as a Food Producing Region	M
	EALLU – Arctic Indigenous Youth, Climate Change and Food Culture	L
	ARENA – Arctic Remote Energy Networks Academy	L
	AREA – Arctic Renewable Energy Atlas	L
	Gender Equality in the Arctic II	L
	One Health – Operationalizing a One Health approach in the Arctic, Part 2	M
	Arctic Energy Summit 2017	M
	Good Practice Recommendations for Environmental Impact Assessment (EIA) and Public Participation in EIA in the Arctic	H
	Teacher Education for Diversity and Equality in the Arctic	L
	Arctic Generation 2030	L
	Arctic Sustainable Energy Futures Toolkit	M
	Nomadic Schools ("Children of Nomads")	L
	Solid Waste Management in Small Arctic Communities	M

Currently, as part of pursuing the abovementioned projects, there are expert groups (Table V.2) within working groups that provide much needed expert knowledge for decision-making. As shown below, the participation of scientist groups is particularly notable in ACAP, AMAP, and CAFF working groups, where the demand for expert knowledge is high. Within these working groups, expert groups on managing pollutants, climate change factors, and understanding plants and animals are established and operational. An expert group's role is to collect scientific data related to a particular project, and to provide recommendations for solving problems. In May 2017, the third legally binding Agreement on Enhancing International Arctic Scientific Cooperation was signed at the Fairbanks Ministerial meeting. It is hoped that this Agreement will spur further cooperation in the science area more broadly, and in scientific research more specifically.

Table V.2 Expert Groups in the Arctic Council Working Groups[4]

WG	Expert Group
ACAP (4)	POPs & Mercury, Hazardous Wastes, Indigenous Peoples Contaminant Action Program, Short Lived Climate Pollutants
AMAP (4)	Climate, Short-lived climate forcer-Black Carbon, Short-lived climate forcer-Methane, Arctic Ocean Acidification
CAFF (7)	Circumpolar Flora Group, Circumpolar Seabird Group, Circumpolar Protected Areas Network, Marine, Freshwater, Terrestrial, Coastal EG
PAME (7)	Shipping, Ecosystem Approach, MPA, Regional Reception Facilities, Arctic Marine Traffic Data, Marine Litter, Resource Exploration and Development
EPPR (2)	Search and Rescue, Marine Environmental Response
SDWG (2)	Arctic Human Health, Social Economic and Cultural EG

KOREA'S CHALLENGES

Government support for the development of Arctic science is a fundamental element of Korean Arctic policy. It was included as one of the core objectives in Korea's 1st Arctic Policy Master Plan, established in 2013, and receives governmental support accordingly.

In 2015 and 2017, respectively, KMI conducted a survey to find out what Korean Arctic experts thought were the long-term and short-term cooperation priorities in the Arctic. Researchers involved in Arctic-related research and those working for a polar research organization were considered "Korean Arctic experts." 32 experts responded in 2015, and there were 36 respondents in 2017.

Of the nine possible areas of cooperation, science was considered as the area with the highest long-term and short-term priority. This demonstrated broad agreement among experts that there were both long-term and short-term needs for cooperation to enhance knowledge about the Arctic through ongoing scientific research. The result also reflected expectations that scientific activities could provide a more solid platform to cooperate with Arctic states, along with the recognition that more scientific understanding about the Arctic was necessary.

Among long-term cooperation priority areas, the area that showed the biggest difference in 2017 compared to 2015 was "cooperation in shipping and logistics," and "cooperation for environmental protection." This is possibly due to the fact that, as a nation with a reliance on shipping for 99.7 percent of its trade, exploration of new shipping routes through the Arctic could have direct consequences for national competitiveness.

Regarding short-term priorities for areas of cooperation, most respondents selected science cooperation, shipping and logistics, and Arctic Council cooperation. It is worth noting that considering the lack of awareness among most experts of the importance of scientific knowledge in the Arctic Council's decision-making processes, cooperation in science and

Table V.3 Results of the Survey on Arctic Cooperation in Korea[5]

Questions	2015	2017
Long Term Priorities in the Arctic Cooperation		
1. Climate Change	11.0%	11.4%
2. Environmental Protection	6.0%	10.0%
3. Science Cooperation	19.0%	20.0%
4. Technology and Equipment Development	13.0%	11.4%
5. Arctic Shipping and Logistics	13.0%	20.0%
6. Resource Development	15.0%	11.4%
7. Fisheries Cooperation	3.0%	0.0%
8. Indigenous Group Cooperation	5.0%	1.4%
9. Arctic Council	15.0%	14.3%
Urgency for Cooperation	**Full Marks 7.0**	
1. Climate Change	4.6	5.1
2. Environmental Protection	4.7	4.6
3. Science Cooperation	5.7	5.4
4. Technology and Equipment Development	5.3	5.2
5. Arctic Shipping and Logistics	5.6	5.4
6. Resource Development	5.1	4.9
7. Fisheries Cooperation	5.0	4.6
8. Indigenous Group Cooperation	4.5	3.9
9. Arctic Council	5.8	5.4

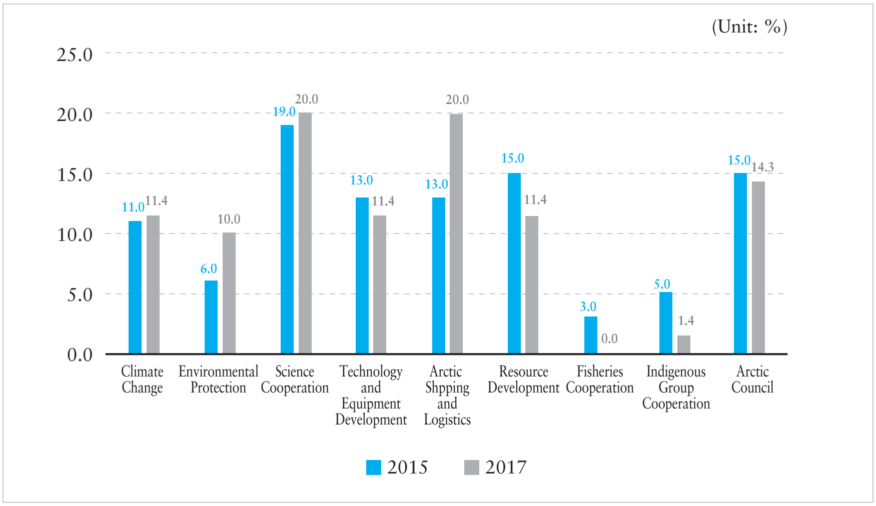

Figure V.1 Long-Term Priorities in Arctic Cooperation

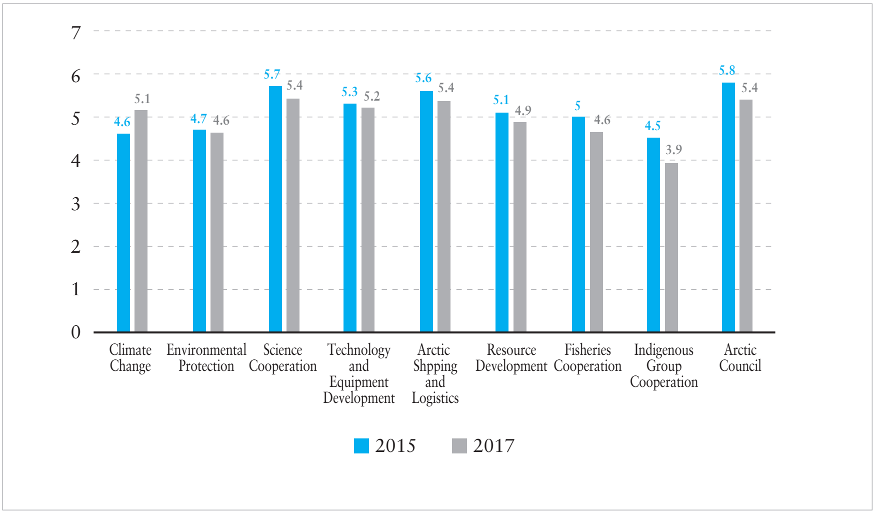

Figure V.2 Urgency for Cooperation

the Arctic Council still ranked high.

It is interesting that the percentage of respondents that selected areas related to economics, (numbers 4, 5, 6, and 7) decreased from 44.0 percent in 2015 to 42.8 percent in 2017, whereas those that selected science relevant areas (numbers 1, 2, and 3) significantly increased, from 36.0 percent to 41.4 percent. It is assumed that this result derives from increasing awareness of climate change issues, and emerging research that proves a positive correlation between Korea's winter climatic conditions and that of the Arctic.

Despite the recognition by many experts on the need for scientific research cooperation, Korea's Arctic-related science research is not yet sufficient to be able to cooperate or link with Arctic Council working group projects that are central to decision-making.

This is partly because of the limited role of Arctic Council Observers, but also because of the lack of framework for promoting mutual cooperation among scientists in addressing Arctic Council challenges. Although exploring scientific knowledge should be linked with efforts to address challenges faced by the Arctic Council, various Arctic science activities pursued by Observers, including Korea, have not developed in ways that effectively help share that information to address these challenges.

Table V.4 Major Scientific Research Projects Related to the Arctic in Korea[6]

Institute	Research projects
KOPRI	Research on analytical techniques for satellite observation of Arctic sea ice
	Development and Application of the Korea Polar Prediction System (KPOPS) for Climate Change and Disastrous Weather Events
	Early animal evolution and the primitive Earth system of north Greenland
	Carbon assimilation rate of sea ice ecosystem in the Kongsfjorden MIZ, Arctic
	Korea-Arctic Ocean Observing System (K-AOOS)
	Investigation of submarine resource environment and seabed methane release in the Arctic
	Arctic permafrost environment change monitoring and prediction method developments
	Changes in environments and coastal geomorphology of Svalbard fjords, Arctic
KRISO[7]	Safety support system for Arctic Sea Navigation
GIST[8]	Study on the Aerosol in the Arctic Sea
YS Univ[9].	Research on Arctic Ozone hole and climate change
	Study on the inter-relation between cryosphere and climate
	Study on the sudden stratospheric warming (SSW) in the Arctic
ITC[10]	Development of evaluation of safe speed in the ice covered water

As shown in Table V.4, there are many Arctic science research projects in Korea that could be linked or complement Arctic Council working group projects. Thus, Korea should consider expanding science cooperation with the Arctic Council, and this increased cooperation should be considered when establishing the second Arctic Policy Master Plan in 2018.

FUTURE CHALLENGES

A methodological and cooperative scientific research program investigating the Arctic's dynamic environment will provide the most important basis for tackling challenges facing the Arctic. It is critical to establish a mechanism to collect comprehensive scientific information provided by Arctic Council states as well as Observers, in order to obtain and provide scientific information needed for Arctic Council working group projects, so more effective solutions to Arctic challenges could be found. For this to happen, connections between the political agenda of the Arctic Council and national Arctic science research agendas need to be reinforced, as well as efforts to strategically make Arctic science investments. This is something that should be discussed at NPAC, as it is a forum where lively debate between scientists and policymakers can take place.

Although there are expert groups within each of the individual Arctic Council working groups, in order to promote the use of Arctic scientific knowledge as a basic tool for decision-making, we propose the establishment of a science consultation group that supports the entire Arctic Council and makes sure that updated science information is considered in Arctic Council decisions. In addition, establishing and operating an information-sharing system on Arctic science could also be considered.

Expanding Central Arctic Ocean research and cooperation is one of the important challenges that needs to be addressed in the future. The idea of creating increased research cooperation mechanisms among research icebreakers owned by both Arctic and Observer states should be carefully considered. This is because research icebreakers that can travel through ice-covered waters are necessary to conduct surveys in the Central Arctic Ocean. At the moment, most of the international cooperation facilitated by research icebreakers is done at the researcher level. However, if observation areas and categories are effectively shared through a cooperative framework that targets the entire Central Arctic Ocean, a comprehensive platform for securing scientific information about the Central Arctic Ocean could be greatly enhanced.

Since 2014, Korea has considerably expanded its participation in Arctic Council working group activities. The Korea Arctic Experts Network (KAEN), which consists of about 50 South Korean experts from some 30 institutions including government ministries, provides the platform for sharing agendas being discussed at Arctic Council working groups and for communication between scientists and policy-makers. In addition, about 30 research institutions, universities and companies formed the Korea Arctic Research Consortium (KoARC) in 2015, and work is currently underway to develop a 2030 Arctic research roadmap with sub-committees such as science, industry and policy. Korean experts will utilize these two frameworks to facilitate understanding of the various Arctic Council projects. If needed, a research plan will be developed to promote utilization of scientific findings by Korean experts to Arctic Council working group projects. Ultimately, we seek to develop a model that promotes the collection of scientific knowledge with Arctic Council cooperation, and then uses that data to inform mid-to-long term national policy by incorporating objective information into the national level inter-ministerial Arctic Policy Master Plan.

Notes

1. We are grateful to Hyoung-Chul Shin, Director of Strategy and Cooperation Division, Korea Polar Research Institute (KOPRI), for his invaluable comments and suggestions.
2. https://www.arctic-council.org/index.php/en/.
3. https://www.arctic-council.org/index.php/en/.
4. Conducted by Korea Maritime Institute in 2015 and 2017.
5. Information from KOPRI and KoARC (Korea Arctic Research Consortium)
6. Expected Science Engagement Level.
7. Korea Research Institute of Ships and Ocean Engineering.
8. Gwangju Institute of Science and Technology.
9. Youngsan University.
10. Inha Technical College.

Four Impacts from the China-Nordic Arctic Research Center

Yang Jian

In December 2013, after China was granted observer status in the Arctic Council together with five other countries, the China-Nordic Arctic Research Center (CNARC) was established with joint efforts by Nordic and Chinese research institutes. Since then, CNARC has evolved from a nascent and immature conception to a real and functioning entity that will eventually develop into a full-fledged platform for academic exchanges between China and Nordic countries. The development and potential of CNARC has attracted attention from other Arctic and non-Arctic countries, marking a highlight of international cooperation on Arctic issues since 2013.

CNARC currently has 14 member institutes: University of Lapland (Finland); Fridtjof Nansen Institute (Norway); Icelandic Center for Research (Iceland); Nordic Institute of Asian Studies (Denmark); Norwegian Polar Institute (Norway); Swedish Polar Research Secretariat (Sweden); The Arctic University of Norway-UiT (Norway); The University of Akureyri (Iceland); Ocean University of China; Polar Research Institute of China; Shanghai Institutes for International Studies (China); Shanghai Jiao Tong University (China); Tongji University (China); and Dalian Maritime University (China). Moreover, a growing number of representatives from non-CNARC members, including scholars from Canada, Russia, South Korea and other countries, also attended CNARC's annual academic symposium.

After five years of development, CNARC has produced four clear results. First, knowledge about governance structures has expanded from Arctic countries to non-Arctic countries. Second, the Chinese government has adopted the concept of "governance" to apply to its Arctic cooperation. Third, Chinese media and businesses have begun taking concrete actions to practice the concept of governance. Fourth, China's positive role in Arctic governance is gradually being acknowledged.

BUILDING EPISTEMIC COMMUNITIES: EXTENDING KNOWLEDGE FROM NORDIC COUNTRIES TO CHINA

China is a non-Arctic country. However, it is closely related to the Arctic region in terms of environment, climate change, economic development, resource utilization, scientific research and more. International cooperation in Arctic research is an important way for China to understand the dynamic Arctic situation.

The Nordic region includes five independent countries: Denmark, Finland, Norway, Iceland, and Sweden. It is a community characterized by "unity with diversities and diversities with unity." The five countries share interests in Arctic security, economic development, environmental protection, and other issues like the rights of Indigenous Peoples. For China, the Nordic region plays a role as a center of Arctic knowledge and experience. Therefore, China has far-reaching prospects for cooperation with the Nordic countries in Arctic scientific research and sustainable development.

"Epistemic community" includes knowledge authorities and expert members from different disciplines and different academic backgrounds. Its members share a set of common beliefs, ideology, values, norms and principles. Based on scientific evidence and practice, this epistemic community establishes a set of consensus agreements regarding the knowledge base describing the causal relationship of core issues affecting the region. This consensus can help establish a link between governance policies and expected governance outcomes.[1] To realize the goals of governance and promote the welfare of humanity, the epistemic community champions best practices by working to influence society and policymakers.

Arctic countries, especially the Nordic countries, have vast experience in the region and have developed an accumulated body of knowledge about climate change, dynamic ice conditions, and the internal connection of Earth's systems. Chinese environmental scientists have joined global projects on the Arctic and contributed in some fields. However, in seeking ways to utilize scientific evidence to support policy decisions, there seemed to be a lack of a bridge between Chinese environmental scientists and Chinese policy makers. Chinese environmental scientists felt that government departments in China lacked clarity about how to support Arctic projects. The government thought that some scientists had offered fragmented portrayals regarding the Arctic's importance.

Under such circumstances, the Polar Research Institute of China (PRIC), led by Dr. Yang Huigen, established a department for strategic studies inside PRIC. This department plays an important role as a node in a social science network that attracts many social scientists (including international law, international relations, environment politics, global governance, maritime economy, and Indigenous People's studies) into studies on the Arctic and Antarctica.

CNARC facilitates China-Nordic cooperation in the following ways: 1) carrying out joint research projects in accordance with research themes with respect to Arctic climate change, Arctic resources, shipping and economy, as well as Arctic policy-making and legislation; 2) developing Arctic research networks and frontiers by providing opportunities for Chinese and Nordic scholars to conduct Arctic research through fellowship programs; 3) convening regularly with the China-Nordic Arctic Cooperation Symposium and at other workshops; and 4) facilitating information sharing and cultural exchanges between China and Nordic countries in an Arctic context.[2]

In its five years of operation, CNARC has worked to develop a long-term mechanism for Arctic governance. It focuses on building a diversified, efficient, and open Arctic academic exchange network by means of academic conferences, economic roundtables, visiting scholars and academic exchange. CNARC connects the two academic networks from the Nordic countries and China, allowing the epistemic community on Arctic governance to rapidly spread from Nordic academia to academia in China. The platform also connects to government agencies through conferences and research reports. In addition, it further connects the media, the shipping industry and the tourism industry through the extension of the CNARC platform, "Economic roundtable."

THE CHINESE GOVERNMENT ADOPTED THE CONCEPT OF "GOVERNANCE" IN ARCTIC COOPERATION

Although some Chinese scholars have discussed the issues for many years, the concepts of "Arctic governance" and "global governance" were not adopted in official Chinese government documents. China's official documents and speeches by Chinese leaders mentioned little about global governance and Arctic governance. With regard to Arctic issues, Chinese government policy for many years has been to place more emphasis on bilateral cooperation rather than multilateral alliances, and more attention was paid to intergovernmental mechanisms rather than multi-stakeholder approaches.

There is a growing awareness that Arctic governance is inextricably linked to global climate change trends. As such, the Chinese government began to embrace the concept of climate global governance several years ago. At the annual academic symposium at CNARC, scholars from China and Nordic countries discussed many issues of Arctic governance, as well as the path and role of China's participation in Arctic governance. Some scholars also published books and articles on Arctic governance, which contributed to linking the Arctic with climate change, as well as linking Arctic development with Arctic governance.[3]

In recent years, in some speeches by representatives of the Chinese government, positive attitudes towards global governance and Arctic governance have systematically emerged. In January 2017, President Xi Jinping pointed out in his speech at United Nations Headquarters in Geneva that all nations in the world should actively strengthen global governance. In order to make polar regions and other new spaces a place for cooperation between the parties rather than competing arenas, he suggested following the principles of sovereignty, peace, benefit-to-all and joint governance.[4]

At the third *Arctic Circle* forum in 2015, Chinese Vice Foreign Minister Zhang Ming mentioned in particular the need to maintain an Arctic governance system based on existing international law. China supports the promotion of Arctic governance within the framework of existing international law, supports the Arctic Council as an important mechanism in Arctic governance, and supports international maritime organizations and other international platforms to play an active role in Arctic governance.[5] Mr. Wang Yang, Chinese deputy prime minister, said at the Russian International Arctic forum *Arctic - Territory of Dialogue* that the Chinese government is ready to promote and improve the multilateral governance of the Arctic, and actively carry on international cooperation at multiple levels and within a wide range of issues to achieve mutual benefit and win-win results.[6]

Mr. Xu Hong, director of the Department of Treaty and Law of the Ministry of Foreign Affairs, published an article in 2017 entitled, *Arctic Governance and Chinese Participation*.[7] In his article, he confirmed that Arctic governance has formed a "*global-regional-national*" three-level pattern with multi-stakeholder participation. According to his view, the main contribution of China's participation in Arctic governance should include: (1) playing a positive role in Arctic governance through constructive participation in global governance; (2) actively contributing to the governance of the Arctic region; (3) steadily deepening bilateral cooperation with Arctic countries; (4) attaching importance to the positive interaction among the Arctic Council, observer countries and stakeholders; and (5) continuously working with other stakeholders to contribute Arctic governance.

It is inseparable from the ongoing communication efforts of CNARC that the Chinese government understands and supports Arctic governance, particularly its commitment to climate change and environmental issues, and its recognition of the important role of multiple stakeholders. Director Xu Hong praised the special contribution of CNARC, saying that CNARC is moving towards to "a long-term mechanism." The Chinese government supports academic exchanges with think tanks from Arctic countries. On May 25, 2017, Vice Foreign Minister Wang Chao met with Mr. Dagfinn Høybråten, Secretary General of the Nordic Council of Ministers. Mr. Wang and Mr. Høybråten clearly put forward five platforms for strengthening bilateral cooperation, one of which is to carry out the Arctic governance based on the CNARC platform.[8]

CNARC ROUNDTABLE: GOVERNANCE RESPONSIBILITY EXPANDING FROM THE ACADEMIC COMMUNITY AND GOVERNMENT TO THE BROADER SOCIETY

The China-Nordic Arctic Research Center (CNARC) Roundtable is a series of meetings for invited scholars, scientists, business leaders and policymakers to focus on an Arctic topic of economic and/or cultural significance. The aim of the CNARC Roundtable is to promote Chinese-Nordic social, economic and cultural Arctic cooperation. It has been hosted on five previous occasions in conjunction with the China-Nordic Arctic Cooperation Symposium: in June 2013 in Shanghai at the establishment of CNARC; in June 2014 in Reykjavik, Iceland, regarding China-Iceland Arctic economic cooperation; in May 2015, on Arctic Shipping in Shanghai; in May 2016, on Arctic Sustainable Tourism in Rovaniemi, Finland; and in May 2017, on Arctic Shipping and Port Cities in Dalian. After five years' practice, the CNARC Roundtable mechanism is maturing. High-level influencers on Arctic affairs have attended all Roundtable events, including those from industry, media, government and academia—from the Nordic countries, China, Russia, South Korea, and other stakeholders.

These kinds of exchanges help participants to understand Chinese and Nordic countries' Arctic policy to promote sustainable social, economic, and cultural activities, but also ensures successful cooperation. Fruitful outcomes have been accomplished, such as in the summer of 2016, when the CNARC Roundtable was held in Rovaniemi, Finland with a theme of "Arctic Sustainable Tourism." Since the Roundtable, there has been frequent and substantial tourism cooperation between Chinese and Finnish tourism companies, who were also participants in the roundtable.[9] In November the same year, "Baidu.com, Inc" announced the establishment of a strategic partnership with tourism bureaus from four Nordic countries. Through the sharing of resources to carry out operational activities to promote joint data exchange, Baidu Maps have also greatly enhanced Chinese tourists' travel experience in Nordic countries. This also promotes the sustainable development of the local tourism industry in Nordic countries.

On the occasion of the 40th Antarctic Treaty Consultative Meeting held in Beijing, echoing China's endeavor in sustainability, China's industry leaders in polar tourism launched the *Initiative for Responsible Travel in the Polar Regions*, which unites various relevant players to promote sustainable development in China's tourism industry and sustainable consumption among Chinese citizens.[10] The core initiator, Mr. Gao Jie from Shanghai China Travel International Co., Ltd has contributed to CNARC roundtables three times and bears substantial credit for ensuring and instilling a sense of environmental protection in the discussions. Mr. Gao hopes to improve Chinese travelers' understanding of global climate change, increase environmental awareness, change consumer habits, and promote sustainable development.

BUILDING UP CHINA'S POSITIVE IMAGE IN ARCTIC AFFAIRS

One of the aims of CNARC is to build a pluralistic, multilateral, pragmatic and open platform for cooperation in the field of Arctic social science research, as well as a network of scholars to promote awareness, understanding and knowledge of the Arctic and its global impact. CNARC was built to explore the frontiers of Arctic research, to carry out joint research on major international Arctic issues, to promote sustainable Arctic development in the global sense, as well as enhancing cooperation between China and the Nordic countries.

Before a CNARC cooperation mechanism was formed, some Arctic scholars, including Nordic scholars and local public opinion, expressed great concern about China's participation in Arctic affairs. Some studies tended to take China's rise as evidence that China was not content with the status quo and described China as a force trying to change the existing Arctic system.

Some studies suggested that cooperation between China and Arctic countries is only a cover for China's geopolitical purposes and for acquiring energy resources. Some media also published articles saying that China's investment in Greenland and other places was an attempt to control Greenland's rare earth resources. Some articles stated that China's investment in the Arctic economic activities would inevitably bring about negative impacts, such as environmental degradation and an influx of foreign labor. This kind of negative public opinion is not conducive to China's participation in Arctic cooperation.

CNARC, based on the linkage between Chinese and Nordic think tanks, tries to make the two sides aware of the great potential of China-Nordic cooperation through symposia, academic visits and dialogue. From the point of view of Chinese scholars, we hope that the Nordic institutions and their researchers can understand more about China's positive role in Arctic affairs, as well as the opportunities accessible to all sides for thoughtful Arctic development.

Of course, these Arctic countries' concerns cannot be completely eliminated in the short term. Therefore, it is crucial to continue the ongoing exchange in the process of growing trust and cooperation. Indeed, in the last two years, governments and scholars from the Nordic countries have viewed China more objectively and gently. The importance attached to China's participation in the Arctic Circle in Iceland, the Arctic frontier in Norway, and Arctic-Territory of dialogue in Russia can be demonstrated. In addition, Chinese President Xi Jinping held talks with the leaders of Denmark, Norway, and Finland in 2017, and the leaders of all sides spoke very positively about bilateral cooperation in Arctic governance.

Besides China and the Nordic countries, the CNARC symposia have also drawn wide attention from other Arctic countries and countries outside the arctic. CNARC has attracted scholars and diplomats from Russia, Canada, the United States, Singapore, and South Korea, to name a few. The operation of CNARC has encouraged other Arctic countries to seek contacts with China with regard to Arctic affairs, and has facilitated policy coordination with Japan, South Korea and other Asia and Pacific countries on Arctic affairs.

Table V.5 The China-Nordic Arctic Cooperation Symposia

1	June 2013	Shanghai, China	Chinese-Nordic Cooperation for Sustainable Development in the Arctic: Human Activity and Environmental Change
Sessions		1. Arctic Shipping and Resource Exploration 2. Arctic Policies and Governance 3. Climate Change and the Arctic in the Anthropocene	
2	2-5 June 2014	Akureyri, Iceland	North meets East
Sessions		1. Arctic Policies and Governance 2. Arctic Policies and Economy 3. Arctic Policies and Maritime Cooperation	
3	May 2015	Shanghai, China	Arctic Synergies: Policies and Best Practices
Sessions		1. Impact of Scientific Developments on Arctic Strategies 2. The Framing and Implementation of Arctic Policies 3. Legal Aspects in the Arctic Governance 4. Arctic Geopolitics and Security 5. Trans-Arctic Synergies in Economic Development	
4	6-9 June 2016	Rovaniemi, Finlan	The Sustainable Arctic - Opportunities and Challenges of Globalization
Sessions		1. Arctic sustainability 2. The Global Arctic: Globalization and the Arctic 3. China, Nordic countries and the Arctic 4. Arctic tourism	
5	May 26, 2017	Dalian, China	Towards the Future: Trans-regional Cooperation in the Arctic: Development and Protection
Sessions		1. Europe-Asia Connectivity: Promoting the Potential Utilization of Arctic Sea Route 2. Arctic Shipping: Safety and Synergy 3. Trans-Arctic Interactions and Compatibility of Arctic Strategies and Policies 4. Geopolitical Development of the Arctic in the Changing World 5. Arctic Sustainability: Climate Change, Indigenous Communities and Eco-tourism 6. Exploring the Way forward in Arctic Ocean: Scientific Cooperation and Fishery Governance	

Source: the website of the CNARC.https://www.cnarc.info/

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Evidence for Informed Decision-Making to Achieve Arctic Sustainability

Paul A. Berkman

This paper responds to an interest from the North Pacific Arctic Conference (NPAC) in "evidence-based decision-making and the best way to encourage communication between knowledge producers and policy-makers" for this year's discussions about *Building Capacity for a Sustainable Arctic in a Changing Order*, convened at the East-West Center in August 2017.

Arguably, all government decisions are based on evidence, begging questions about which decisions are not based on evidence and why. Either way, the apex goal simply is contribute to informed decision-making.

DECISION-SUPPORT PROCESS

Rather than thinking about "evidence-based decision making as a communication issue between knowledge producers and policymakers," which seems reactive to current events, this paper will consider the development and applications of evidence for decisions that will need to operate across generations to achieve Arctic sustainability. Context of these Arctic decisions is global, recognizing that we live in an interconnected civilization on a planetary scale, as revealed unambiguously by the two "World Wars" of the 20th century (Figure V.3), unlike any preceding century since continuous human calendars emerged around 6000 years ago.

First, for clarification, data and evidence are not the same (Figure V.4). Data is generated from information and observations to answer specific questions, posed with methods from the natural and social sciences as well as indigenous knowledge. These data reveal patterns and trends in our societies and natural world, underscoring the evidence that is available for decision-making to address impacts, issues and resources within, across and beyond the boundaries of nations—recognizing that nations remain the principal jurisdictional unit.

In the international context of the Arctic, especially in the Arctic Ocean where questions extend across and beyond national jurisdictions with

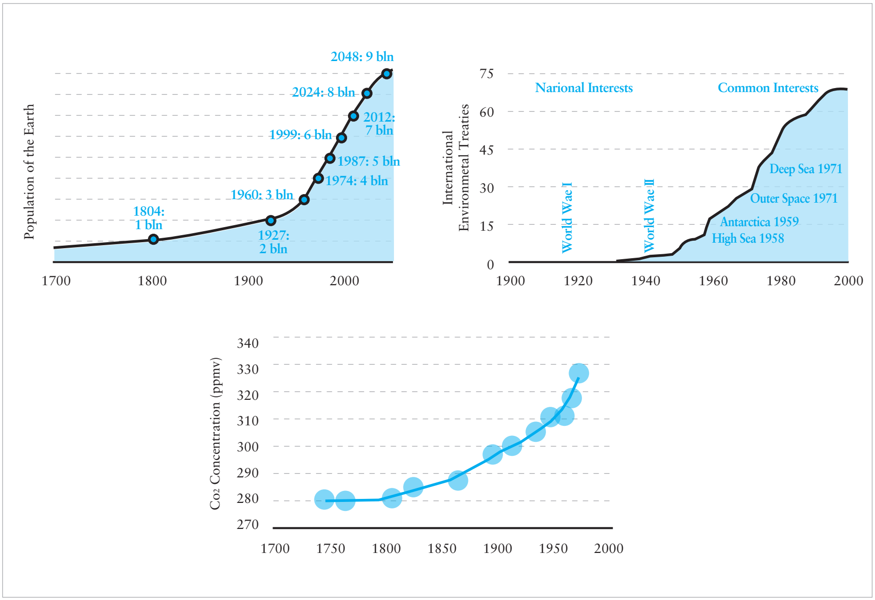

Figure V.3 Human population growth is at the root of the challenges we now face as a globally interconnected civilization. The first billion people alive on Earth at the same time happened around 1800, at the start of the Industrial Revolution, underscoring necessity as the mother of invention. In the first half of the 20th century, during the period of two World Wars, human population growth accelerated past two billion people. This period is characterized by national interests in contrast to the second half of the 20th century, when nations increasingly developed international legal institutions to address issues across as well as beyond sovereign jurisdictions in view of their common interests. Throughout, the exponential growth of humans – projected to approach eight billion people by the end of this decade – as well as our activities and by-products, have increasingly influenced Earth's climate, as reflected by atmospheric carbon-dioxide concentrations on a planetary scale.

increasing frequency, diverse perspectives are involved. Biological, chemical, physical, and geologic data are collected to interpret dynamics and features of natural systems, in which humans are a keystone species. Health, education, trade, and other demographic data are collected to interpret the well-being of societies. These biophysical and socio-economic data come from indigenous knowledge as well as the natural and social sciences, indicating that evidence for decisions is international and interdisciplinary in the Arctic.

Options (Figure V.4), which can be used or ignored explicitly, are integrated from the evidence. Such options can be introduced to decision-makers without advocacy, unlike recommendations that involve advocacy and agendas, whether perceived or actual. This distinction between options and recommendations is important to avoid the politics that materializes when two or more agendas exclude each other.

However, informed decision-making (Figure V.4) also implies inclusion through an inquiry process that is iterative in relation to changing circumstances in our world (Figure V.5). With questions from the natural and social sciences as well as indigenous knowledge—across all silos, inclusively—as an umbrella concept, science can be defined as the study of change.

Figure V.4 *Inquiry Pyramid, starting with questions framed from information and observations into data that can be distilled as evidence for decisions. The difficulty is to integrate the evidence into options (without advocacy), which can be used or ignored explicitly, contributing to informed decisions. In the Arctic, the options involve built elements and governance mechanisms that underlie sustainable infrastructure development. Anywhere in the pyramid can reveal new questions. From Berkman et al. (2017a).*

Figure V.5 *Decision-support process to integrate evidence from the natural and social sciences as well as indigenous knowledge regarding impacts, issues and resources within, across and beyond the boundaries of nations on Earth. The process is intended to be holistic (international, interdisciplinary and inclusive), delivering options (without advocacy) that can be used or ignored explicitly, contributing to informed decision-making (Fig. V.4) across jurisdictions over time. From Berkman et al. (2017a).*

Inclusion in this iterative process of investigation (Figure V.5) further involves three general types of information to integrate: stakeholder perspectives; time-space evidence; and governance records. Compared to international and interdisciplinary actions, inclusion is the most difficult aspect of this holistic process.

Stakeholder perspectives are complex, especially to be inclusive of multiple perspectives and worldviews. As a strawman to elaborate, Figure V.6 distinguishes two general classes of stakeholders: rights-holders and interested parties. Rights-holders define the decision-making processes, as do decision-makers who are imbued with authorities through their relative institutions, recognizing jurisdictions overlap from local to global scales with diverse legal and financial dimensions. Interested parties include those with recognized competence, who can help reveal options that contribute to informed decision-making (Figures V.4 and V.5), as well as others who are self-identified.

Clearly, all four million residents of the Arctic are rights-holders at one jurisdictional level or another with regard to the Arctic as a special place on Earth, especially for Indigenous Peoples who have inhabited the region for millennia. In addition, under the international legal framework of the law of the sea, all nations have rights and responsibilities in the Arctic Ocean beyond sovereign jurisdictions. In particular, this includes the "High Seas"

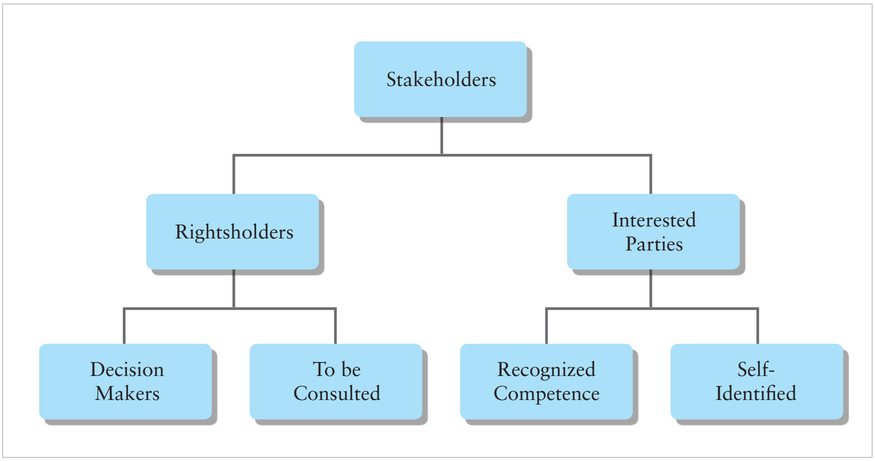

Figure V.6 For definitions, this stakeholder hierarchy represents the decision-making capacities of diverse audiences inclusively concerned with issues, impacts and resources within, across and beyond national jurisdictions. This hierarchy recognizes that all rights-holders are stakeholders, but not necessarily vice versa.

(which will remain fixed in relation to coastal baselines beyond the 200-mile limits of "exclusive economic zones") and in the "Area" (which likely will decrease in coverage in the deep sea after decisions and agreements about extended "Continental Shelf" limits).

In the Arctic Ocean, the high-level significance of data and evidence (Figure V.4) is complemented by Part XIII of the 1982 United Nations Convention on the Law of the Sea (UNCLOS), which is devoted to "Marine

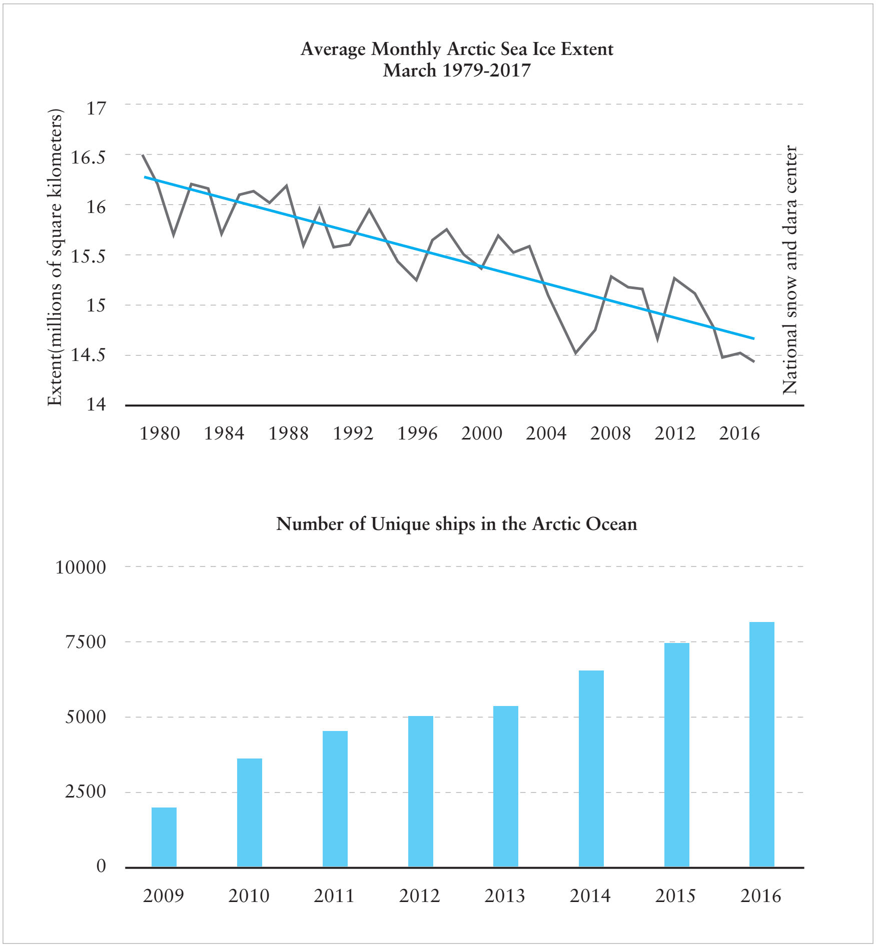

Figure V.7 Satellite Data North of the Arctic Circle Showing: (left) decreasing sea-ice area in March from 1979-2017, measured by the National Snow and Ice Data Center; and (right) increasing number of unique ships from 31 August 2009 to 31 December 2016, measured by the Automatic Identification System with each ship having its own Maritime Mobile Service Identity (unpublished).

Scientific Research." The *Agreement on Enhancing International Arctic Scientific Cooperation* (2017 *Science Agreement*), which just was signed in May 2017 by foreign ministers from the eight Arctic states and Greenland as well as the Faroe Islands, further emphasizes the "importance of using the best available knowledge for decision-making" to maintain "peace, stability and constructive cooperation in the Arctic." These are examples of governance records, in the vernacular of an archive, representing primary sources and authentic transactions of governments.

Integrated with data, governance records define the evidence that ultimately will be crafted into options to inform decisions. Consider application of UNCLOS and the 2017 *Science Agreement* in relation to data about decreasing sea ice and increasing ship traffic in the Arctic Ocean, objectively defined as north of the Arctic Circle (Figure V.7). For the benefit of all, what are the options to address transformative change in the Arctic Ocean, as revealed by these biophysical and socio-economic data independently?

To address changes in the Arctic Ocean (Figure V.7), it is necessary to recognize that options involve a combination of fixed, mobile, and other built assets that require capitalization and technology (including communications, research, observing and information systems) in addition to regulatory, policy, and other governance mechanisms (including insurance). Informed decision-making involves built assets and governance mechanisms, which are required together for sustainable infrastructure development to achieve Arctic sustainability.

SCIENCE DIPLOMACY

The environmental state-change in the Arctic Ocean is creating immediate economic opportunities along with ecosystem risks (Figure V.7), where "eco" is taken to be the home for all flora and fauna in the Arctic. The innovation required is to balance economic prosperity, environmental protection and societal well-being. These three pillars of sustainability further involve stability, balancing urgencies of the moment and of future generations. The scope of sustainability is emphasized, recognizing that children born today will be alive into the 22nd century. Consequently, options for informed decisions must operate across a continuum of urgencies from security time scales to sustainability time scales (Figure V.8).

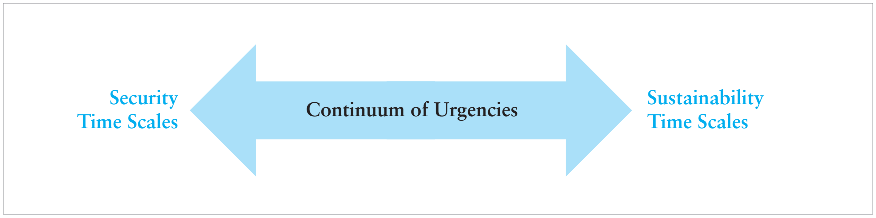

Figure V.8 In our globally interconnected civilization today, there is a "continuum of urgencies" that exists simultaneously across security time scales (mitigating risks of political, economic and cultural instabilities that are immediate) and sustainability time scales (balancing societal, economic and environmental elements across generations) that must be addressed by nations and peoples individually and collectively. From the Berkman et al. (2017b).

Heralded in 1987 by Mikhail Gorbachev, the roots of an "Arctic Research Council" enabled nations and Indigenous Peoples to define "common Arctic issues"—initially sustainable development and environmental protection—as memorialized in the 1996 *Declaration on the Establishment of the Arctic Council*. This history of science diplomacy in the Arctic underlies the holistic process (Figure V.5) to balance national interests and common interests for the benefit of all on Earth, where lessons and precedents from the Arctic have global relevance.

However, before national interests and common interests can be balanced, it is first necessary to build common interests, which is the primary contribution of science diplomacy, recognizing that nations will always first and foremost look after their national interests. With inclusion, in a scalable manner, the elements of science diplomacy (Table V.6) underlie societal actions to address issues, impacts and resources with urgency (Figure V.8).

From 1996 to the present, the six working groups of the Arctic Council have provided scientific assessments that relate sustainable development from different perspectives. However, with the environmental state-change in the Arctic Ocean (Figure V.7), the elements of science diplomacy (Table V.6) will increasingly contribute to evidence and options for investment and implementation decisions in the Arctic, all of which are focused on sustainable development for the moment.

The assessment-to-implementation transition effectively began in 2006 at the start of the Norwegian Chairmanship of the Arctic Council, when Norway became the first among all of the Arctic states and then non-Arctic states to craft national security policies for the Arctic. Presumably,

Table V.6 *Elements of Science Diplomacy**

Science as an essential gauge of changes over time and space (providing perspective for informed decision-making)
Science as an instrument for Earth system monitoring and assessment (revealing insights for sustainable development)
Science as an early warning system (relating to security and well-being)
Science as a source of invention and commercial enterprise (enabling business and societal transformations)
Science as a determinant of public policy agendas (underscoring the allocation of government resources and assets)
Science as an element of international institutions (facilitating cooperation, coordination and consistency among nations)
Science as one of the "subsidiary means for the determination of rules of law" (International Court of Justice)
Science as a source of continuity in our civilization (built on an evolving foundation of prior knowledge)
Science as a tool of diplomacy (fostering inclusive dialogues among allies and adversaries alike)

* Compiled and elaborated from Berkman et al. (2009).

the transition also was influenced by other factors as well: the Russian flag planting at the North Pole and first "sea-ice minimum" in 2007; as well as the 2007-2009 International Polar Year and 2008 *Ilulissat* Declaration. Whatever the reasons, at the end of the Norwegian chairmanship in 2009, the Arctic Council Ministerial Meetings elevated from mid-level diplomats to foreign ministers, changing the import of their declarations that have since referred to "peace" or "peaceful" with the operation of "task forces."[1]

With $1 trillion in investment anticipated over the next couple decades, progress to implement sustainable infrastructure development in the Arctic is demonstrated by the emergency-response agreements signed by the eight Arctic states in conjunction with the Arctic Council Ministerial Meetings: the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*; and the 2013 *Agreement on Cooperation on Marine Oil Pollution, Preparedness and Response in the Arctic*. Creation of the Arctic Economic Council in 2013 as well as the Arctic Coast Guard Forum and Arctic Offshore Regulators Forum in 2015—all of which now rotate with Arctic Council chairmanships—further reveal tangible steps to achieve Arctic sustainability.

Recognizing that infrastructure development will happen within regions of the Arctic Ocean, the next step would be to develop a network of Arctic regional investment initiatives, contributing to their sustainability both individually and collectively. The challenge is to transform the investments anticipated during the next couple decades into Arctic sustainability across the 21st century and beyond. Questions, data, evidence and options that contribute to informed decision-making (Figure V.4) are critical for this journey, progressing into the distant future with the vision and wisdom of the *United Nations Sustainable Development Goals* well after the 2030 Agenda.

CONCLUSION

Signing of the 2017 *Science Agreement* reflects the high-value of science diplomacy (Figures V.4 and V.5; Table V.6) as an holistic process that contributes to informed decision-making to balance national interests and common interests for the benefit of all on Earth across generation (Figure V.3; Berkman et al. 2017a). In practice, science diplomacy and the decision-support process are one and the same, revealing an architecture to operationalize sustainable infrastructure development in the Arctic with informed decisions for actions involving built elements and governance mechanisms. Across the "continuum of urgencies" (Figure V.8)–the diplomacy with science is provided through the options (without advocacy), which can be used or ignored by the decision-makers, with the apex goal to continuously produce informed decisions.

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1. See http://arcticcouncil.knohow.co/ to interrogate all Arctic Council Ministerial.

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Bridging Science and Policy in the Arctic Council in a Time of Increasing Political Stakes

Malgorzata (Gosia) Smieszek

There is an urgent, recognized need to bridge the gap between science and policy to enhance the use of scientific knowledge as a basis for decision-making (Gluckman 2016; Brundtland 1997 cited in Sarkki et al. 2015). Science is held to be an essential component in addressing global challenges such as climate change, and attaining goals of sustainable development such as the United Nations Sustainable Development Goals (United Nations 2015). Science and research play a major role in mitigation and adaptation to a rapidly changing environment, and the scientific community is being called upon to provide evidence and advice to policy-makers across a wide range of issues. However, science and policy constitute two distinct systems of behavior and their goals are ultimately different. Whereas the purpose of research is to produce knowledge, the purpose of politics is to produce authoritative decisions on behalf of a society or a group (Andresen 2000). How to combine the two in a manner that does not compromise the credibility and legitimacy of scientists on the one hand, nor policy-makers on the other hand, and instead results in decisions that are informed by science and based on evidence, has been subject of many debates and studies. One point around which there has been consensus is the necessity of establishing—and sustaining—science-policy interfaces (SPIs), to encourage "social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making" (Van den Hove 2007). Science-policy interfaces can take the form of organizations, initiatives or projects working at the boundary of science, policy and society (Sarkki et al. 2015) and ultimately serve as arenas where scientists and policy-makers can work together effectively towards a consensual interpretation of relevant knowledge with reference to a particular policy problem (Andresen 2000).

The Arctic Council (AC) presents an example of one such arena. The AC serves as a primary forum for circumpolar cooperation on issues concerning environmental protection and sustainable development in the

Arctic. Since its inception, the AC has played a major role in providing new knowledge about the rapidly changing region through fact-finding activities based on environmental monitoring and scientific assessments. Scientific assessments have been regarded the most effective products of the AC, and the fact that the Council enables dialogue among different knowledge groups has been considered the most important factor contributing to the AC's effectiveness (Kankaanpää & Young 2012). That fact also confirms conclusions from other studies on science-policy interfaces (SPI), which prove that SPIs are likely to be more influential when they facilitate iterative dialogues among science, policy and stakeholders in order to influence changes in the understanding or decisions of policy makers (Sarkki et al. 2015). However, we should not assume the static nature of those interactions. Like institutions themselves, the character of relationships between scientists and policy-makers within the institution can change over time, in response both to endogenous forces and exogenous pressures. The related question that arises in the context of the Arctic Council is whether there has been such a change in the AC regarding the relationship among its Working Groups—considered here as the "science" component in the Council's architecture—and the Senior Arctic Officials (SAO), as the "policy" component. What are potential consequences of these changes for the work and effectiveness of the AC, if any? Seeing the consensus on the proposition that the AC's most effective work is in identifying emerging issues, framing them for consideration in policy venues and raising their visibility on the policy agenda (Kankaanpää & Young 2012), it is justified to explore what potential effects on this role of the Council and the role of science within it have increasing political and economic stakes in the region.

To consider this question, we need to go back to the foundations of formalized Arctic cooperation and the predecessor of the Arctic Council, the Arctic Environmental Protection Strategy (AEPS), signed in Rovaniemi, Finland in 1991. The AEPS aimed at deepening scientific understanding of sources, pathways and effects of pollution in the Arctic as well as assessment on the continuous basis of the threats to the Arctic environment. To achieve its objectives, the Strategy called for establishment of four working groups: Arctic Monitoring and Assessment Programme (AMAP), Conservation of Arctic Flora and Fauna (CAFF), Emergency, Preparedness, Prevention and Response (EPPR), and Protection of Arctic Marine Environment (PAME), which were to carry out the programmatic activities of the AEPS in accordance with their respective mandates. The initial stages of the AEPS were to set those programs in motion and to develop arrangements to enable the specialists' work to deliver results of some substance (Nilson 1997). As a result, the process was to a large extent driven by environmental experts and a "bottom-up" nature, where working groups were given substantial autonomy in organizing themselves and setting their agendas. What is important from today's perspective is that practices established during the AEPS largely prevailed when the Arctic Council was established in 1996 and when it subsumed four working groups formed under the Strategy. Consequently, during much of its first decade in operation, the Council resembled more a science than policy forum, where Arctic affairs were of limited interest to officials from ministries of foreign affairs from Arctic states and the working groups were predominantly responsible for carrying out the Council's work. Their priorities were identified and their work plans were elaborated on by scientists and officials in each working group and usually approved by SAOs and Ministers without many modifications, following at best a limited debate (Fenge & Funston 2015). Moreover, in the SAO meetings much more time was dedicated to discussions about the substance of the scientific reports and developing concrete recommendations for actions to mitigate the observed adverse effects in the Arctic environment and among its residents. Finally, members of the WGs were directly involved in the process of drafting the ministerial declarations that arguably enhanced the scientific input and helped to transform that work into documents setting the future direction of the Council. However, all those developments took place during a time when the Arctic was only a matter of regional, rather than global, interest. The scientific outlook for Arctic climate change provided with the seminal Arctic Climate Impact Assessment (ACIA) in 2004, the widely reported 2007 Arctic sea-ice minimum, as well as the planting of the Russian flag on the seabed under the North Pole in the summer of same year all sparked speculation about geopolitical tensions and economic opportunities in the opening Arctic Ocean. That led to a change in the international perception of the region and resulted in an increasing public focus on the Arctic. This growing interest of the outside world has, in turn, presented new challenges to the Arctic Council, reflected, *inter alia*, in the influx of both state and non-state, non-Arctic actors willing to join the AC as observers. The AC on its side took efforts to address those challenges, among others, through elaborating on criteria for admission of new observers in Nuuk in 2011, accepting six new states as observers at the Ministerial meeting in Kiruna in 2013 (followed by the next round of expansion in

Fairbanks in 2017), opening of a permanent secretariat in Tromsø in 2013, and facilitating the creation of the Arctic Economic Council (AEC) as well as of the Arctic Coast Guard Forum and Arctic Offshore Regulators Forum. To address issues of growing concern in the region, it has also provided a venue for negotiation of three legally binding international agreements: on cooperation on aeronautical and maritime search and rescue concluded in 2011; on marine oil pollution preparedness and response completed in 2013; and on scientific cooperation in the region, signed in 2017. Finally, for the first time since they were approved in 1998, the Arctic Council amended its rules of procedure in 2013 and adopted, in addition, a series of guidelines intended to streamline its own work and that of its subsidiary bodies. Those included the *Observer Manual for Subsidiary Bodies* (2013, updated in 2015 and 2016), *Guidelines for Relationships with Outside Bodies (2016), AC Communications and Outreach Guidelines* (2016) and lastly, *Working Group Common Operating Guidelines* (2016). In addition to those concrete measures, there have been also some more incremental changes, particularly when it comes to relationships and interactions between WGs and Senior Arctic Officials (SAO), which is arguably the main line of the science-policy interface of the Arctic Council. Those measures began during the Norwegian AC chairmanship (2006-2009), when the Arctic states and Permanent Participants (so organizations of Arctic Indigenous Peoples) began holding closed meetings among themselves, without the working groups and observers, immediately before the scheduled SAO meetings to discuss the agendas and the most contentious issues before the open plenary sessions (Fenge & Funston 2015). In a similar vein, the time for discussing conclusions emerging from scientific reports of the WGs in the official SAO meetings has been reduced, and WGs no longer present results of their work directly to Arctic ministers at the ministerial meetings as was the case in the past. Furthermore, SAO reports to ministers no longer include recommendations for concrete actions to address identified problems, based on recommendations formulated by the WGs in their work—as they often did in the earlier days. Finally, representatives of Working Groups no longer take part in negotiations about ministerial declarations issued every two years.

Not all changes are moving in the same direction, however. The U.S. Chair of the Council (2015-2017) put a lot of emphasis on improved communication with and among the working groups and called for meetings of the AC Chair and the WGs' representatives, the practice continued by the next Chair, Finland (2017-2019). It would be also premature to formulate any decisive conclusions about the effects of the changes described above and of the arguably growing distance between science (WGs) and policy (SAO) components of the Arctic Council. However, bearing in mind that enabling dialogue among different knowledge groups has been considered the key factor to AC effectiveness, and that science-policy interfaces are more influential when they facilitate iterative dialogues between scientists and policy-makers, some observed developments raise questions about whether the Council will be able to perform this bridging function as well today as it did in the past.

Interactions between the Working Groups and Senior Arctic Officials, as much as they are central to bringing science into processes evolving within the Council, are not the only way in which science or contributions from academia can inform decision-makers in the AC and can shape their agenda. Another mechanism for influence is through the chairmanship of the Council, as each Arctic state takes the helm of the institution for a period of two years. With the end of the Swedish chairmanship in 2013, the Council entered a second round of rotations that repeated the order of the first one; with Canada followed by the United States (2015-2017) and then Finland, which will pass the gavel to Iceland in 2019. Finland took over the chairmanship from the United States at the Ministerial meeting in Fairbanks, Alaska in May 2017. The country had begun its preparations for this task much earlier, gradually building up a team of officials from its ministries (predominantly the Ministry of Foreign Affairs) to take responsibility for the management of the AC chairmanship. These officials include the chair of Senior Arctic Officials, Finland's Senior Arctic Official, and the chair of the Sustainable Development Working Group, as well as other persons with more specific/focused areas. To support them in their preparations for the work, in December 2015 Finland's Prime Minister's office announced a call for a project/study with the following focus: "What is the political and economic situation in the Arctic region, particularly based on the themes set for the Finnish Chairmanship of the Arctic Council (2017-19)?" It was one of a much longer list of other, non-Arctic related calls, each dedicated to a specific issue and a concrete area or need identified by ministries in an earlier consultation process. Those announcements, usually coming out once a year, are an established practice of Finland's government and the Prime Minister's office to seek and solicit expertise from actors outside of government, including academia, the business community, and NGOs. In the case of the call regarding the AC chairmanship, the consortium that won was comprised of three major Finnish institutions focused either exclusively on Arctic research or that dedicate part of their activities to Arctic affairs: the Arctic Centre, University of Lapland; Finnish Institute of International Affairs (FIIA); and the Finnish Environment Institute (SYKE).[1] The project began in March 2016, more than a year before the start of the country's Arctic Council's chairmanship. It will continue throughout most of Finland's term, until December 2018. The main deliverable of the project was a report in Finnish, which was a background study analyzing geopolitical, economic and social trends and uncertainties affecting the Arctic, and thus of relevance to the Council Chair. The report also provided an overview of tasks and opportunities for action available to the AC chair in an increasingly complex institutional set-up of the Council, its subsidiary, and satellite bodies. Among other ideas considered, it explored possibilities created by the situation whereby representatives from the same country simultaneously chair the Arctic Council as well as the Arctic Economic Council and other AC satellite forums. It also considered prospects for enhanced action regarding reducing black carbon and methane emissions—prospects stemming from a specific role assigned to the AC chair in this respect (Arctic Council 2015), where the chair of the Council appoints a representative to lead the Expert Group in support of implementation of the Framework for Action on Black Carbon and Methane. This mechanism was established by that Framework when it was approved in Iqaluit at the Ministerial Meeting in 2015.[2]

The report from the project was first presented to the team preparing for the Arctic Council's chairmanship, followed by its official delivery to members of the Finnish parliament at a seminar in February 2017. In addition to the report's official delivery, the consortium has been tasked with preparing two shorter briefing papers in order to elaborate on the applicability of the Paris Agreement and the Sustainable Development Goals (SDGs) to the work of the AC (two overarching themes of the Finnish AC chairmanship program 2017-2019), and to present suggestions for how the two could be brought closer to the activities of the Council. Lastly, following the decision of Arctic ministers included in the Fairbanks Ministerial declaration to develop a strategic plan for the Arctic Council, the consortium was asked to present its perspectives on such strategy, together with two invited academic experts from the United States and

Iceland, the previous and incoming chairs of the AC, respectively. This kind of arrangement is intended to ensure greater continuity between successive chairmanships and arguably, to enhance the legitimacy of proposals to be presented to the Senior Arctic Officials by the Finnish Chair.

The above-described mechanism of course does not negate the developments and challenges described above regarding science-policy interface within the Arctic Council itself. It represents, however, a different form by which members of the scientific community can provide input to political processes and advice to whichever government sits at the helm of the Council. It is very important to note here that final decisions on taking the proposals formulated by the experts to be discussed at the AC forum lie ultimately in the hands of Finland's Ministry of Foreign Affairs and the chair of Senior Arctic Officials. Nonetheless, the value of the process lies in its iterative nature, and regular exchanges between members of the consortium and Finland's Arctic team. It is also an example of a fruitful practice that could be adopted by consecutive chairmanships of the Arctic Council. This process could be particularly useful to Chairs from countries with smaller administrations, which might be challenged by the task of chairing the AC and covering the entire spectrum of issues that the Council must oversee. Should this kind of network of scientists and scholars available to support their respective countries in their work related to the AC Chairmanship develop, it could constitute another form of sustained Arctic science-policy interface, which remains outside of, yet, closely related to, the Arctic Council.

Notes

1. For the official description of the project (in Finnish) please see: http://tietokayttoon.fi/hankkeet/hanke-esittely/-/asset_publisher/suomen-puheenjohtajuus-arktisessa-neuvostossa-kasvaneen-epavarmuuden-aikakaudella.
2. The Expert Group is tasked to periodically assess progress of the implementation of the Arctic Council's *Framework for Action on Black Carbon and Methane*, and to inform respective policy makers from Arctic States and from participating AC Observer States. This includes preparing, once every two-year cycle of the Arctic Council chairmanship, a high level *Summary of Progress and Recommendations* report, with appropriate conclusions and recommendations, for presentation to

Arctic Council Ministers at the biennial ministerial meeting. The Chair of the Expert Group (coming, as mentioned, from the country chairing the AC) is made responsible for the overall preparation of this report and should provide updates to SAOs and seek their guidance as appropriate. Furthermore, it is at the discretion of the AC Chair to convene a high-level policy-maker forum among relevant decision makers to promote greater action and ambition regarding reducing black carbon and methane emissions, and/or to open dialogue with other relevant stakeholders including representatives of private sector and other states. Such effort is envisaged as to complement and support work of the Arctic Council (Arctic Council 2015). Since the Framework provides the opportunity for convening such a dialogue with inclusion of private sector and other relevant stakeholders, it was proposed that its organization could be undertaken in cooperation with the Arctic Economic Council (AEC) that will be also chaired at the same time (2017-2019) by Finland's representative. While the AEC is a body independent from the Arctic Council, it works closely with the AC membership aiming to provide advice and a business perspective on specific areas of cooperation in the Arctic. It seeks to facilitate Arctic business-to-business activities and responsible economic development through the sharing of best practices, technological solutions, standards and other information. Thus, taking upon the initiative of convening the high-level policy-maker forum in collaboration with the AEC could be a way to advance debates on how to accelerate the decline in Arctic countries' overall black carbon emissions and to significantly reduce the overall methane emissions - as proposed by the 2015 Framework for Action. As such, not only it would ensure continuity of efforts of the previous AC Chairmanships to address the impacts of climate change in the region but it could also provide the example for future actions for consecutive Chairmanships of the Council (Koivurova et al. 2017).

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View from a Young Analyst

Zhimin Mao

UNCERTAINTIES IN THE ARCTIC REGION

The Arctic region is undergoing unprecedented transformative changes. The climate is changing rapidly, with rising temperatures that lead to retreating sea ice and changes in weather patterns. For a long time, this vast region has been isolated from the rest of the world, with minimal commercial and political influence. However, changes in climate and ecosystems have spurred increased attention from the international community regarding the economic and development potential in the Arctic. Rising temperatures and declining sea ice could increase competition for Arctic natural resources and access to new shipping routes. Inevitably, we expect to see far-reaching political developments occurring in the region.

A list of uncertainties complicate the situation. There is a range of projections for Arctic's future environmental conditions and accessibility of its natural resources. Existing global climate model results indicate great uncertainty in terms of how fast Arctic ice will melt, and how that will affect precipitation patterns across the globe.[1] When considering long-term impacts, we cannot predict the future economic and political landscape with great confidence either. The progress of technology development, the future prospects for hydrocarbons, the growth of world's economy, as well as political development among Arctic states will also alter future scenarios of the region's political and economic landscape.

The changing climate, evolving political landscape, and economic potential call for more governance efforts among Arctic nations and other stakeholders. Sound decisions are needed to protect the fragile environment, foster sustainable economic development, and avoid potential conflicts among Arctic states. However, similar to other collective-action challenges, decisions frequently cannot be made because deep uncertainty means one cannot predict a future with great confidence, making it difficult to identify an optimal solution. Thus, when we talk about linking science and policy-making, one important aspect of such link is how to analyze and present complex scientific findings and analytical results to make them useful for policy decision-making.

THE NEED FOR SCIENTIFIC ASSISTANCE IN DECISION-MAKING UNDER UNCERTAINTY

This is where scientific research and analysis often can help. To assist decision-making when facing similar deep uncertainty, I was fortunate to work with a group of experts at RAND Corporation to apply a methodology called Robust Decision Making (RDM)[2] to aid the process. The methodology applies a structured decision-framing approach (named XLRM framework) to gain consensus on key uncertainties that might influence future outcomes (X), strategies for improving the performance of the system over the long term (L), the relationships to represent the link between policy action to desired performance metric (R), and policy goals and performance metrics (M). The key idea is to test whether a candidate strategy can be robust, i.e., perform well across a wide range of futures. And if not, how could we use available information to propose modifications that could improve the robustness. It is also important to identify a set of strategies that is flexible enough to evolve over time based on new information.

Scientists play key roles in two components of this decision framework. On the one hand, scientists are often involved in developing the relationship/mathematical models that are needed to connect policy action with strategy outcomes. On the other hand, scientists can characterize and communicate uncertainties associated with the problem. To be able to achieve the two characteristics of decision-making under uncertainty, i.e., robustness and flexibility, decision-makers need to be involved throughout the process, as they may propose and select what policy actions to take and what kind of outcomes these proposed strategies need to achieve. It is an iterative process and requires a great amount of thinking into the kind of model to use, how to facilitate trust and collaboration, and how to communicate scientific findings that enable decision-making under deep uncertainty. Below I present some anecdotes that I thought would be beneficial in supporting my suggestions. I would like to revisit the history of the construction and implementation of the regional air pollution information and simulation model (RAINS)[3] at the International Institute of Applied Systems Analysis (IIASA). It is a living example of building scientific credibility, stakeholder acceptance, and policy relevance into a decision-support tool that balances scientific rigor and usefulness.

HISTORY OF THE RAINS MODEL

One example that I want to share is the building of RAINS model at International Institute of Applied Systems Analysis (IIASA). This model provided a scientific base for the successful implementation of the United Nations Economic Commission for Europe (UNECE) Geneva Convention (the convention) on Transboundary Air Pollution signed in 1979. It provides a living example of how to construct a scientifically sound model that is influential in policy making. The scientists were able to establish authority while setting up a basis for consensus building among many stakeholders across the East and West bloc. Some even argued that the Geneva Convention established a new, regional notion of Europe.[4]

rior to the building of the RAINS model, air pollution and associated acid rain was an enduring challenge in Europe. However, how much responsibility each country should take became a highly politically charged process. While air pollution emission can be local, due to atmospheric transportation the actual impact can lead to pollutant deposition beyond national boundaries. The complex linkages among pollution sources, emission levels, and environmental and health impacts are complex. The possible ranges of trade-offs between the cost of abatement and improvements in health outcomes are also hard to fully explore. Disputes arose among countries regarding who is polluting and how much to compensate downwind nations. Soon, countries realized the necessity to take a regional approach to collectively reduce air pollution across borders. Thus, there's the need of building a decision-support tool that is scientifically rigorous, but can still facilitate negotiations to reach an agreed-upon air pollution reduction agreement. The RAINS model thus was developed to offer values in the following aspects.

First, it provides a consistent framework for national stakeholders and European Union authorities to gather data, evaluate pollution levels under different abatement scenarios, and identify the most cost-effective pathways to achieve targeted pollution levels. It collects key input data related to economic activities, scientific knowledge of pollution formation, policy options, and abatement costs into one standardized package. The model also made its technical specifications publicly available and its uncertainties open for scientific exploration. Thus, the scientific community was able to develop a model that connects policy actions that will influence economic activities with their associated pollution outcome. It allowed negotiators to focus on the identification of a regional pollution reduction strategy package rather than being stymied by debates about which country provided a more accurate pollution scenario.

Second, the model is a living example of the balance between complexity and functionality that I mentioned earlier. The scientific community relies heavily on models to explore interesting research questions and identify new insights. These models are valuable tools for guiding policy decision-making as well. However, it is important to think about what kind of models are better fitted for guiding policy decision-making. It is often difficult to gather all the key stakeholders in the same room for a long time. While decision-making is an iterative process, it also requires us to think about whether it is possible to design models that require a shorter run time but still have enough precision to preserve scientific integrity. Scientists always strive for higher resolution and more detailed data. However, if the model becomes too complex, it will lose support, transparency and thereby the faith of those who use it. The developers of RAINS model did not seek to advance scientific knowledge but to "reconcile existing results."[5] Thus, the development of RAINS tried to balance the complexity of the model, its data requirements, and maintaining valuable output for policy and decision making. The model is not perfect. However, the model is capable of addressing a complex transboundary environmental issue. And most importantly, it has the support and engagement of the broader community.

Third, the model was developed with a combination of scientific research and policy needs, which in turn established scientific authority and provided a basis for consensus. In the late 1970s, the scientific understanding about acid rain was emerging. A 1979 study conducted by the Cooperative Program for Monitoring and Evaluation of the Long-Range Transmission of Air Pollution in Europe (EMEP), a program mobilized initially between the Soviet Union and Scandinavia, indicated the transboundary flow of pollutants in a "blame matrix."[6] The study paved the way for the establishment of the convention. Due to the representatives of East and West blocs, there's a need to develop a concrete pollution reduction plan to identify the level and the rate of emissions abatement as well as "hard facts" on the associated economic impacts.[7] The negotiators also understood the urgency of the problem and thus recognized the need of a mutually acceptable decision-support tool in order to reach an agreement. RAINS fulfilled this need by creating a model that not only provided a scientific basis but also political credibility. Beyond the computer-based software model, scientists at IIASA also formed a supporting social network for the model that includes both influential scientists and distinguished government officers. As a result, the RAINS model enabled EU countries to agree to address the complex transboundary air pollution challenge in one round of negotiation.[8] It has also guided the development of transboundary air pollution policy over the past two decades and continues to expand its influence.[9] It is the primary model used to set up emission reduction targets and assess policy effectiveness of the EU National Emission Ceilings Directive (NECD), the Gothenburg, and Sulfur Protocols of the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

SCIENTIFIC COMMUNICATION BEYOND MODEL BUILDING

While the RAINS model provided an example of how scientists can support international governance by identifying relationships and building mathematical models to support decision- making, scientists can also help decision-makers navigate a complex and uncertain world with better communication. When designing decision-support tools, we often rely on models to generate representative scenarios to guide decision-making. How to present and package such information then becomes critical, especially in a complex decision environment.

In one of the research projects in which I participated, we tested the hypothesis of whether participants could identify a robust decision when presented with scenario conditions versus forecast conditions for managing the population and profitability of a fishery, similar to the collective action problem facing the Arctic region. The fishery management tool presented uncertainty on the performance of management strategies in terms of fishery population and economic return using either Forecasts or Scenarios. Participants who were given the Scenario Condition chose the robust strategy, i.e., the one that performed well over the full range of uncertainties, far more often than did those in the Forecast condition due to their increased attention to worst-case projections.[10] Thus, presenting uncertainty using scenarios may increase decision-makers' focus on multiple futures, make the future more concrete, and promote consensus by not focusing on a single future for decision-making.

CONCLUSION

The example provided here illustrates that scientists can play key roles in decision-making and consensus building when facing a challenge that is complex and full of uncertainty. The success of the RAINS model reminds us that in order to make a model influential in policy making, scientists need to consider the balance between complexity and usability, and need to take policy credibility into account. The wide application of the model was also largely due to the efforts of scientists to build a supporting network among the scientific community as well as among policy-makers. On the last note, the identification of robust and flexible solutions also requires scientists to carefully design decision-making tools that can present information in an easier to understand manner that facilitates consensus building.

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