

1. Arctic Transformation: Introduction and Overview

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Overview: This book is about the extraordinary changes in a region long known for its remoteness, its frozen, inaccessible reaches, and forbidding total darkness for months every year. It is the story of transformations to and within a region—the Arctic—that foretells of accessible natural resources hidden for thousands of years, of maritime operations and trade potential heretofore unthinkable, of regional development and human well-being for peoples and societies unattainable in the past, but also the challenges from its remoteness, the impacts on indigenous peoples and the fragile environment that will test humankind’s capacities to find viable socioeconomic and sustainable ways forward. It is a new story of the transformations that nest the Arctic in world affairs in ways heretofore unimagined. The papers in this book explore the reaches of this transformation, from causes to challenges and opportunities, with a focus on the perspectives of the peoples and countries of the North Pacific, i.e., Korea, China, Japan, Russia, Canada and the United States. This book is the first in a series of at least three additional books for 2012, 2013 and 2014 that will extend and deepen the exploration of the many aspects of the transformations occurring across the Arctic.

INTRODUCTION

The Arctic region is changing at accelerated rates and levels that have not been experienced by modern humankind or its ancestors for at least 800,000 years, and quite possibly for millions of years. The peoples of the Arctic are facing accelerating challenges because these changes, documented by scientific evidence, are at levels beyond human experience. For many years, the Arctic was a wilderness detached from mainstream society. However, over the most recent decades that image has taken on new

dimensions. While the wilderness remains a prominent part of it, the Arctic and its peoples are experiencing tangible realities from climate change, melting ice, increased industrial activities and the possible development of the region's rich natural resources.

The Arctic is increasingly impacted by globalization processes that have their genesis outside the region and hence are shaped by, but in turn are shaping, the course of world affairs. Climate change and other environmental changes within the Arctic and around the planet are emerging with greater clarity and are inexorably linked. These linkages are explored by the authors throughout the book. In summary, as we enter the second decade of the 21st century, the Arctic region is experiencing a profound transformation across many dimensions.

Since the beginning of the industrial revolution (from about 1750), the Arctic has warmed two to three times as rapidly as the Earth as a whole, leading to the average surface temperature increasing more than 2°C (though most of that increase has occurred during the past 50 years). These changes in the climate system are driven globally mostly by increases in emissions of carbon dioxide and other greenhouse gases, mainly from use of fossil fuels (coal, oil and natural gas). The Arctic region is experiencing substantial changes directly induced by climate change, such as a reduction in the September minimum annual sea ice extent since the late 1970s that reached 50% in 2012, while the total sea ice volume was only 19% of what it was in 1979. However, these changes do not simply affect the Arctic, but have global implications, such as the opening of seaways over the past few decades along the Russian coast (i.e., the Northern Sea Route, or NSR) and through the island archipelago of northern Canada (i.e., the Northwest Passage), which are likely to provide navigable maritime operations for several months each year and much longer times in the future. Further, with the substantial reductions in the volume of sea ice and the fact that the annual ice is now only one or two years old, operations over many months can be considered. Also, there have been substantial losses of glacial ice mass in Greenland and mountain glaciers of the north that have global implications for mean sea level rise around the world, which is now projected to be about 1.2 meters (4 feet) globally by 2100. Along with these effects of climate change within the Arctic and globally, there are many other consequences of the rate of climate system change, from the weather in mid-latitudes driven by changes in the Arctic (e.g., the recent very cold summer in Europe) to negative impacts on commercial fisheries, the forestry

industry, and socioeconomic changes for societies living in the Arctic.

These developments have significantly changed how the Arctic is viewed. For example, the Arctic Ocean is fast becoming a semi-open sea, providing opportunities for shipping and other maritime operations, natural resources development, and cruise ships and other tourism opportunities. New commercial shipping routes are already being actively tested. As the Arctic waters warm up, current fishing stocks are changing their migration patterns, while southern fish populations are starting to venture northward. The fishing industry is moving further north more than ever before. The rich natural resources of the Arctic are becoming accessible. Mines are opening up and the potential for rare earth metals is being scrutinized and assessed. Oil and gas deposits are being explored and developed. Climate change is influencing the livelihood of northern peoples in both positive and negative ways. The shrinking of the Arctic's ice cap increases environmental fragility and threatens the traditional way of life of indigenous peoples. Climate change in the circumpolar region is already affecting these people, who consider the region to be their homeland. Arctic indigenous peoples are trying to protect their traditional ways of life in light of economic development that seeks to take advantage of new opportunities to exploit the region for oil, mineral, and forestry resources, with adverse effects on their communities.

These changes and the new development opportunities they have created have turned the Arctic into an increasingly important region in political and socioeconomic terms. In summary, the consequences of interactions and feedbacks between regions of the Northern Hemisphere and the Arctic on climate change, ecosystems, human health, economic and resource development and societies have the potential to substantively directly effect the interests of the eight Arctic countries, the Asia Pacific countries of Korea, China and Japan, as well as Europe and the rest of the planet. The Arctic is no longer a remote, isolated and inaccessible region, but one receiving intense interest from Arctic and non-Arctic countries alike that face the challenge of balancing their socioeconomic and development interests with the environmental and geopolitical governance challenges of a region rich with natural resources and socioeconomic potential.

The book is divided into four parts, each of which is led by a major paper authored by a leading authority on the topic, followed by four to six commentaries authored by experts who provide national or sectoral perspectives on the topic. The four parts are:

- Implications of Arctic Transformations for the North Pacific
- Opening of the Northern Sea Route and Changes in North Pacific Transportation and Logistics
- North Pacific Access to Arctic Energy Resources
- Promoting North Pacific Cooperation on the Governance of Arctic Marine Shipping and Energy Resource Development

INTRODUCTION TO PART I: IMPLICATIONS OF ARCTIC TRANSFORMATIONS FOR THE NORTH PACIFIC

In this part, the authors explore the consequences of the changes across the Arctic in a world affairs framework, within a governance framework for the North Pacific nations. The consequences of climate and environmental changes and the realities of globalization are explored, as well as the implications of these changes for Arctic and non-Arctic countries and indigenous and other peoples of the North. In summary, with high scientific probability, the changes in climate, globally and for the North Pacific region, include:

- ***Surging greenhouse gas emissions:*** Global carbon dioxide emissions from fossil fuels were nearly 58% higher in 2011 than in 1990. The rate of emissions for 2010 were 5.9% higher than the previous year, which is almost twice the highest rate ever recorded. Even if global emission rates are stabilized at present-day levels, with just 20 additional years of such emissions there is a 25% probability that the warming will likely exceed the UNFCCC goal of 2°C.
- ***Global temperature rise:*** Reconstructions of global surface temperature show that Earth has warmed since 1880, with most of that warming occurring since the 1970s and all 10 of the warmest years occurring in the past 12 years.
- ***Warming oceans:*** The oceans have absorbed more than 90% of this increased heat, with the top 700 meters (about 2,300 feet) of ocean containing virtually all of the warming, hence contributing to sea level rise from the simple thermal expansion of the water.
- ***Declining Arctic Sea ice:*** Both the extent and thickness of Arctic sea ice has declined rapidly over the last several decades, at extent reduction rates of about 10% to 12% per decade.

- ***Shrinking ice sheets:*** The Greenland and Antarctic ice sheets have decreased in mass, which will increasingly contribute to sea level rise globally. It is likely that by the end of the century, half to two-thirds of the sea level rise will be derived from the Greenland and Antarctic ice sheets.
- ***Sea level rise:*** The global sea level rose about 17 centimeters (6.7 inches) in the last century. The rate in the last decade, however, is nearly double that of the last century. The sea level is now projected to rise about 1.2 meters (4 feet) by 2100.
- ***Glacial retreat:*** Glaciers are retreating in more than 95% of the world, including in the Alps, Himalayas, Andes, Rockies, Alaska and Africa, which affect water supplies for upwards of one third of the world's people.
- ***Extreme weather events:*** The number of record-high temperature events around the world has been increasing since 1950, while the number of record-low temperature events has been decreasing. Further, the energy in cyclonic storms (i.e., hurricanes in the Atlantic and typhoons in the Pacific) has increased by about 50% during the past several decades. The duration and extent of droughts and floods have also increased.
- ***Ocean acidification:*** The acidity of surface ocean waters has increased by about 30% since the beginning of the Industrial Revolution. This increase is the result of excess carbon dioxide being emitted into the atmosphere, absorbed by the oceans and converted into carbonic acid, which profoundly affects the full oceanic food chain, potentially including the biological diversity of the oceans and even global fisheries.

INTRODUCTION TO PART II: OPENING OF THE NORTHERN SEA ROUTE AND CHANGES IN NORTH PACIFIC TRANSPORTATION AND LOGISTICS

The authors in this part explore, in considerable detail, the implications of the opening of the Arctic near-continent seaways, particularly along the NSR. The potential for maritime operations along the NSR has substantially increased because the annual minimum of the extent of Arctic sea ice for 2011 is only 50% of what it was only 35 years earlier, a

reduction in extent that is the lowest in 10,000 years and a first in modern human history. The Arctic Council's Arctic Marine Shipping Assessment estimates that the NSR within the Arctic Ocean could become ice-free for a short period during the summer as early as 2015. But conditions that would make regular and sustained maritime operations on the NSR a viable option are harder to predict (*AMSA 2009 Report*).

The Arctic Council was established as a high-level intergovernmental forum for promoting coordination and cooperation among the Arctic States, a forum that holds the potential to be an intergovernmental venue to foster "sustainable development and environmental protection in the Arctic" (1996 Arctic Council Declaration) and a venue for Arctic and non-Arctic countries and their peoples to explore the implications of the opening of Arctic seaways. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) provides a global regime and a set of rules on using the world's oceans and seas and their resources, and so is an essential intergovernmental agreement to address a wide range of international legal issues surrounding the opening of Arctic seaways for maritime operations and natural resources development.

At the same time, melting ice facilitates the use of the Arctic for shipping, with subsequent access to untapped natural resources. The NSR is slowly becoming a reality as an international trade route between the North Atlantic and North Pacific regions. There was a sharp rise in the number of ships passing through the NSR in 2010, and 2011 promises to bring even more vessels. Fleet operator RosAtomflot received at least 15 requests for icebreaker assistance in 2011 from oil tankers, cargo ships and bulk carriers.

The NSR, which is the shortest route between Northeast Asia and Northwest Europe, has the distinct advantage of being only half as long as the corresponding distance via the Suez Canal and Malacca Straits. However, the advantages of the NSR run up against significant obstacles linked to the characteristics of the territories traversed. About 2,500 nautical miles of Siberian coast between the Bering Strait and the port of Murmansk have limited facilities, so no stopovers are currently possible.

Recognizing that the NSR can be competitive in the near future in comparison to the Suez Canal route, the Korea Transport Institute and the Korea Maritime Institute recently carried out a joint study on the benefits of the NSR for the North Pacific Rim. Specifically, this study sought to evaluate savings in distance and time using the NSR, forecast container

traffic among East Asian countries, and examine possible shipping scenarios using the NSR. The joint research predicted that port-industry clusters will emerge in Northeast Asia along the NSR. The results of the research are discussed herein. To prepare for the use of the NSR, the world's shipyards are already building ice-capable ships and the private sector is investing billions of dollars in Arctic tankers.

As global warming melts the sea ice and opens the region to commercial navigation, Arctic oil and gas will become more accessible. The U.S. Geological Survey launched a comprehensive study of the Arctic's resources in 2008. According to USGS scientists, 90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may be found in the Arctic. Approximately 84 percent of these resources are expected to lie in offshore areas. The U.S. Energy Information Administration in an October 2010 report concluded that the Arctic holds about 22 percent of the world's undiscovered conventional oil and natural gas resources, based on the mean estimate of the USGS. Numerous geopolitical and policy issues arise and are explored by the authors of this section:

- Who owns the Arctic Ocean and any resources that might be found beneath Arctic waters? This question has enormous economic and political significance. The Arctic is currently experiencing an upsurge in political and economic activity as a result of decreasing ice in the summer months and the prospect of large oil and gas deposits for future exploration and development. Pressure on the Arctic environment is likely to increase in the light of these activities.
- What are the implications of these developments for governance? The authority of the Arctic Council is limited; its future as a policymaking body is unclear. The resultant ambiguity, when coupled with pressure by such actors as the European Union and major countries in Northeast Asia for increased internationalization of the Arctic, could produce friction among the Arctic states and between these states and non-Arctic states and organizations. This book and its authors see the North Pacific framework as having inherent advantages as a venue that engages the three major Arctic countries (Canada, Russia and the U.S.) and three major non-Arctic countries (China, Japan, and Korea), all of which have substantial economic interests and roles in environmental stewardship. Note, too, that all six countries

are members of the G-20 and share substantial trade and financial interests as well as regionally defined common concerns. The North Pacific Arctic Conference (NPAC) series and the books to emerge from these conferences have the potential to provide a venue in which the three Arctic countries and three major North Pacific users can exchange views regarding the future and transformation of the Arctic. While the Arctic is currently an area of low tension, the long-term geopolitical risks are significant.

- What are the options for providing non-Arctic states with a voice in addressing Arctic policy issues? There is no comprehensive answer to this question. It is likely that, initially, the solution will almost be informal, e.g. Arctic Council Official Observer ships, while simultaneously providing the non-Arctic states with a sense that their voices are being heard. Further, they will most likely play official membership roles in such intergovernmental organizations as UNCLOS, where the five Arctic coastal nations (Canada, Denmark, Norway, Russia and the U.S.) are working on claims to extended jurisdiction over the seabed in the Arctic under the provisions of UNCLOS Art. 76. Non-Arctic nations are seeking ways and means to be engaged more directly in the socioeconomic potential in the Far North, particularly policy issues (e.g. maritime operations) in Arctic affairs. The Arctic region is not currently governed by comprehensive multilateral norms and regulations; hence the authors in this book (and NPAC conferences and books to come) explore these matters more fully.

INTRODUCTION TO PART III: NORTH PACIFIC ACCESS TO ARCTIC ENERGY RESOURCES

In this part the authors explore the implications of the strategic importance of Arctic oil and gas for energy security in the North Pacific. The Arctic region is likely to contain substantial undiscovered hydrocarbon reserves (U.S. Geological Service 2008) that are projected to include about 13% of the world's undiscovered oil reserves and 30% of its natural gas. It has been noted that the major parts of these oil reserves are close to Alaska's coast, while practically all the natural gas reserves are near Russia's shores, with over 90% on the Yamal Peninsula. Overall, more than 60 % of Arctic

oil and gas resources are deposited in areas that belong to or are claimed by the Russian Federation. Russia has been active in the Arctic for decades, advancing its interests through research, and making claims, under their interpretation of international law, to establish a comprehensive presence in the Arctic. The existence of hydrocarbon resources in the Arctic has been known for decades, but only in recent years, with the opening to full-scale resource development and navigation, has it become technically and economically feasible to seriously consider such development.

China's growing energy needs has enhanced their interest in the Arctic, particularly since 1993, when it became a net energy importer, mostly of oil. China's economic boom and its limited capacity for domestic production of oil have turned it to foreign oil imports, hence its increasing interest in Arctic oil and gas production. It can also be noted that Korea, Japan and China constructed more than 90% of all ocean shipping vessels over 100 tons worldwide in 2011 (China 40%, Korea 33% and Japan 18%). This, combined with energy interests, helps frame China's interests in the Arctic. Korea imports 97% of the energy it uses domestically and is highly dependent on oil and gas from the Middle East. Korea seeks to diversify its sources of energy, so oil and gas developments within the Arctic Ocean are a high-priority interest.

As the authors note, energy security plays a vital role in many different aspects of today's world: an adequate supply of energy is needed for military and defense purposes; limited energy resources place limitations on a nation's ability to conduct foreign policy; and economic disruptions due to the inherent volatility of energy prices affect the global economy by retarding recovery of developed economies and hindering growth of developing economies. Vulnerability to disruption of energy supplies as a result of acts of terrorism, accidents, or natural disasters places great stress on governments, and a nation's vulnerability to a cutoff of energy supplies for geopolitical purposes have the potential to define that nation's foreign policy. Finally, the role of energy in contributing to security issues related to climate change has begun to influence international norms, setting new standards for conscientious behavior on the international stage.

Hence, the development of energy resources in the Arctic has been seen by many as an important avenue for improving global energy security. While the energy resources of the Arctic appear to be quite large, the financial, technical and environmental risks of operating in an offshore Arctic environment create significant challenges for future production in

the region. To make a significant contribution to global energy supplies in the future, governments will, of necessity, need to put forth a set of rules regarding investment (e.g. the Arctic Council's Ministers of Foreign Affairs Intergovernmental Agreement on Marine Oil Pollution Preparedness and Response to minimize the damage of possible oil spills or accidents). Further, operating requirements, environmental standards and other rules will be needed to address the challenges and safety requirements facing companies that undertake exploration and development activities in the Arctic. Even with an expansion of investment in Arctic development, the principal driver for global energy security is likely to continue to be the Middle East, which still holds the largest share of recoverable petroleum resources.

INTRODUCTION TO PART IV: PROMOTING NORTH PACIFIC COOPERATION ON THE GOVERNANCE OF ARCTIC MARINE SHIPPING AND ENERGY RESOURCE DEVELOPMENT

The authors in this part explore the implications of major international governance issues for access to and use of the three major Arctic routes: the Bering Strait, the Northwest Passage and the NSR. For decades, shipping through the Northwest Passage and the NSR was restricted to heavy icebreakers because of the year-round presence of thick, hard, multi-year sea ice. But climate change is rapidly causing the ice to be thinner and much smaller in a real extent. In September 2007, an unprecedented melting of Arctic sea ice took the lowest coverage that season to 1 million square kilometers below the previous record. For the first time, both the Northwest Passage and NSR were temporarily free of ice, and therefore open to non-icebreaking vessels. The record was shattered in subsequent years when the area covered by Arctic sea ice plunged to just 3.41 million square kilometers, about 50% below the 1979 to 2000 average.

It now seems possible that the Arctic could have a September with a virtually ice-free ocean within a decade or two, though there are analyses that suggest the Arctic Ocean will appear to be ice free, but will still contain sea ice patches that cover 10% to 15% of the ocean. What is increasingly clear is that there will be a permanent loss of multi-year ice. Indeed, imagery from the European Space Agency's new Cryosat satellite shows

that 85% of the multi-year ice is already gone from much of the Arctic Ocean. Before long, the waterways along northern Canada and Russia will resemble the Baltic Sea or Gulf of St. Lawrence, where ice-strengthened vessels and icebreaker-escorted convoys can operate safely throughout the year.

Increased shipping brings with it environmental and security risks such as oil spills, life-threatening accidents, smuggling, piracy and terrorism that in such a large and remote region can only adequately be addressed by the nearest coastal state. Yet the extent of coastal state jurisdiction in the Northwest Passage and the NSR is contested, in both instances by the U.S., which claims the choke points along both waterways constitute so-called “international straits” through which vessels from all countries may pass freely.

Severe storms and temperatures, combined with fog, ice and the sheer remoteness of the region, make the Bering Strait a challenging place for navigators. Yet the strait is becoming a critically important shipping route because it connects the Pacific Ocean to both the Northwest Passage and the NSR. The waterway has long been of considerable strategic interest to Russia and the U.S. At its narrowest point, only 44 miles separate the mainland coasts of the two countries, while less than three miles separate two islands in the middle of the strait: Russia’s Big Diomedes and the U.S.’s Little Diomedes. Both Russia and the U.S. accept that the Bering Strait is an international strait through which foreign vessels may pass without their permission. The two coastal states already cooperate on the provision of search-and-rescue and aids to navigation, and are likely to increase that cooperation.

The NSR offers a reduction in distance and sailing time from Northern Europe to Northeast Asia of up to 40% or 45% compared to the traditional routes through the Suez and Panama canals. It is also the first circumpolar shipping route to open as the result of climate change, with the thick, hard, multi-year sea ice having already disappeared from the Russian side of the Arctic Ocean. However, the viability of the NSR for international shipping is compromised by a dispute between Russia and the U.S. over the status of the Vil’kitskii, Shokal’skii, Dmitrii Laptev and Sannikov straits. Moscow claims these straits constitute “internal waters,” while Washington maintains they are “international straits.” Significantly, no other country has explicitly taken a side in the dispute, which dates from the early 1960s.

The Northwest Passage constitutes a number of different possible routes between the 19,000 islands of Canada's Arctic Archipelago. The islands have been incontestably Canadian since Britain transferred title to them in 1880, while the nearly impenetrable sea ice meant that the issue of ownership and control over the waters was never even discussed. Only the acquisition of powerful icebreakers, and more recently climate change, has brought the issue to the fore.

Canada claims the Northwest Passage constitutes "internal waters." In December 1985, the Canadian government drew "straight baselines" around the Arctic islands. Again, under international law, straight baselines may be used to link the headlands of a fragmented coastline, provided the lines are of a reasonable length, and the straits and channels within them are subject to the full force of the coastal state's domestic laws. Canada argues that its baselines are consolidated by historic usage, including the occupation of the sea ice by the Inuit, a largely maritime people.

The lead author recommends:

- Russia and the U.S. should press forward with additional forms of cooperation in the Bering Strait on matters such as shipping lanes, search-and-rescue, navigation aids, ports of refuge, and oil spill response.
- Multilateral cooperation on the Bering Strait could usefully be institutionalized in a "Bering Strait Council" or "North Pacific Council," which over time might expand its work to include fisheries management, environmental protection, security, and search-and-rescue cooperation in the Bering Strait, Bering Sea and North Pacific region.
- Russia and Canada should initiate negotiations with a view to publicly endorsing each other's respective legal positions on the Northwest Passage and NSR.
- Canada should initiate negotiations with the U.S. with a view to securing recognition of its internal waters claim in return for assured access and investments in infrastructure, search-and-rescue, policing, etc.
- Russia should initiate negotiations with the U.S. with a view to securing recognition of its internal waters claim in return for assured access and investments in infrastructure, search-and-rescue, policing, etc.

These negotiations could also take place trilaterally between Canada, Russia and the U.S., or even multilaterally by including major shipping states.

- Parallel to their negotiations with each other and third states, Canada and Russia should initiate negotiations with international shipping companies with a view to securing private investments in new ports of refuge, navigation aids and other essential infrastructure for the Northwest Passage and NSR.
- Russia, Canada and the U.S. should ask the IMO to endorse mandatory ship registration schemes and shipping lanes in the Bering Strait, Northwest Passage, and Russian Arctic straits.
- The IMO's "Guidelines on Arctic Shipping" should immediately be made mandatory, as was originally intended.

CONCLUSIONS

The Arctic region is changing, and the changes are accelerating at rates and levels that have not been experienced by modern humankind. This volume underscores the many ways in which the Arctic is changing and the challenges and opportunities that this represents. The Arctic is warming two to three times as rapidly as the Earth as a whole. This amplification is a result of both natural feedback processes (e.g. snow- and ice-albedo feedback) and human activities contributing directly to warming in the region, all underpinned by ongoing changes in the climate system that are being caused primarily by emissions of carbon dioxide and other long-lived greenhouse gases. The amplified warming of the Arctic is already having significant impacts on the environment and indigenous peoples of the region, as well as amplifying the changes and impacts outside the region, including weather in the mid-latitudes and sea level rise around the planet.

These developments have significantly changed how the Arctic is viewed. The Arctic Ocean is fast becoming an open sea. Within a few decades it is likely to be open every summer for a few months to shipping and other maritime operations. There is increasing interaction and feedback between the regions of the Northern Hemisphere and the Arctic, with consequences for climate change, ecosystems, human health, economic and resource development, and societies, and these have the potential to

substantively affect development and governance agreements that affect the eight Arctic countries, the countries of the North Pacific, as well as much of Europe, the rest of North America and the world at large. This volume and those to follow explore these interactions.