2011 North Pacific Arctic Conference Proceedings

The Arctic in World Affairs

A North Pacific Dialogue on Arctic Transformation

Edited by

Robert W. Corell
James Seong-Cheol Kang
Yoon Hyung Kim

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Preface

As we enter the second decade of the 21st century, we witness that the Arctic is experiencing a profound transformation, driven primarily by climate change and nuclear-powered icebreaker ship technology, and it is occurring all too quickly. The Arctic meltdown has accelerated to the degree that after a catastrophic collapse in 2007, the Arctic ice has shrunk to an area that climate models predicted we would not see until 2055. Estimates vary as to when the Arctic is likely to be ice-free during the summer. The U.S. Intelligence Council, in its report *Global Trends 2025*, predicted a date as early as 2013.

The shrinking of the Arctic's ice cap significantly exacerbates its environmental fragility and threatens the traditional way of life of indigenous populations. At the same time, melting ice cover facilitates the opening of the Northern Sea Route (NSR), with subsequent access to untapped natural resources. The NSR is slowly becoming a reality and a potential international trade route between the North Atlantic and North Pacific regions. The NSR, which links Northeast Asia and Europe by way of the Arctic Ocean, has the distinct advantage of being only half as long as the corresponding distance via the Suez Canal.

Moreover, the Russian Arctic holds enormous reserves of oil, gas, and other natural resources that may best be exported by sea. The melting of the polar ice cap in the Arctic region may result in international disputes over the territory and its vast natural resources. The region is not currently governed by any comprehensive multilateral norms or regulations.

With this background, the Korea Transport Institute and the East-West Center organized the first in a series of planned conferences, "A North Pacific Dialogue on Arctic Transformation," which was held in Honolulu, Hawaii in August 2011. This North Pacific framework has inherent advantages. It includes the three major Arctic countries (Canada, Russia, and the United States) and the three major NSR users (China, Japan, and Korea). All six countries are members of the G-20 with substantial trade and financial interests, as well as a number of geographically defined common concerns.

This volume contains the proceedings of the first North Pacific Arctic Conference (NPAC). The chapters and commentaries included in the book are based on presentations made at the conference. There are important contributions from those located in the Arctic states, including Robert Corell's magisterial review of the nature and scope of the changes occurring in the Arctic, Nodari Simoniya's revealing description of the development of Russia's energy industry, and Michael Byers' analysis of the legal issues confronting those interested in shipping and resource development in the areas of the Bering Strait, the Northwest Passage, and the NSR. The proceedings also include informative accounts by non-Arctic state experts on the growth of commercial shipping and the implications of this development for the role of the Arctic, including Sung-Woo Lee's analysis of the potential benefits of using the NSR and Hong-Seung Roh's broader account of the recent and projected growth of commercial shipping in Asia.

We would like to take this opportunity to thank Dr. Robert W. Corell, a principal at the Global Environment and Technology Foundation and its Center for Energy and Climate Solutions (Washington, DC), Dr. James Seong-Cheol Kang, former director of the Center for Global Transport Research, the Korea Transport Institute, and Dr. Yoon Hyung Kim, emeritus professor at Hankuk University of Foreign Studies and senior fellow at the East-West Center, for coordinating the conference and preparing the papers and commentaries for publication. We wish to extend our appreciation to Dr. Sang Min Lee at the Korea Transport Institute for his contribution to the development of the conference program. We are grateful to Dr. Nancy Lewis at the East-West Center for her support of the NPAC program and her editorial help and contributions to this book. We also wish to thank the paper writers, commentators, and others involved in contributing to the success of this conference. Our sincere gratitude goes to Eugene Alexander of the East-West Center for his expert management of the conference's logistics.

Gyeng Chul Kim
President
The Korea Transport Institute

Charles E. Morrison
President
East-West Center

1. Arctic Transformation: Introduction and Overview

Robert W. Corell, Yoon Hyung Kim, and James Seong-Cheol Kang

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 forthe 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 are as 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 seaice 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 Diomede and the U.S.'s Little Diomede. 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.

PART I

IMPLICATIONS OF ARCTIC TRANSFORMATION FOR THE NORTH PACIFIC

2. Consequences of the Changes across the Arctic on World Order, the North Pacific Nations, and Regional and Global Governance

Robert W. Corell

Overview: The Arctic region and the Northern Hemisphere oceans and continental lands[1] are now experiencing some of the most rapid and severe changes in climate on Earth. Over the coming decades, climate change is expected to accelerate, contributing to major physical, ecological, social, and economic changes in the region, many of which have already been documented. Changes in Arctic climate will also affect the Pacific region north of the equator, as well as the rest of the world, through increased regional surface temperatures, changes in regional weather, and rising sea levels across the globe. Further, these changes are very likely to have consequences in multinational policy, national and international governance, and security issues affecting societies and human well-being across the Arctic and neighboring Northern Hemisphere nations.[2] Is this important? Former Secretary General of the United Nations Kofi Annan summarized its importance when he stated:

> *"The stakes are high. Climate change has profound implications for virtually all aspects of human well-being, from jobs and health to food security and peace within and among nations. Yet too often climate change is seen as an environmental problem when it should be part of the broader development and economic agenda. Until we acknowledge the all-encompassing nature of the threat, our response will fall short."*

On a global scale the IPCC, and more recently, peer-reviewed scientific publications, have concluded that:

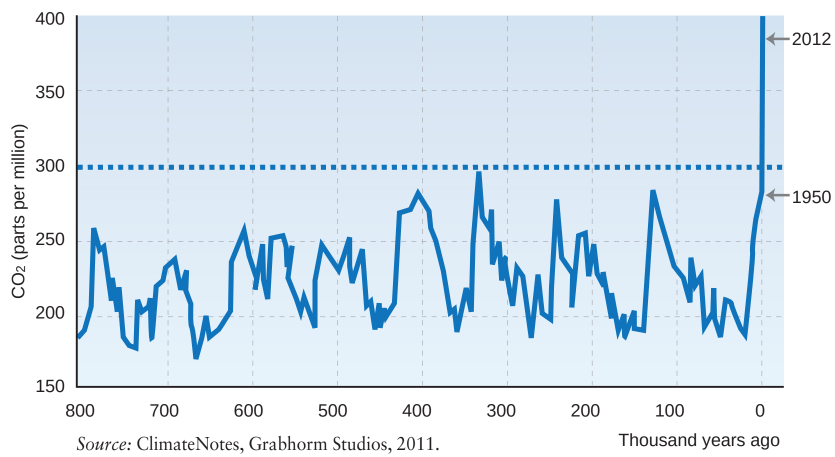
- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level,

- There is now higher confidence in projected patterns of warming and other regional-scale features, including changes in wind patterns, precipitation and some aspects of extreme weather and of ice, and
- Anthropogenic warming and sea level rise will continue for centuries due to the time scales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized.

Earth's climate is changing, with the global temperature now rising at a rate unprecedented in the experience of modern human society. While some historical changes in climate have resulted from natural causes and variations, the strength of the trends and the patterns of change that have emerged in recent decades indicate that human influences, resulting primarily from increased emissions of carbon dioxide and other greenhouse gases, have since about 1950 become the dominant factor.

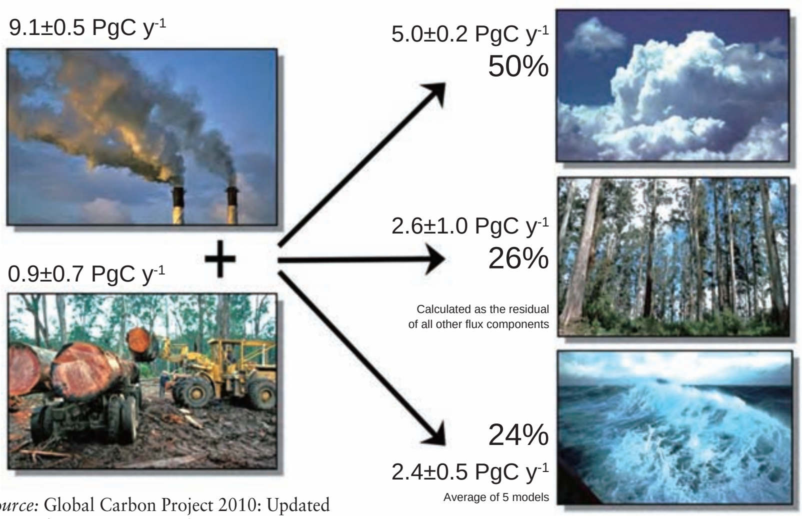
WHAT IS HAPPENING TO OUR CLIMATE AND WHY?

Earth's climate is indeed changing, with the global temperature now rising at rates unprecedented in the experience of modern human society. The strength of the trends and the patterns of change that have emerged in recent decades indicate that human influences, resulting primarily from increased carbon dioxide emissions from fossil fuels, deforestation of the tropical rain forests, and numerous other greenhouse gases, have now become the dominant factor. These climate changes are being experienced particularly intensely in the Arctic, where the average regional surface temperatures have risen at two to three times the rate of the rest of the world, particularly during the past several decades. Widespread melting of glaciers and sea ice and rapidly thawing permafrost provide further evidence of strong Arctic warming. These changes in the Arctic provide an early indication of the environmental and societal significance of global climate change. These climatic trends across the Arctic are projected to accelerate during the coming decades and beyond this century. These climatic changes are not limited only to the Arctic, as the climatic shift in the Arctic will influence regions far beyond, affecting global climate,



Source: ClimateNotes, Grabhorm Studios, 2011.

Figure 2.1 The 800,000 year record of carbon dioxide

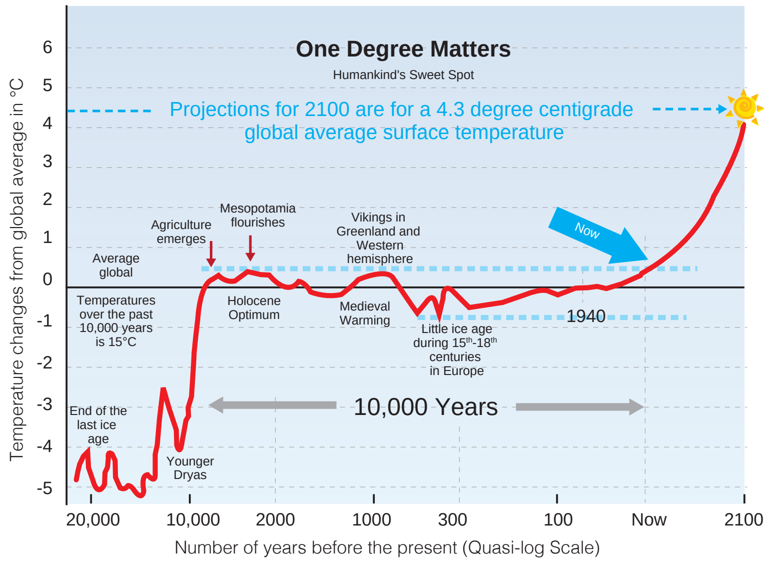


Source: Global Carbon Project 2010: Updated from Le Quere et al. 2009 Nature Geoscience.

Figure 2.2 The global emission sources and sinks for anthropogenic carbon dioxide

sea level, biodiversity, and many aspects of human social and economic systems. What follows are some of the scientific foundations for the issues that are likely to be derived from climate change and an ice-free Arctic region in the decades ahead.

Earth's climate is changing in ways unprecedented in human history,



Source: Adapted from "Climate Change and Human Health-Risk and Response" published by WHO in collaboration with UNEP and WMO 2003 and more recent data from IPCC 2007.

Figure 2.3 *Humanity has developed during a 10,000 year period with a very stable climate*

with global temperatures and impacts now rising at rates that exceed any in human history. The Fourth Intergovernmental Panel on Climate Change (IPCC) projected an anticipated global temperature range by 2100 of 1.1°C to 6.4°C, with a more than likely mean expected temperature of about 4°C (or over 7°C). As the data in the graphic indicates, humans have had over 10,000 years of remarkably stable climate, with less than one degree centigrade variability in temperature over that entire period of modern human history. Anthropologists and others studying the history of human development note that the stability of the Earth's climate has enabled humans to evolve to the richness of modern times. The Earth is entering into a new epoch, called the Anthropocene.[3] This geological epoch is unique in at least 800,000 years and quite possibly for millions of years.

While it is evident that changes in our climate historically have resulted from natural causes and variations – from Medieval Warming to the Little Ice Age – the scientific evidence is now unequivocal that during the past half-century, human influences on the climate system now exceed natural climatic variability. The scientific evidence is now unequivocal that climate change is real, dangerous and immediate. The primary cause of this unparalleled human influence on our climate is the use of fossil fuels as the primary energy source, providing unequaled standards of living for many societies throughout the world. While at the same time, billions of people have not ever experienced these levels of societal well-being, fostering continued poverty, hunger, unacceptable levels of disease and inadequate capacity to deal with increased incidents of drought, floods and severe weather.

The foundation of this human influence on the climate system is simply the pervasive and unparalleled human uses of, and emissions from, fossil fuels that overwhelm the capacity of the greenhouse effect, which then increases global temperatures. While there are many greenhouse gases that form the protective greenhouse envelope around the planet, the primary greenhouse gas is carbon dioxide (CO_2), the concentration of which in the atmosphere is increasing dramatically because human-created emissions are accelerating. As depicted in Figure 2.2, about 90% of the CO_2 emissions are from the use of fossil fuels and the remaining 10% is largely the result of the clearing and burning of the tropical rainforest, such as in Brazil. Unfortunately, the capacity of both the oceans and plants in the terrestrial biosphere to absorb the CO_2 has decreased by about 5% over the past few decades, further increasing the concentration of CO_2 in the atmosphere,

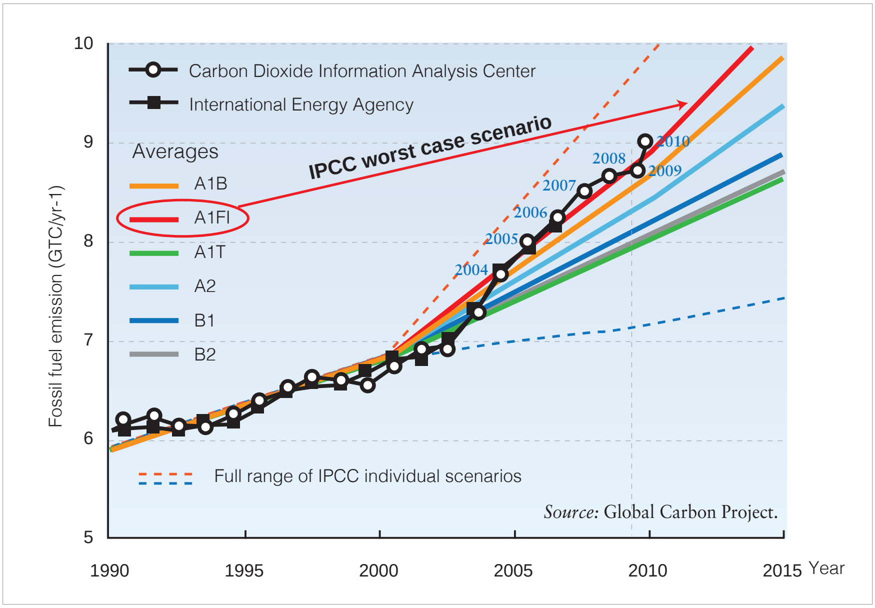


Figure 2.4 *Fossil fuel emission are now at or above the IPCC worst case scenario*

which further accelerates the warming of the global atmosphere. Figure 2.4, while seemingly complex, describes a troubling reality; even with international agreements under the United Nations Framework Convention on Climate Change (e.g., the Kyoto Protocol) seeking to curb the warming of the planet, global emissions of CO_2 have increased four times faster during 2000-2009 than in the previous decade and have exceeded the projected worst-case emission scenario projected by the IPCC in 2001 and depicted in Figure 2.4. If the observed rate of increase for the period 2000 to 2010 continues, the projected global temperatures will very likely exceed the temperatures projected by IPCC and be at or above 4°C by 2100. Further, if humans continue accelerating emissions of CO_2 and other greenhouse gases, the consequences for all humankind and the Earth's natural systems are likely to be devastating. This scientific finding is unfortunate, as this has been the period of implementation of the Kyoto Protocol, ratified by 184 parties, which set binding emissions reduction targets by 2012 for 37 industrialized countries and the European community.

The early warnings have been evident for decades and particularly intensely in the Arctic. The Arctic average temperature has risen at between two and three times the rate of the rest of the world in the past few decades and has been particularly evident during the past 15 or more years, as

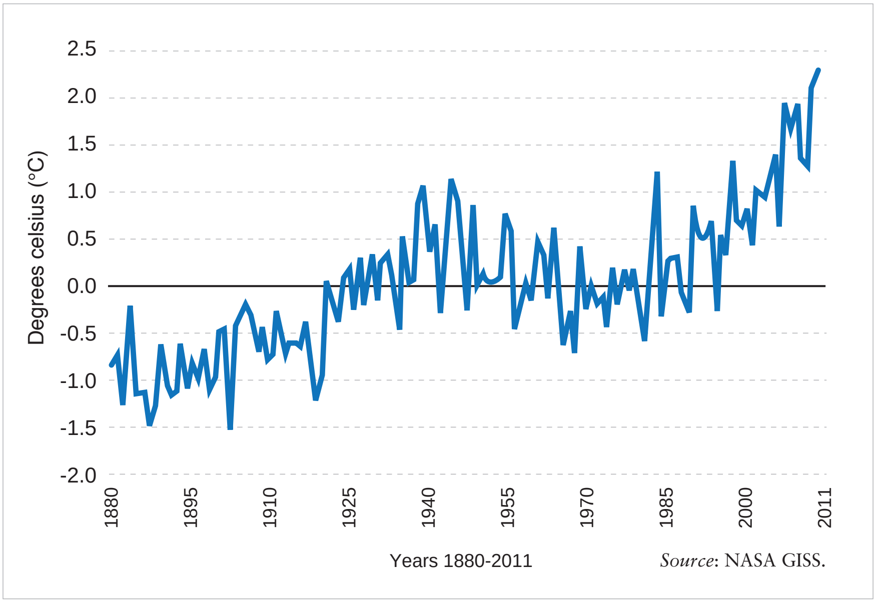
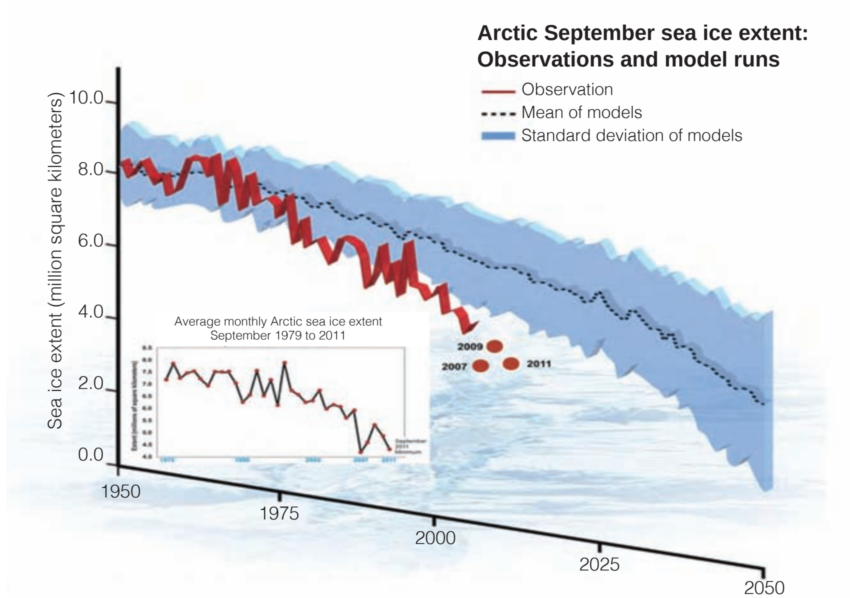


Figure 2.5 Circumpolar surface mean temperature changes 1880 to 2011



Source: Adapted from ACIA, NSIDC and UCAR.

Figure 2.6 *Arctic sea ice minimum extent (September 1950 to 2011)*

depicted in Figure 2.5.

These increased Arctic temperatures have created widespread melting of glaciers, particularly the Greenland Ice Sheet, and dramatic decreases in both the surface area and thickness of the sea ice in the Arctic Ocean, as depicted in Figures 2.6 and 2.7. Figure 2.6 shows that climate models dramatically underestimate the rates of Arctic sea ice melting. Figure 2.7 shows the actual summer (September 2011) area of Arctic sea ice, which is about one half of what it was in 1980. While not depicted here, the sea ice thickness has similarly decreased by upwards of 25% to 40%, with a continued decline in overall Arctic basin sea ice volume. Current scientific research suggests that the Arctic Ocean will be increasingly ice free in summer, which opens seaways along both the Canadian and Russian coastal regions. A totally ice-free Arctic Ocean in the summer is likely to occur within a few decades, with increasingly longer periods, over the decades there after, of ice-free waters.

A further complication of substantial warming in the Arctic is the thawing of permafrost, shown in Figure 2.8, and the prospect therefore of the

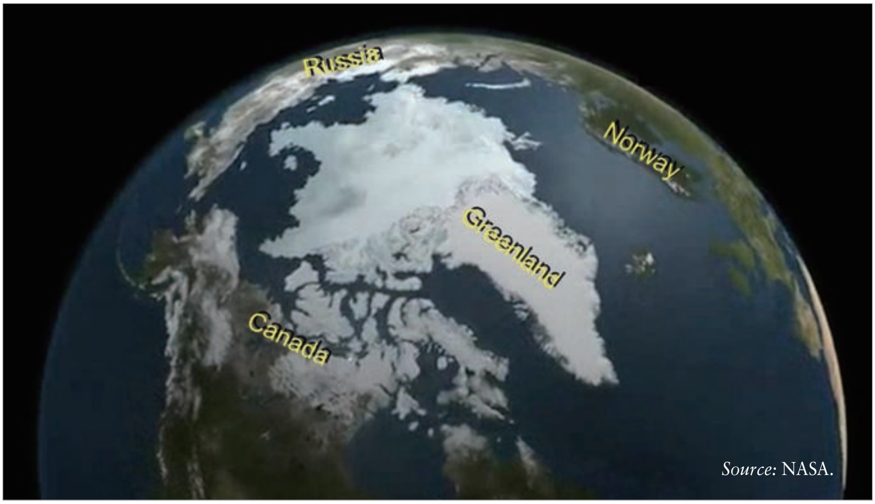


Figure 2.7 Satellite imagery of 2011 minimum Arctic sea ice on September 19, 2011

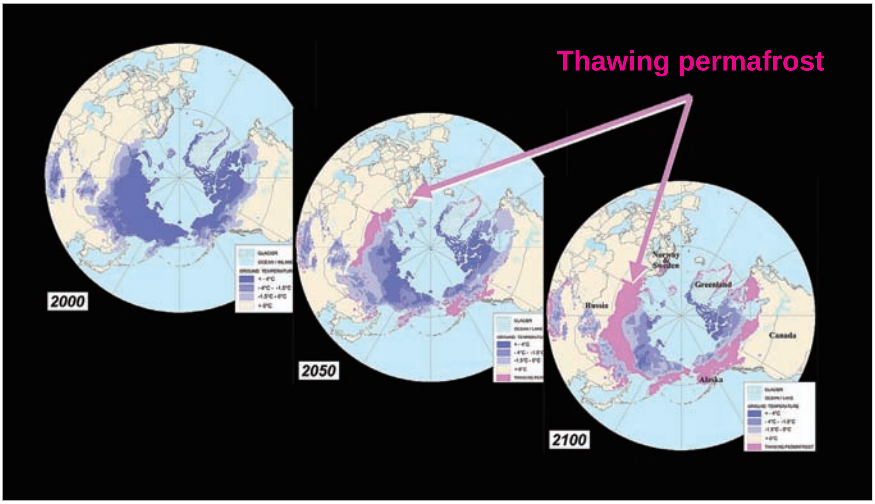


Figure 2.8 Thawing of Arctic region permafrost for three periods: 2000, 2050 and 2100

release of substantial amounts of methane (commonly known as the "natural gas" used throughout the world to heat homes, run appliances, and power industry). Methane is an extremely powerful greenhouse gas, 20 to 30 times more potent in effect than CO_2. The surface permafrost in the tundra regions of Alaska and Russia are already thawing, with projections for major areas to thaw over the coming decades as depicted in this graphic.

The prospect of such rising permafrost temperatures is further evidence of a strong Arctic warming trend. These changes in the Arctic provide an early indication of the environmental and societal significance of global

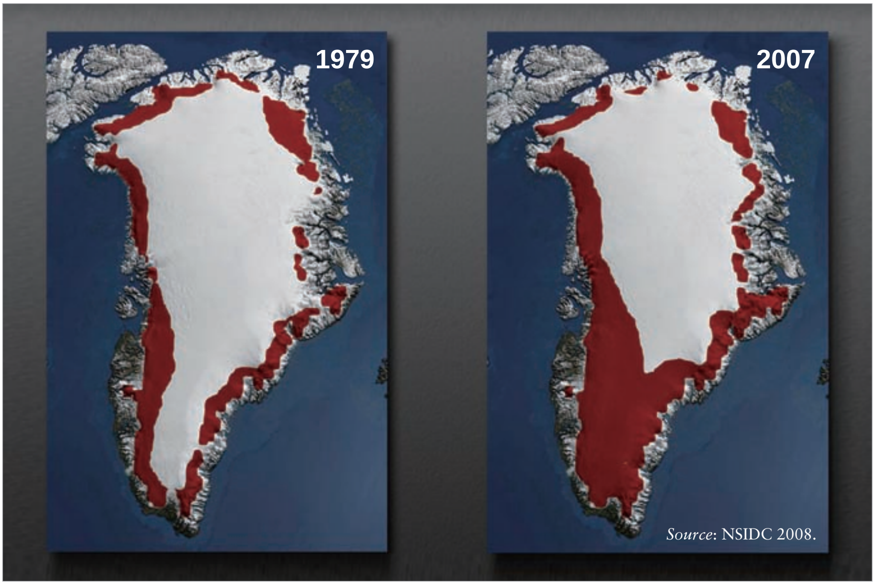


Figure 2.9 Greenland regions of ice sheet melting from first satellite data in 1979 to 2007

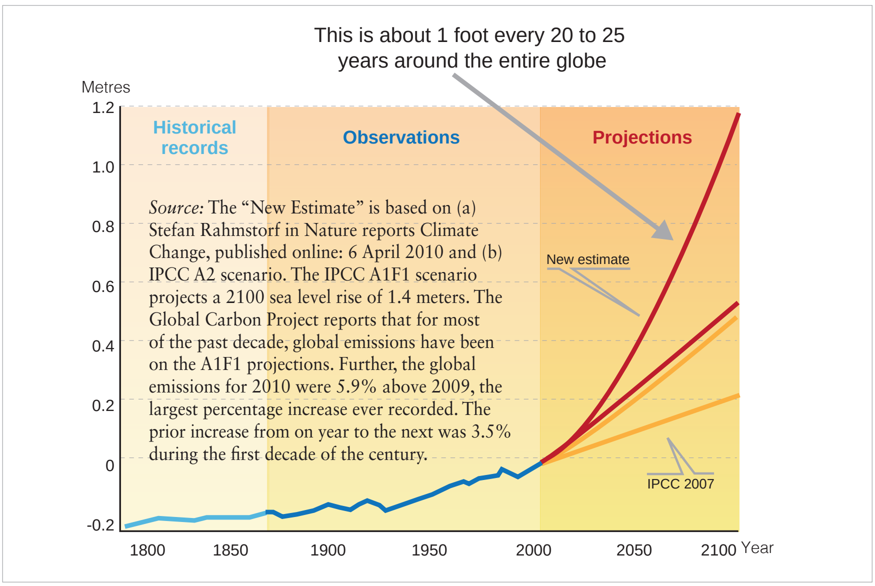


Figure 2.10 Global mean sea level rise, updated from the 2007 IPCC analysis

warming. These changes will reach far beyond the Arctic, affecting water and food availability, sea level rise, biodiversity, human health and many other aspects of human social and economic systems. An additional consequence of this early and accelerated warming in the Arctic is the melting of glaciers and the Greenland Ice Sheet. Whereas the melting of the Arctic sea ice does not add to sea level rise, the melting of land-fast glacial ice will directly contribute to sea level rise. The Greenland Ice Sheet is melting along its coastal regions (Figure 2.9) and is calving icebergs and small ice growlers from its internal ice sheet at accelerated rates, with the prospect of contributing to sea level rise of upwards of one meter (3.3 feet) or more by the end of this century. Some leading scientists are projecting about one foot of sea level rise every generation or so (Figure 2.10), which the IPCC projects is likely to displace tens to hundreds of millions of people in lowland areas and many small island states. Figures 2.11 and 2.15 depict the consequences of one meter or more sea level rise by 2100. There are highly variable regional changes in sea level rise (Figure 2.11) based on regional factors, such as regional seawater heating, regional currents, and regional wind patterns. This results in the conditions depicted in Figure 2.11, where the "small island nations" region of the Asian Pacific are likely

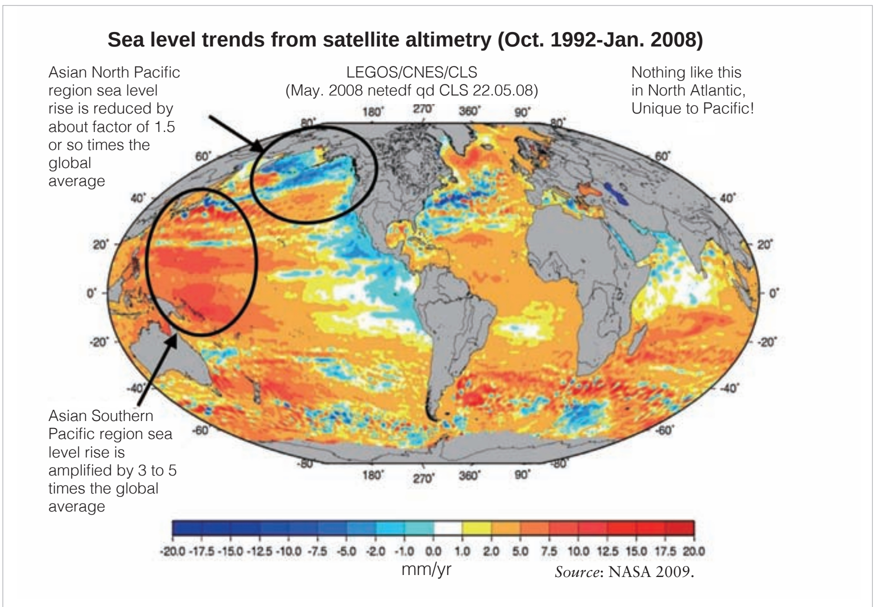


Figure 2.11 *Variability in mean sea level rise depicting the increased regional sea level rise for Western Pacific*

to experience regional sea level rise at rates three to five times the global average sea level rise. However, in the North Pacific region, the average regional sea level is likely to be reduced by a factor of 1.5 or more from the global average sea level rise.

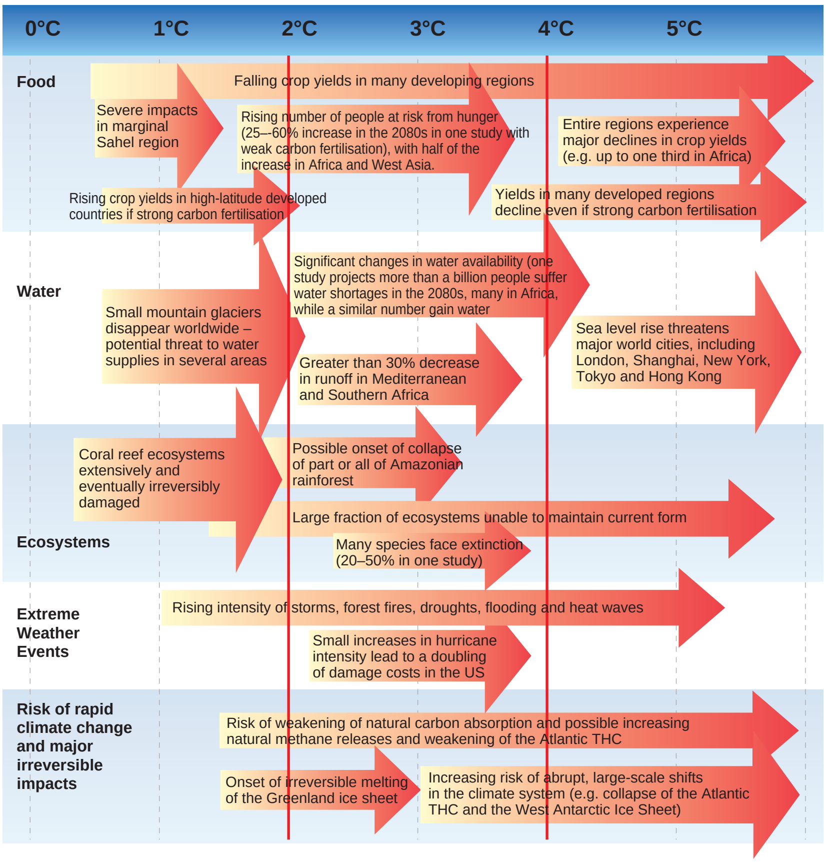
It is important to note that climate change is taking place within a context of many other ongoing changes, including globalization, poverty and hunger, land use changes, rapid human population growth, and changes in cultural, governance, and economic conditions. It is now scientifically clear that the current levels and rates of climate change are already exceeding levels of stabilization of greenhouse gas concentrations in the atmosphere that will prevent dangerous anthropogenic interference with the climate system. In summary, we know these realities, all of which have direct and serious implications for the North Pacific Ocean region, with high scientific probability.[4]

1. *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.
2. *Global Temperature Rise:* All three major global surface temperature reconstructions show that Earth has warmed since 1880. Most of this warming has occurred since the 1970s, with the 20 warmest years having occurred since 1981 and with all 10 of the warmest years occurring in the past 12 years. Even though the 2000s witnessed a solar output decline, resulting in an unusually deep solar minimum in 2008-2009, surface temperatures continue to increase.
3. *Warming Oceans:* The oceans have absorbed much of this increased heat, with the top 700 meters (about 2,300 feet) of ocean showing warming of 0.302 degrees Fahrenheit since 1969.
4. *Shrinking Ice Sheets:* The Greenland and Antarctic ice sheets have decreased in mass. Data from NASA's Gravity Recovery and Climate Experiment show Greenland's net lost was approximately 200 cubic kilometers (36 to 60 cubic miles) of ice per year between 2002 and 2006, while in the 2010 period it was double that loss. Antarctica had a net loss of about 152 cubic kilometers (36 cubic miles) of ice between 2002 and 2005.
5. *Declining Arctic Sea Ice:* Both the extent and thickness of Arctic sea ice has declined rapidly over the last several decades, at extent rates of about 10% to 12% per decade.

6. ***Glacial Retreat:*** Glaciers are retreating almost everywhere around the world (over 95%), including in the Alps, Himalayas, Andes, Rockies, Alaska and Africa.
7. ***Ocean Acidification:*** Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30 percent. This increase is the result of humans emitting more carbon dioxide into the atmosphere and hence more being absorbed into the oceans and converted into carbonic acid. The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year.
8. ***Extreme Events:*** The number of record-high temperature events in the United States has been increasing, while the number of record-low temperature events has been decreasing, since 1950. The U.S. has also witnessed increasing numbers of intense rainfall events. Further, the energy in cyclonic storms (i.e., a hurricane in the Atlantic region, called a typhoon in the Pacific region) has increased by about 50% during the past several decades. While the total annual increases in precipitation (U.S.) since 1910 increased by less than 10%, observations for the same period indicate that extreme precipitation events (more than 2 inches in 24 hours) in the U.S. have increased by 20%-30%.[5]
9. ***Surging Greenhouse Gas Emissions:*** Global carbon dioxide emissions from fossil fuels in 2008 were nearly 40% higher than those 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, just 20 more years of emissions would give a 25% probability that warming exceeds 2°C, even with zero emissions after 2030. Every year of delayed action increases the chances of exceeding 2°C warming.

WHAT ARE THE IMPLICATIONS OF THESE FINDINGS FOR HUMANKIND AND NATURAL SYSTEMS?

The scientific consensus is now unequivocal that climate change is real and the danger is immediate. The primary cause of this unparalleled human influence on our climate is the use of fossil fuels as the primary energy source, providing unequaled standards of living for many societies throughout the world. When combined with the deforesting of our tropical rain forests, this will continue to change the climate for decades to come, hence warming the planet on long time scales. Further, several vulnerable elements in the climate system (e.g. continental ice sheets, the Amazon rain forest, West African monsoons and others) could be pushed towards abrupt or irreversible change if warming continues as business-as-usual throughout this century. These impacts from a changing climate are pervasive and potentially affect people on a global scale, from the most highly economically developed nations to those living in the "Bottom

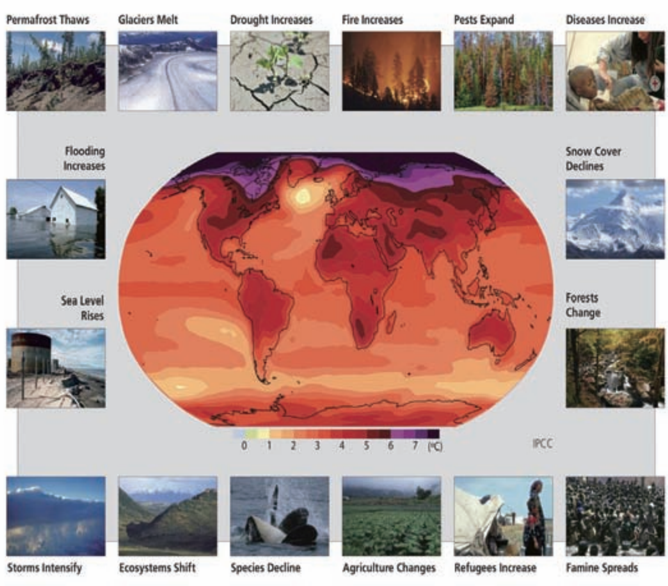


Source: Stern Report 2007.

Figure 2.12 *Consequences of global mean surface temperatures for critical impacted areas*

Billion."[6] Thus, waiting for higher levels of scientific certainty could mean that some tipping points will be crossed before they are recognized. These impacts are summarized in Figure 2.12, where the 2°C (3.6°F) and 4°C (7.2°F) lines depict the range within which projected emission rates will likely be towards the end of the 21st century (i.e., 2100). It is clear that the impacts affect global food supplies and security, water availability and security, the health of ecosystems and sustainability of vital life-supporting biodiversity, along with such issues as extreme weather events on regional scales and the risk of unpredictable and rapid climate change and major irreversible impacts affecting human well-being.

The Global Carbon Project (GCP)[7] documents global carbon emissions, atmospheric concentrations of global carbon, and other measures of the global carbon system in order to assist in the development of a comprehensive, policy-relevant understanding of the global carbon cycle, encompassing both natural and human dimensions and their interactions. Actual global emissions, as shown in Figure 2.4, have essentially followed the IPCC upper scenario projections (i.e., A1FI). Using peer-review



Source: ClimateNotes.

Figure 2.13 Consequences of global mean surface temperatures as projected by IPCC 2007

C-ROADS simulation[8] to project global mean surface temperatures based on the publicly available emission reduction proposal of the 194 UNFCCC nations, it is projected that the global mean surface temperature for 2100 will be 4.5°C, which is depicted in Figure 2.13 and shown graphically in the center of Figure 2.13. Such projections of climate change by 2100 are predicted to very likely affect virtually all aspects of society's activities, as suggested in Figure 2.13.

The Fourth IPCC Assessment[9] concluded in more detail than depicted in Figure 13 that the impacts are very likely (IPCC used "very likely" if the probability of occurrence is greater than 90%) to be severe and affect systems on decadal time scales, including, inter alia:

- ***Ecosystems:*** The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfires, insects, ocean acidification) and other global change drivers (e.g. land use change, pollution, fragmentation of natural systems, overexploitation of resources).
- ***Food:*** At lower latitudes, especially in seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1 to 2°C), which would increase the risk of hunger.
- ***Coasts:*** Coasts are projected to be exposed to increasing risks, including coastal erosion, due to climate change and sea level rise. The effect will be exacerbated by increasing human-induced pressures on coastal areas.
- ***Industry, Communities and Society:*** The most vulnerable industries, settlements and societies are generally those in coastal and river flood plains, those whose economies are closely linked with climate-sensitive resources and those in areas prone to extreme weather events, especially where rapid urbanization is occurring.
- ***Human Health:*** The health status of millions of people is projected to be affected through, for example, increases in malnutrition; increased deaths, diseases and injury due to extreme weather events; increased burden of diarrhoeal diseases; increased frequency of cardio-respiratory diseases due to higher concentrations of ground-level ozone in urban areas related to climate change; and the altered spatial distribution of some infectious diseases.

- *Water:* Climate change is expected to exacerbate current stresses on water resources from population growth and economic and land-use changes, including urbanization. On a regional scale, mountain snow pack, glaciers and small ice caps play a crucial role in freshwater availability. Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by melt water from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives.
- *Extreme Weather Events:* Altered frequencies and intensities of extreme weather, together with sea level rise, are expected to have mostly adverse effects on natural and human systems.

The Fourth Assessment IPCC further suggests these regional findings:

- *Africa:* By 2020, between 75 and 250 million of people are projected to be exposed to increased water stress due to climate change.
- *Asia:* By the 2050's, freshwater availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease.
- *Australia and New Zealand:* By 2020, significant loss of biodiversity is projected to occur in some ecologically rich sites, including the Great Barrier Reef and Queensland Wet Tropics.
- *Europe:* Climate change is expected to magnify regional differences in Europe's natural resources and assets. Negative impacts will include increased risk of inland flash floods and more frequent coastal flooding and increased erosion (due to storminess and sea level rise).
- *Latin America:* By mid-century, increases in temperature and associated decreases in soil water are projected to lead to gradual replacement of tropical forest by savanna in eastern Amazonia. Semiarid vegetation will tend to be replaced by arid-land vegetation.
- *North America:* Warming in western mountains is projected to cause decreased snow pack, more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources
- *Polar Regions:* The main projected biophysical effects are reductions in thickness and extent of glaciers, ice sheets and sea ice, and changes in natural ecosystems with detrimental effects on many organisms

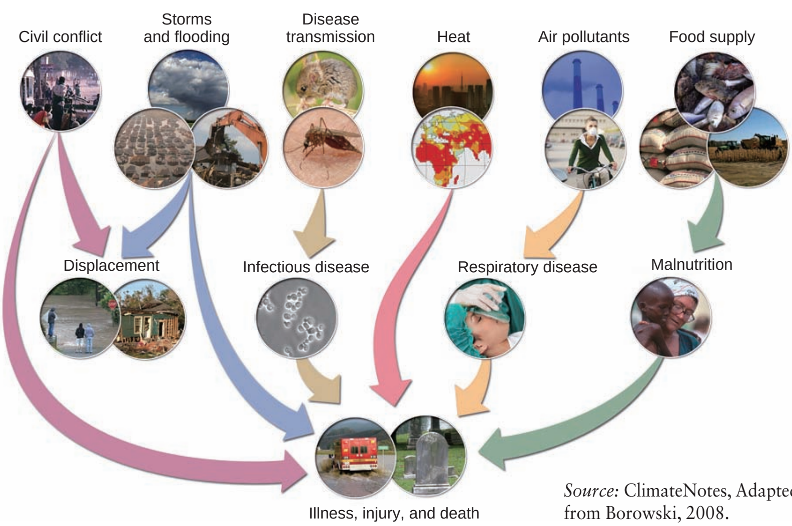
including migratory birds, mammals and higher predators.

- ***Small Islands:*** Sea level rise is expected to exacerbate inundation, storm surges, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities.

An acceleration of these climatic trends is projected to occur during the 21st century, due to ongoing increases in concentrations of greenhouse gases in the earth's atmosphere. These impacts will have particular significance for the North Pacific region and raises security issues for the peoples and nations of this region: (i.e., sea level rise and human health).

HUMAN HEALTH[10]

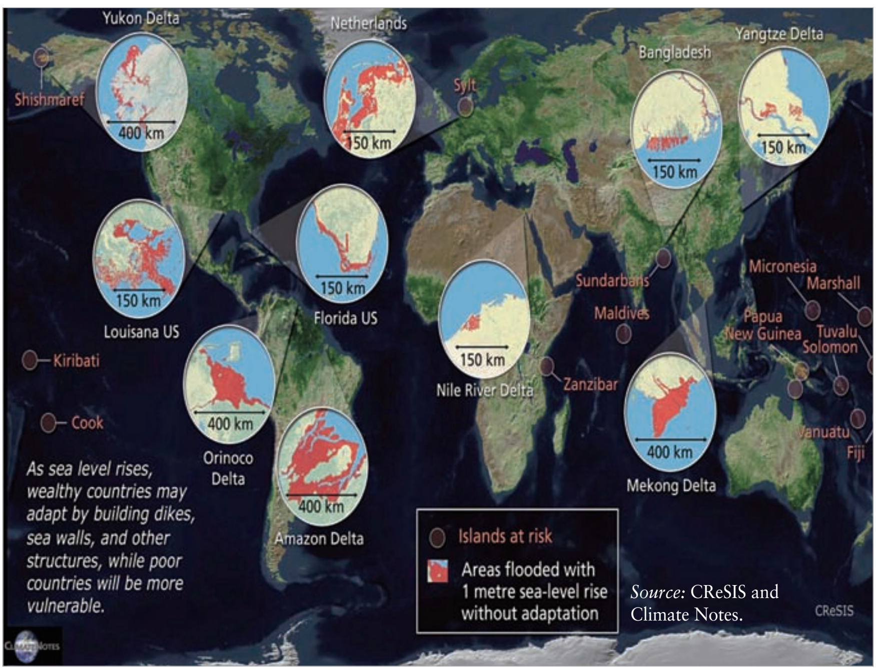
"Heat waves, droughts, wildfires, heavy downpours, floods, and other extreme weather events are projected to become more frequent and intense, with serious consequences for human health and well-being. The impacts of extreme weather events range from illness or death as a result of heat stress, injuries, drowning, air and water contamination, and mental health effects. Increased incidence of cardio-respiratory diseases caused by higher



Source: ClimateNotes, Adapted from Borowski, 2008.

Figure 2.14 *The human health effects of a changing climate* concentrations of ground-level ozone (smog) is projected. Ground-level ozone formation increases under the hot and stagnant conditions that are expected to increase in a warmer world. Breathing ozone results in short-term decreases in lung function and damages the cells lining the lungs. It increases the incidence of asthma-related hospital visits and premature deaths. Increased incidence of infectious diseases, such as those transmitted by insects and rodents, may become more common in regions where these diseases are not currently prevalent. Higher temperatures and changes in precipitation can alter the ranges and life cycles of disease-causing pathogens and the animals that carry them.

Impacts of climate change on food and water supplies are also expected to adversely affect human health, particularly in less-developed countries. About one-sixth of the human population is already undernourished, and climate change will further challenge food production. Hundreds of millions of people face water shortages that will worsen as temperatures rise. Regions most at risk include those already subject to drought. These impacts are shown in Figure 2.14.



Source: CReSIS and Climate Notes.

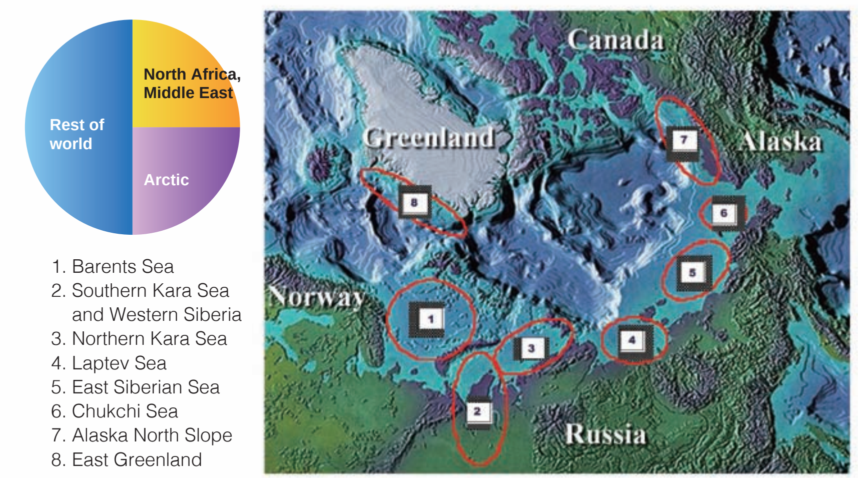
Figure 2.15 *The range of regions impacted by 1 meter of global sea level rise*

SEA LEVEL RISE AND COASTAL HAZARDS

Sea-level rise exposes coastlines to greater risks of flooding and erosion, and is expected to affect millions of additional people each year by late this century. Small islands, such as the Maldives, Asian mega-deltas such as in Bangladesh, low-lying coastlines in the United States along the Southeast and Gulf of Mexico coasts, and heavily populated coastal cities of Europe such as London and Venice are among the vulnerable locations. Some small island nations and major cities could disappear entirely from the face of the Earth. In addition to the loss of coastal land due to the gradual rise in sea level, there will also be increasing risks associated with storm surges. During such events, significant areas of land can be lost instantaneously. As populations are displaced from flooded coastal regions, such as the mega-deltas of Asia and Africa, large numbers of climate refugees will create significant potential for human suffering. Coastal wetlands, including salt marshes and mangroves, are very sensitive to sea level rise, and large fractions of these ecosystems are projected to be lost around the world. The largest losses are likely to be on the Atlantic and Gulf of Mexico coasts of the Americas, the northern Pacific oceanic barrier island and river deltas basins, the Mediterranean, the Baltic, and most importantly the small is lands of the oceanic Pacific basin. A graphical summary of these consequences is shown in Figure 2.15.

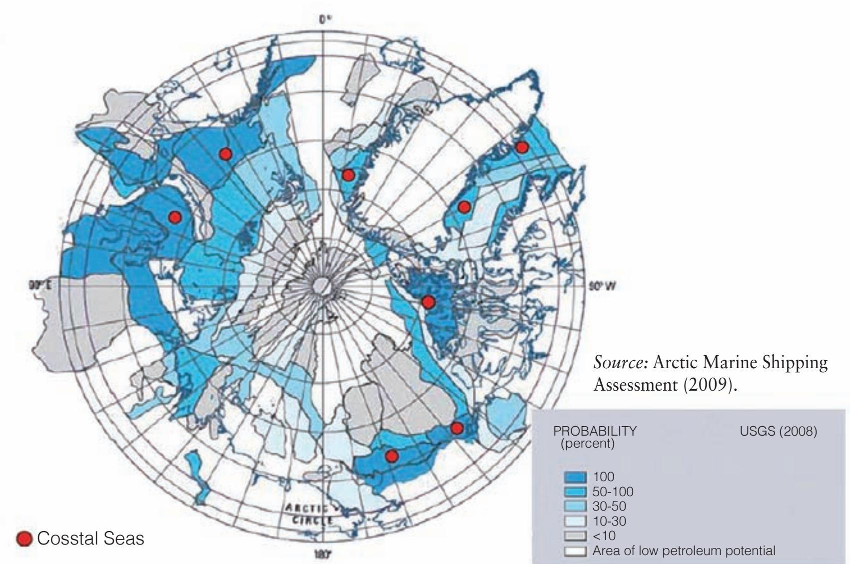
OPENING OF THE NORTHERN SEA ROUTE AND ITS IMPACTS ON THE PACIFIC REGION

The Arctic Marine Shipping Assessment (2009)[11], states that the Arctic is regarded as containing some of the last physically undisturbed marine spaces on Earth. The Arctic has also undergone extraordinary environmental and developmental changes early in the 21st century. Long known as a storehouse of untapped natural resources, high commodity prices and growing worldwide demand have in recent years poised the Arctic as a significant contributor to the global economy. Increasing regional and coastal marine transport to support the exploration and extraction of oil, gas and hard minerals, coupled with the increasing presence of the global marine tourism industry, have brought a complex set of users to the maritime Arctic. The potential impacts of these new marine



Source: USGS and US CIA 2009.

Figure 2.16 The projection of locations of the world petroleum reserves reported by the U.S. Geological Survey and US CIA



Source: Arctic Marine Shipping Assessment (2009).

Figure 2.17 Probability of the presence of undiscovered oil and/or gas fields in the Arctic region

uses - social, environmental, cultural and economic - are unknown, but will be significant for the Arctic's indigenous people and a marine environment already undergoing significant changes due to climate change. Simultaneous with the globalization of the Arctic, marine access in the Arctic Ocean, driven by global climate change, has been changing in unprecedented ways. Arctic sea ice is undergoing an historic transformation - thinning, its extent reduced in all seasons, and substantial reductions in the area of multi-year ice in the central Arctic Ocean - which has significant implications for longer seasons of navigation and new access to previously difficult to reach coastal regions. The international scientific community has already taken advantage of these changes through pioneering voyages in the central Arctic Ocean. The same sea ice retreat also has important influences on the regional, Arctic marine ecosystems and future fisheries. Taken together, these changes present increased demands on the existing legal and regulatory structures that have the challenge of meeting the needs for enhanced marine safety and environmental protection in the face of increasing Arctic marine activity. Such challenges will require unprecedented levels of cooperation among the eight Arctic states and broad engagement with many non-Arctic stakeholders within the global maritime industry. The oil and gas resources appear to drive much of the interests in an Arctic Ocean that will be increasingly ice free in the summer in the coming decades. Assessments in recent years suggest that 25% or so of the world's petroleum (i.e., oil and gas) is located in the Arctic, as Figure 2.16 shows.

A more detailed assessment by the USGS in 2008 suggests these reserves are widely disturbed across the Arctic, the probabilities of which are shown in Figure 2.17.

Economically important marine-oriented resources, such a shard minerals, marine tourism, fisheries, oil and gas, shipping in the summer, and research expeditions can be seen, as this Arctic Marine Shipping Assessment report suggests. Marine shipping activities are very likely to increase over the coming decades as the sea ice reductions continue, as projected by IPCC, ACIA[12] and the SWIPA[13] study. Figures 2.18, 2.19 and 2.20 provide an early indication of the marine shipping traffic potential in the Bering Straits and across the Russian Arctic. The AMSA study notes that there is a long history of Arctic marine transport conducted primarily around the ice-free periphery of the Arctic Ocean. Year-round navigation has been maintained since 1978-79 in the ice-covered western regions of the Northern Sea Route (between the port of Dudinka on the Yenisei River and Murmansk). Previous Arctic marine transport studies for the Northern Sea Route, Canadian Arctic, Alaska's coastal seas and other regions have

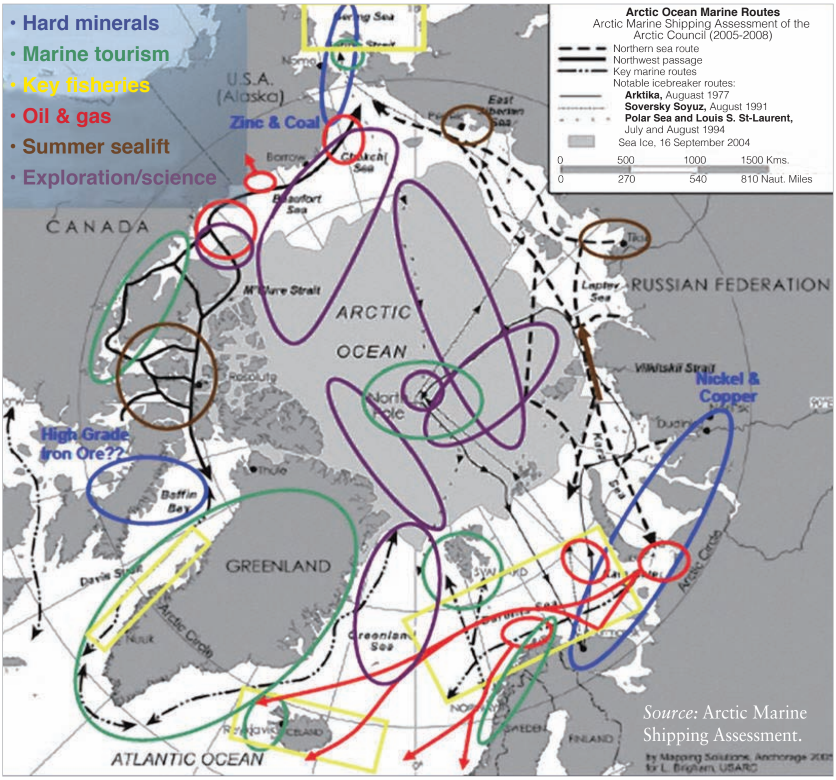


Figure 2.18 *The projection of current marine related resources around the Arctic*

Figure 2.19 *Marine shipping traffic in the Bering Straits region*

Source: AMSA Report 2009.

Figure 2.20 *Vessel traffic in the Russian Federal Arctic*

significant relevance to developing any future regulatory framework for the Arctic Ocean. Most of these past studies involved public-private partnerships and close international cooperation. While these Arctic Marine Shipping Assessment data are from 2004, recent data suggests that the trend towards increased marine shipping is continuing. Arctic Ocean ice is now predominated by one- or two-year ice, which is much thinner, thus making it much easier to access by icebreakers.

FISHERIES IN THE BERING SEA AND NORTH PACIFIC

The Arctic Climate Impact Assessment[14] reported that the continental shelves of the eastern and western Bering Sea together produce one of the world's largest and most productive fishing areas. They contain some of the largest populations of marine mammals, birds, crabs, and ground fish in the world. A quarter of the total global yield of fish came from here in the 1970s. The central Bering Sea contains a deep basin that separates the shelves on the Russian and American sides and falls partly outside the 200 nm EEZs of the two countries (See Figure 2.21).

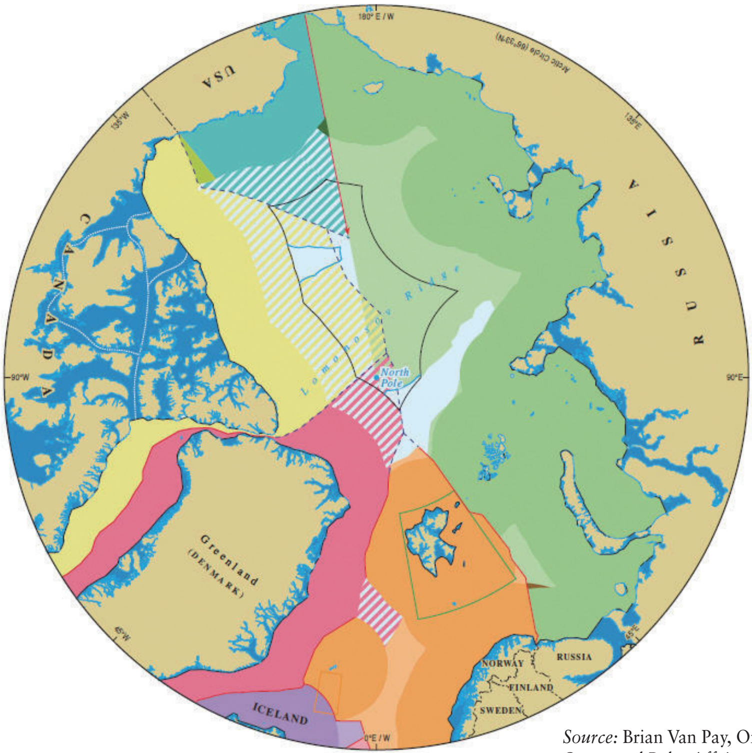
Figure 2.21 Economic zones between United States and the Russian Federation in the Bering Sea

Prior to extended fishing zones, a complex set of bilateral and multilateral fisheries agreements was established for the area. These range from agreements on northern fur seal harvests and Canada/U.S. fisheries for Pacific salmon and Pacific halibut, to the multilateral International North Pacific Fisheries Convention for the development and use of scientific information for managing fisheries on the high seas. In the so-called "Donut Hole," a pocket of high seas area surrounded by U.S. and Russian EEZs, scientific research and commercial fishing are carried out in accordance with the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea by the two coastal states and Japan, Korea, Poland, and China. The North Pacific Science Organization and the North Pacific Anadromous Fish Commission were established to facilitate fisheries and ecosystem research in the North Pacific region, including the Bering Sea. Commercial fisheries in the Bering Sea are generally large-scale trawl fisheries for ground fish of which about 30% of the total catch is processed at sea and the rest delivered to shore-side processing plants in Russia and the

United States. The home ports for many of the Bering Sea vessels come from outside the Arctic region, reflecting the comparative advantage of supplies and services available in lower-cost regions. Small coastal communities have a strong complement of indigenous peoples with subsistence fishing interests. They depend on coastal species, especially salmon, herring, and halibut, but the overlap with commercial activities is generally small. Anadromous species extend far inland via the complex river systems and are critical resources for indigenous peoples. The chief indigenous involvement in the marine commercial sector is the Community Development Program in the Northeast Pacific, where 10% of total allowable catches are allocated to coastal communities and their chosen partners (Ginter, 1995). Because the eastern Bering Sea is within the EEZ of the United States, harvest levels of commercially important species of fish and invertebrates are regulated through federal laws. Management plans exist for the major target species that specify target fishing mortality levels calculated to maintain the long-term female spawning stock levels at 40% of the unfished equilibrium level for fully exploited species. In the western Bering Sea, within the Russian EEZ, fishery management is executed on the basis of an annual TAC established for all commercial stocks of fish, invertebrates, and marine mammals. Allowable catch is calculated as a percentage of the fishable stock. Percentages for individual stocks and species were based on early scientific studies and do not exhibit annual change. However, since 1997, these harvest percentages have been revised by government research institutes, using new modeling applications and adaptive management approaches. The recommended total allowable catches are approved by the special federal agency and issued as a governmental decree. There is a need for a comprehensive assessment of all living marine resources in the Bering Straits and Sea, the Chukchi Sea, the Eastern Siberian Sea and the Beaufort Sea. In this context, it is important to include coastal states and provinces, as they manage fisheries in state or provincial waters and coastal areas, which are very significant commercial and sport harvests. The Continental Shelf regions are depicted in Figure 2.22.

AN OVERVIEW OF THE CHANGES TO THE ARCTIC REGION AND ITS PEOPLES

- Substantial changes in climate and weather, with substantial changes in the oceans (e.g., acidification) and the biosphere (e.g., biodiversity



Source: Brian Van Pay, Office of Ocean and Polar Affairs, U.S. Department of State.

Figure 2.22 *A description in 2009 of the Arctic continental shelf regions as prepared by the U.S. Department of State*

losses affecting food supply and human well-being);

- Globalization, such as mixed economies and technological changes, which raises issues of human, economic and national security issues;
- New economic development opportunities and challenges, e.g., oil and gas reserves, economic minerals, fisheries, shipping and other commerce, etc.;
- Rapid cultural and social change;
- Challenging and heretofore unaddressed governance issues: boundary disputes, access to economic zones and extent of continent shelves, and legal regimes;
- High concentrations of contaminants such as PCBs and other POPs, mercury and other heavy metals; and

- Ozone depletion that leads to UV increases.

THOUGHTS ON CLIMATE CHANGE AFFECTS ON INDIGENOUS PEOPLES OF THE ARCTIC REGION

The resilience of the indigenous cultures of the Arctic (See Figure 2.24) has been remarkable; they have sustained their way of life for thousands of years. For these people, flexibility and innovation has long been the key to adapting and coping with climate and other environmental change. For example, the reindeer herding communities across Russia and northern Scandinavia have historically moved their homes (their tent-like lavvu[15]) with their herds to summer pastures, back to higher ground for the winter and back again. More recently, they have made permanent homes in the winter grounds and move into summer pastures with their lavvu, or even modest homes. Reindeer pastoralism, an ancient model that has sought and maintained a sustainable exploitation and management of northern terrestrial ecosystems, is based on generations of accumulated, conserved, and developed experience, and strategies for adaptation to the climatic and political/economic transformations that impact their culture. The research project EALÁT[16] focuses on understanding the adaptive capacity of reindeer pastoralism to climate variability and change and, in particular, on the integration of reindeer herders' knowledge in the study and analysis of their ability to adapt to environmental variability and change. For example, the EALÁT study has shown that with increasing climate temperature variations causing more "freeze-thaw-freeze" cycles that result in icing over forage plants, the presence of larger animals in the herd, such as those that have been sterilized, becomes an adaptation tool, a practice now more commonly used in reindeer husbandry as a tool for herd structure management. These sterilized males serve a special purpose in the herd regarding the icing issue because, due to their larger size, they are more able to easily break through ice layers in the snow, facilitating access to food for females and calves. In addition, the presence of these males has the effect of calming female reindeer and calves, making herds easier to control. Therefore, adjusting herd composition through male reindeer sterilization represents a critical strategy for adaptation to future climate change.

Empowering northern residents, particularly indigenous peoples, through self-government and self-determination arrangements, including ownership and management of land and natural resources, is key to addressing the challenges of climate and other environmental and globalizations changes.[17] Increasingly, there are compelling reasons for the national governments of the arctic states to work toward supplying indigenous peoples with the powers, resources, information, and responsibilities they need to adapt to climate change.

As noted in the Arctic Climate Impact Assessment,[18] Their vulnerability, and hence the capacity to build resilience into their communities, will engage a number of cultural perspectives, and so the consequences of change will be perceived differently across cultures, age groups, economic sectors, etc. A reindeer herder will most likely define the vulnerability of their community differently than would an outsider assessing the same socioeconomic community. There may well be a range of different perspectives on what constitutes a vulnerable condition, and therefore it is essential to recognize and address these perspectives in carrying out solutions to these challenges. Evaluation of the exposure, sensitivity, and adaptive capacity of the human–environment system will require scientific and indigenous knowledge perspectives, observation, and participation of people who are part of the human-environment system. These local perspectives can help identify important locally oriented stresses, local human–environment challenges, and the outcomes they seek to obtain. They will inevitably identify changes in their cultural system, describe coping and adaptive capacities, monitor environmental and social phenomena, and articulate their perspectives and findings. An excellent analysis of the vulnerabilities of Arctic communities and societies is contained in the CAVIAR study,[19] the aim of which was to increase understanding of the vulnerability of Arctic communities to changing environmental conditions, including climate change, and to contribute to the development of adaptive strategies and policies. In partnership with local collaborators in over two dozen communities, researchers have documented the conditions and forces that contribute to vulnerabilities, identified adaptive strategies and attempted to assess the prospects for adaptation in the future.

The increasingly successful results of the Inuvialuit of the Canadian Beaufort Sea region in the face of climate change finds its roots in the Inuvialuit Final Agreement of 1984, a comprehensive native land claims agreement that recognizes rights of land ownership, co-operative management, protected areas, and economic development opportunities. The agreement evolved new governance mechanisms that, by contributing to self-organization, help the Inuvialuit negotiate and manage the effects of change. While the agreement has profoundly important sectors, as Notzke and others have noted, there remains considerable unfinished work.[20]

For some arctic peoples, the political and management systems that could assess the impacts of climate change and allow local and regional governments to act on policy recommendations to deal with the consequences are already in place. Significant political changes since the 1970s have included land claims in Alaska and Canada and the formation of regional governments in Greenland and Nunavut. These political changes altered the ways that living and non-living resources are managed. A greater degree of local involvement in resource use management decisions has been introduced, including, in some cases, the actual transfer of decision-making authority to the local or regional level. Understanding land use and land cover issues is critically important, and is well addressed in a recent study[21] on "Eurasian Arctic Land Cover and Land Use in a Changing Climate," which studied the interactions of land-cover/land-use change with climate in a region of the Arctic where climate warming is most pronounced compared to other areas of the globe. The climate warming in the far north, and in the Arctic region of Northern Eurasia in particular, affects both the landscape and human activities, and hence human dimensions are an important aspect of the topic. Environmental pollution, together with climate warming, may produce irreversible damages to the current Arctic ecosystems. Regional land-atmosphere feedbacks may have large global importance. Remote sensing is a primary tool in studying the vast northern territories where in situ observations are sporadic. State-of-the-art methods of satellite remote sensing, combined with GIS and models, are used to tackle science questions and provide an outlook on current land-cover changes and potential scenarios for the future. The Continental Shelf regions are shown in Figure 2.22.

FRAMING THE GOVERNANCE ISSUES AFFECTING THE ARCTIC AND NORTH PACIFIC REGION

The territories encircling the Arctic Ocean belong to eight Arctic states. The three large federations, Russia, Canada and the U.S., are the first-, second- and fourth-largest stakeholders, respectively, in terms of Arctic lands.[22] The Russian quadrant, by far the largest, spans Eurasia to western North

America, roughly from meridian 32°04'35" E to meridian 168°58' 37" W. Given its vast territory, no initiatives regarding Arctic governance can succeed without due attention to Russia. The North American quadrant comprises northern Canada and the northern U.S. (Alaska), whereas the European quadrant includes Greenland, the Faroe Islands, Iceland, northern Norway, northern Sweden and northern Finland.[23] Sweden and Finland are considered Arctic states but have no coastlines on the Arctic Ocean.

The Arctic Ocean, the core of the region, is the smallest of the world's five oceans. Much of its economic activity comes from the exploitation of natural resources, including petroleum, natural gas, fish, and seals.[24] It covers an area of approximately 14 million square kilometers, or about 1.5 times the size of the U.S., with a maximum depth of 5,500 meters (18,040 feet). Though modest in capacity compared to the other oceans, this body of water has the widest continental shelf of all the oceans. The shelf is wide and shallow off Europe and Asia, all the way from the Barents Sea in the west to the Bering Strait. In some areas along this coast, the continental shelf extends a significant distance toward the North Pole. The corresponding continental shelves off Alaska, Canada and Greenland are significantly narrower. Norway, Russia, the U.S., Canada, Iceland, and Denmark (Greenland) all have an Arctic continental shelf. Arctic Russia embraces by far the largest area.[25]

The Ilulissat Declaration, adopted by the ministers of foreign affairs of Canada, Denmark, Norway, Russia, and the United States on May 28, 2008, reminds us that while there are pressing issues to address in this region, existing national and international legal frameworks already cover large parts of the Arctic region and address a range of issues. Thus, the declaration states, among other matters, that: "*By virtue of their sovereignty, sovereign rights and jurisdiction in large areas of the Arctic Ocean the five coastal states are in a unique position to address these possibilities and challenges...We remain committed to this legal framework and to the orderly settlement of any possible overlapping claims.*"

Nonetheless, we are now witnessing an outpouring of ideas and proposals aimed at upgrading or supplementing the existing governance systems to address these issues (see the Arctic Governance Projects Compendium at: www.arcticgovernance.org/). There are hundreds of proposals, articles and governance suggestions from various official and stakeholder interests within Arctic states, as well as from non-Arctic states, scientists, political commentators, and representatives of nongovernmental organizations, some of whom warn of competition and conflict for access to the Arctic's natural resources.

More recently, significant steps have been taken with innovative co-management regimes that allow for the sharing of responsibility for resource management between indigenous and other uses. A remarkable development in 2010 is the resolution of the so-called "disputed lands" between Norway and Russia. In a new spirit of collaboration and dispute resolution, on September 15 in Murmansk,[26] the Russian and Norwegian ministers of foreign affairs signed an agreement on the definition of their maritime border and concerning their cooperation on the Barents Sea and the Arctic Ocean. The agreement marked an end to a 40-year territorial dispute between the two countries. It also eased pressure in the region and has opened up the possibility of furthering the exploitation of an area potentially rich in natural resources. Furthermore, in a hallmark speech,[27] Russian Prime Minister Vladimir Putin stated on September 23, 2010 that *"While we are taking care of a steady and balanced development of the Russian North, we are working to strengthen our ties with our neighbors in our common Arctic home. And we think that preserving the Arctic as a zone of peace and cooperation is of the utmost importance. It is our conviction that the Arctic area should serve as a platform for uniting forces for genuine partnership in the economy, security, science, education and the preservation of the North's cultural heritage."*

The partnership and collaboration suggested by the Putin speech and the introduction of co-management has the potential to allow the nations of the Arctic region and indigenous peoples of the North to manage and regulate resource use in a way that incorporates indigenous views and traditional resource use systems. And it is within this new political and scientific environment of power sharing that indigenous communities, scientists, and policy makers can work together to find solutions to address the challenges and opportunities of globalization, climate change and other environmental challenges in the Arctic. Under these circumstances, there is a growing recognition that rapid change in the Arctic is producing new challenges to manage and regulate societies that live in these high northern regions. Whether these challenges may be met by adjusting existing frameworks,[28] or if they will require the development of new governance systems, remains to be seen. Nevertheless, it is already possible to identify a number of the central issues that are very likely to impact indigenous communities across the Arctic region and that will foster adaptation strategies, as well as require further attention by governments, regional authorities, indigenous organizations and local entities:

- *Access:* As the Arctic sea ice recedes toward a more open ocean for months every year, issues of access and rights of passage through sea routes, including the Northern Sea Route (Russia) and the Northwest Passage (Canada), will be critical to not only the coastal nations of the Arctic, but to oil and gas development, trade and commercial sea routes for many other nations.
- *Maritime claims and boundary issues:* Currently, Denmark, Russia, and Canada are researching claims to the 1,220-mile underwater continental crust, the Lomonosov Ridge. The Lomonosov Ridge is five times the size of Britain, with twice the amount of oil of Saudi Arabia. The more open ocean is raising numerous issues involving claims to jurisdiction over areas beyond the territorial sea within the Arctic oceanic basin (including claims under the provisions of UNCLOS Art. 76 to continental shelves extending beyond the limits of Exclusive Economic Zones) and the resolution of offshore boundary disputes. (See Figure 2.23). It is within these benthic regions that analyses now underway will likely determine the range and scope of the continental shelves, and so the jurisdictions for economic zone protections for oil, gas and mineral exploration.
- *Commercial shipping & oil and gas development:* Issues regarding the development of effective codes of conduct for shipping under Arctic conditions and for the conduct of offshore oil and gas drilling and production.
- *Arctic fisheries:* Management of northward-moving commercial fisheries that takes into account the principles of ecosystem-based management and the rights of indigenous peoples.
- *Land claims:* Longstanding use and occupancy and the still unresolved claims of a number of indigenous peoples as they relate to the governance of human-environment interactions in the Arctic.
- *Conservation of Arctic ecosystems:* Protection of marine and terrestrial ecosystems in the Arctic under pressure from human actions as well as biophysical changes.
- *Regional Governance:* Multi-level governance and collaboration among regional, national, and international bodies in guiding northern development

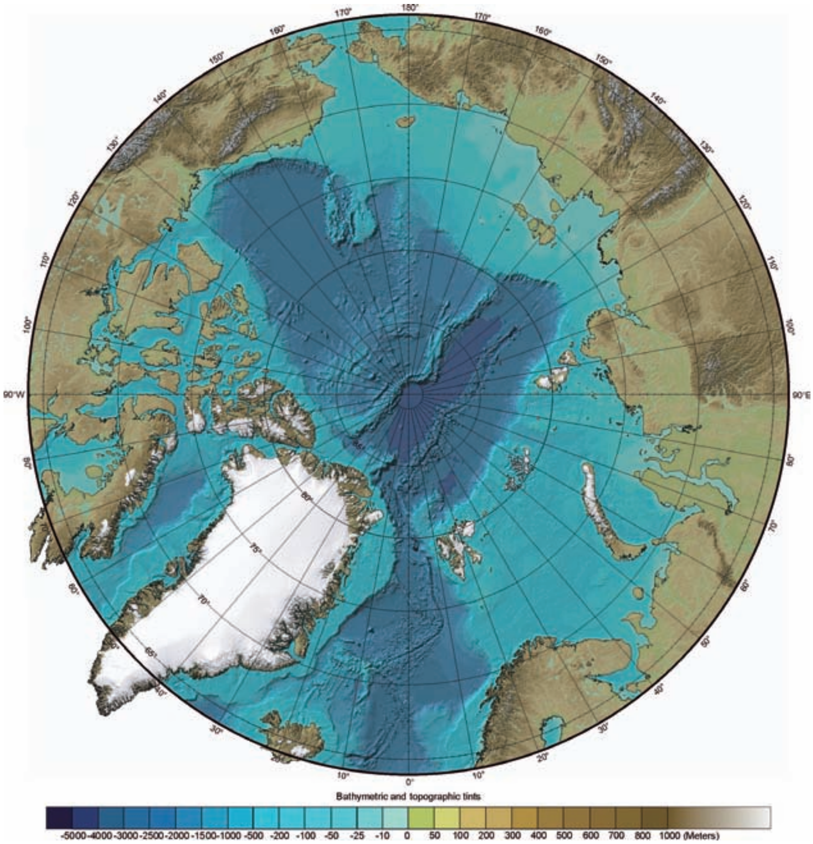
SUMMARY THOUGHTS

Six overarching issues are posited as likely to dominate geopolitical deliberations, and the development of adaptation strategies to cope with the rapid changes that are occurring across the Arctic region in the years to come. They are likely to be:

1. ***Human Security and Well-being:*** Strategies and implementation practices will be needed that protect and insure human security and well-being against the rapid changes induced by climate change, globalization and other facets of change. The challenges of increased storm intensities and increasingly longer and more frequent drought conditions projected by the IPCC, rising sea levels, major changes in land use and other scientific assessments, are likely to increase because of globalization patterns and/or climate change.[30]
2. ***Historic Claims and Rights of Indigenous Peoples:*** There are a host of issues about land rights and access by the historical claims of indigenous peoples across the Arctic who have lived and had unrestricted access to lands for thousands of years.
3. ***Challenges to Civil Infrastructures:*** The civil infrastructure within the region is being extended in ways that impact indigenous communities and their cultures. These civil infrastructures are being impacted, for example, by the thawing of permafrost and the loss of coastal ice that historically has protected lowlands across the Arctic,[31] all of which will likely require changes in domestic practices, policy and legal arrangements.
4. ***Access:*** Demands by many nations, local authorities, and indigenous and other residents of the North to address the need for legally protected access to vital lands and natural resources across the Arctic, which range from the pasture needs of reindeer herding cultures to fisheries and oil/gas resource development strategies.
5. ***Legal Challenges:*** Legal disputes within Arctic nations, among the Arctic countries and local cultures, and internationally among non-Arctic nations that perceive they have rights to access such resources as water, fossil fuels, food and arable land.
6. ***Patterns of Cultural and Human Behavior:*** The role of behavior, culture, and values should not be underestimated as key factors in addressing change, as the International Council for Science[32] found in

> an extensive study of the issues in harnessing the knowledge required to address the diverse realities of social life embedded in different cultural contexts. Culture and values define the goals of peoples and societies, frame their attitudes, and provide standards against which the behavior of individuals and societies can be judged. Social systems are characterized by their values, from which are derived norms, that is, concrete patterns of action that can include legal and moral norms, and a wide range of social norms. The change over time of prevailing norms and values is influenced by numerous forces, including social structures and power relations, and personal perceptions and identification processes. Understanding these across the Arctic region is likely to required reassessments of the role of local knowledge, scientific research strategies, and program implementation practices.

The landscape of these and other issues discussed in this paper will be profoundly impacted by the rapidly changing Arctic, which is populated by challenges outside the experience of humankind of 10,000 years of remarkable climatic stability, when the global mean temperatures did not exceed +/- 0.7°C. The world, and the Arctic, which is it leading indictor, are faced with the prospects of global mean surface temperatures significantly higher than this, with a projected global mean surface temperature of as much as 4.5°C by 2100 and global mean sea level rise of a meter or more. The Arctic is very likely to see much more dramatic increases in regional mean temperatures (i.e., up to or more than 10°C by 2100). Hence, the Arctic is very likely to dominate the geopolitical agenda of the eight Arctic nations and many non-Arctic countries for decades to come. There is an implication that developing solutions to the consequences and impacts from climate and environmental changes, and changes induced from patterns within globalization, are long-term, multi-decade issues. These present unprecedented challenges to humankind, its institutions of government, and to the cultures and socioeconomic foundations of societies of all kinds across the planet.



Note: This International Bathymetric Chart of the Arctic Ocean was produced by investigators representing the Intergovernmental Oceanographic Commission (IOC), the International Arctic Science Committee (IASC), the International Hydrographic Organization (IHO), the US Office of Naval Research (ONR), and the US National Geophysical Data Center (NGDC). Available at: (http://geology.com/world/arctic-ocean-map.shtml).

Figure 2.23 *A bathymetric chart of the Arctic Ocean basin*

Source: ACIA and Map by Clifford Grabhorn.
Note: This map of the people of the Arctic is from the 2004 and 2005 ACIA Reports.

Figure 2.24 *The locations in the Arctic region of the major indigenous peoples as organized within the Arctic Council*

Notes

1. The map of the Arctic is at the end of the paper. See the previous two pages.
2. This opening statement was adapted from material contained in the Arctic Climate Impact Assessment (ACIA), 2004. ACIA was an international project of the Arctic Council (www.arctic-council.org) and two of its Working Group (i.e., AMAP and CAFF) and the International Arctic Science Committee (http://iasc.arcticportal.org), to evaluate and synthesize knowledge on climate variability, climate change, and increased ultraviolet radiation and their consequences. The results of the assessment were released at the ACIA International Scientific Symposium held in Reykjavik, Iceland in November 2004 (www.acia.uaf.edu).
3. In 2000, Paul Crutzen, an eminent atmospheric chemist, realized he no longer believed he was living in the Holocene. He was living in some other age, one shaped primarily by people. Dr. Crutzen suggested this age be called the Anthropocene, "the recent age of man."
4. Reference for this summary (Much is taken from http://climate.nasa.gov/evidence/):

   IPCC Fourth Assessment Report, Summary for Policy Makers, p. 5.

   B. D. Santer et al., "A search for human influences on the thermal structure of the atmosphere," *Nature* vol. 382, July 4, 1996, 39-46.

   Gabriele C. Hegerl, "Detecting Greenhouse-Gas-Induced Climate Change with an Optimal Fingerprint Method," *Journal of Climate* vol. 9, October 1996, 2281-2306

   V. Ramaswamy et al., "Anthropogenic and Natural Influences in the Evolution of Lower Stratospheric Cooling," *Science* vol. 311 (February 24, 2006), 1138-1141.

   B. D. Santeret al., "Contributions of Anthropogenic and Natural Forcing to Recent Tropopause Height Changes," *Science* vol. 301 (July25, 2003), 479-483.

   In the 1860s, physicist John Tyndall recognized the Earth's natural greenhouse effect and suggested that slight changes in the atmospheric composition could bring about climatic variations. In 1896, a seminal paper by Swedish scientist Svante Arrhenius first speculated that changes in the levels of carbon dioxide in the atmosphere could substantially alter the surface temperature through the greenhouse effect.

   National Research Council (NRC), 2006. Surface Temperature Reconstructions for the Last 2,000 Years. National Academy Press, Washington, DC.

   Church, J.A. Church and N.J. White, 2006. "A 20th Century Acceleration in Global Sea Level Rise," *Geophysical Research Letters* 33, L01602, doi:10.1029/2005GL024826.

The global sea level estimate described in this work can also be downloaded from the CSIRO website.

http://www.ncdc.noaa.gov/oa/climate/research/ anomalies/index.html.

http://www.cru.uea.ac.uk/cru/data/temperature.

http://data.giss.nasa.gov/gistemp.

T.C. Peterson et al., "State of the Climate in 2008," *Special Supplement to the Bulletin of the American Meteorological Society* Vol. 90, No. 8, August 2009, pp. S17-S18.

I. Allison et.al., The Copenhagen Diagnosis: Updating the World on the Latest Climate Science, UNSW Climate Change Research Center, Sydney, Australia, 2009, p. 11.

http://www.giss.nasa.gov/research/news/20100121/.

http://science.nasa.gov/headlines/y2009/ 01apr_deepsolarminimum.htm.

Levitus, et al, "Global Ocean Heat Content 1955–2008 in Light of Recently Revealed Instrumentation Problems," *Geophysical Research Letters* Vol. 36, L07608 (2009).

L. Polyak et.al., "History of Sea Ice in the Arctic," in Past Climate Variability and Change in the Arctic and at High Latitudes, U.S. Geological Survey, Climate Change Science Program Synthesis and Assessment Product 1. 2, January 2009, Chapter 7.

R. Kwok and D. A. Rothrock, "Decline in Arctic Sea Ice Thickness from Submarine and ICESAT Records: 1958-2008," Geophysical Research Letters Vol. 36, paper No. L15501, 2009.

http://nsidc.org/sotc/sea_ice.html

National Snow and Ice Data Center

World Glacier Monitoring Service

http://lwf.ncdc.noaa.gov/extremes/cei.html

http://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F (Note: The pH of surface ocean waters has fallen by 0.1 pH units. Since the pH scale is logarithmic, this change represents approximately a 30 percent increase in acidity.)

http://www.pmel.noaa.gov/co2/story/Ocean+Acidification

C. L. Sabine et al., "The Oceanic Sink for Anthropogenic CO_2," *Science* Vol. 305 (16 July 2004), 367-371.

Copenhagen Diagnosis, p. 36.

5. http://www.ncdc.noaa.gov/ol/climate/severeweather/rainfall.html

6. The Bottom Billion: Why the Poorest Countries are Failing, and What Can Be Done About It by Paul Collier is a book worth reading. He argues that global poverty is actually falling quite rapidly for about 80 percent of the world. The real crisis lies in a group of about 50 failing states, the bottom billion, whose problems defy traditional approaches to alleviating poverty. Further, he contends that these 50 failed states pose the central challenge of the developing world in the 21st century. His analysis focuses on this group of small nations, largely unnoticed by the industrialized West, which are dropping further and further behind the majority of the world's people, and often falling into an absolute decline in living standards. He suggests that there is a struggle within each of these nations between reformers and corrupt leaders—and the corrupt are winning. He analyzes the causes of failure, pointing to a set of traps that snare these countries, including civil wars, a dependence on the extraction and export of natural resources, and bad governance. Standard solutions do not work against these traps, he notes; aid is often ineffective, and globalization can actually make matters worse, driving development to more stable nations. What the bottom billion need, he argues, is a bold new plan supported by the Group of Eight industrialized nations. If failed states are ever to be helped, the G8 will have to adopt preferential trade policies, new laws against corruption, new international charters, and even conduct carefully calibrated military interventions. Collier is the former director of research for the World Bank and current director of the Center for the Study of African Economies at Oxford University. In The Bottom Billion, he outlines strategies for solving one of the great humanitarian crises facing the world today.
7. www.globalcarbonproject.org/.
8. http://climateinteractive.org/scoreboard (more details about the assumptions and methods behind this analysis are available at www.climatescoreboard.org)
9. www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm
10. This material is from a publication, Climate Notes, published by the Forum for Active Philanthropy(www.activephilanthropy.org) and prepared by a team composed of Susan Joy Hassol (www.climatecommunication.org/), Paul Grabhorn(Grabhorn Studios), Josh Weybright (Grabhorn Studios), Marta Darby (Climate Communications), Randy Udall (Climate Communications), Dr. Felicitas von Peter (Forum for Active Philanthropy) and Dr. Robert W. Corell.
11. www.pame.is/amsa/amsa-2009-report
12. The Arctic Climate Impact Assessment (ACIA) of 2004 and 2005 (www.acia.uaf.edu/)
13. The Snow, Water, Ice and Permafrost Assessment (SWIPA) of 2011 (www.amap.no/swipa/SWIPA%20Brochure%20Final.pdf)

14. ACIA Chapter 13, Fisheries and Aquaculture, Lead authors Hjáalmar Vilhjáalmsson, Alf Hakon Hoel.
15. http://lavvu.com/history.htm
16. http://icr.arcticportal.org/index.php?option=com_content&view=article&id=245&Itemid=86&lang=en
17. http://arcticgovernance.custompublish.com/index.php?find=self+governance
18. www.acia.uaf.edu/
19. www.waterstones.com/waterstonesweb/products/grete+k-+hovelsrud/barry+smit/community+adaptation+and+vulnerability+in+arctic+regions/8070725/
20. http://books.google.com/books?id=tWR7lYnQzokC&pg=PA160&lpg=PA160&dq=Inuvialuit+Final+Agreement+of+1984&source=bl&ots=8fTfFqWSqa&sig=GIMfC8qVSscJmjk-7q95xdRG4uQ&hl=en&ei=g-_JTJ7vGIOdlgeoqMjBAQ&sa=X&oi=book_result&ct=result&resnum=8&sqi=2&ved=0CDQQ6AEwBw#v=onepage&q=Inuvialuit%20Final%20Agreement%20of%201984&f=false and Aboriginal peoples and natural resources in Canada By Claudia Notzke at http://books.google.com/books?id=6VbIJTDlZIoC&printsec=frontcover&dq=and+Aboriginal+peoples+and+natural+resources+in+Canada+By+Claudia+Notzke&source=bl&ots=fwG_RIHJLB&sig=oWcnPhbWoRzN5w6TVNzwISgoZk8&hl=en&ei=SvHJTKPkE8aqlAfYtbHEAQ&sa=X&oi=book_result&ct=result&resnum=2&sqi=2&ved=0CBgQ6AEwAQ#v=onepage&q&f=false
21. www.springer.com/earth+sciences+and+geography/geography/book/978-90-481-9117-8 in the book: Eurasian Arctic Land Cover and Land Use in a Changing Climate. Gutman, Garik; Reissell, Anni (Eds.).
22. The total area of Greenland is 2,170,000 sq km (840,000 sq mi). Alaska has a total area of 1,717,854 sq km (663,267 sq mi).
23. More specifically, the land territories in the Arctic are generally considered to include Alaska; the northern territories of Canada (Northwest Territories, Yukon, Nunavut); northern Russia, including the Republics of Karelia and Komi, the Murmansk and Arkhangelsk Oblasts, the Yamalo-Nenets and Khanty-Mansi Autonomous Okrugs, the Taimyr and Evenkia former Autonomous Okrugs, the Republic of Sakha, the Magadan Oblast, and the Chukotka and Koryakia Autonomous Okrugs; Greenland; the Faroe Islands; Iceland; Arctic Norway (Finnmark, Troms, Nordland, Svalbard Archipelago and Jan Mayen), Arctic Sweden (Väasterbotten and Norrbotten) and Arctic Finland (Lapland and Oulu).
24. The Arctic Ocean includes Baffin Bay, Barents Sea, Beaufort Sea, Chukchi Sea, East Siberian Sea, Greenland Sea, Hudson Bay, Hudson Strait, Kara Sea, Laptev Sea and certain other waters. [source: https://www.cia.gov/library/publications/

the-world-factbook/geos/xq.html]

25. This Russian shelf area is estimated to contain 45–55 percent of the total volume of the undiscovered oil and gas resources in the Arctic. Russia and Norway have filed claims to portions of the Arctic seabed under the United Nations Convention on the Law of the Sea (UNCLOS). The Russian claim covers a vast area of 1,191,000 sq km (460,800 sq miles). Canada and Denmark are currently conducting research to support claims, whereas the U.S. has not yet ratified UNCLOS.
26. www.osw.waw.pl/en/publikacje/eastweek/2010-09-22/russia-and-norway-agree-maritime-border
27. http://icr.arcticportal.org/index.php?option=com_content&view=article&id=1746:full-text-of-putins-speech-a-closing-remarks-to-arctic-forum-in-moscow&catid=47:ealat-news-latest&Itemid=111&lang=en
28. The Arctic Governance Project Recommendations. See www.arcticgovernance.org/agp-report-and-action-agenda.156784.en.html
29. The routes from Asian markets to Europe make up about 45% of the current routes through the Suez Canal.
30. Storm severity and the depth of and duration of droughts are projected by the IPCC and numerous other scientific assessments to increase, creating challenges to human security and well-being.
31. For example: building supports and roadways have be damaged or lost by the thawing of permafrost, pipeline supports and integrity have been challenged, access to pastures by reindeer herders has been dramatically altered, and the forests, agricultural lands and ecosystems all have experienced impacts. Some coastal barrier islands in Alaska and Russia, with indigenous residents who have lived and thrived there for thousands of years, will be lost due to severe spring and fall storms that historically were protected by coastal sea ice that is now lost as the ice disappears earlier in the spring and re-freezes much later in the fall.
32. www.icsu.org/Gestion/img/ICSU_DOC_DOWNLOAD/584_DD_FILE_Consortium_Report.pdf

Commentary

Masahiro Akiyama

First, I would like to express my respect and gratitude to Professor Corell for his extremely well-prepared discussion paper.

I appreciate his explanations of climate change by demonstrating it with many charts, graphs and adducing evidence. I understand that the IPCC AR4 Report and many other scientific public actions have concluded there is warming of climate systems, with increases in air and ocean temperatures, melting of snow and ice, a rise in average sea level, and extreme weather.

While I am not a scientist myself, my understanding is that climate change is not due solely to such a simple mechanism as the increase or decrease in CO_2.

Nevertheless, based on results from the relevant Japanese studies, I am for the most part in agreement with Professor Corell's assessment of AR4 and the related views.

On the other hand, some experts insist that we will soon confront (in this century?) a Little Ice Age, although during the past half-century human influences on the climate system were realized. I have heard this opinion often in Russia. I cannot judge whether this is correct or not. I would appreciate it if you gave us reasons based on what they insist, and then make clear your scientific views against them as an introduction. It will help me further understand warming of the climate system.

I think the implications of Arctic transformation for the North Pacific include fishery issues, natural resource exploration, environment protection (sustainability) and marine transportation, such as the NSR.

1. With regard to fisheries, the eastern and western Bering Sea produce one of the world's largest and most productive fishing areas, as Professor Corell writes in the paper. There are many bi- and multilateral fisheries agreements established for the area. Many management plans, including TAC, exist and stakeholders maintain the frameworks.

   The Arctic transformation, in particular, factors related to climate change including changing of temperatures, current, and mechanism of oceans, will affect the North Pacific Sea, including the Bering Sea.

We are concerned if it would have a negative effect on fisheries there. At the same time, I am interested in the possibility of a productive fishing area emerging in half of the Arctic Ocean (the eastern region) toward the Bering Strait. We should study carefully, from a fishery-related perspective, the future of both seas, which are geographic neighbors, and which North Pacific countries are interested in.

2. Thanks to Professor Corell for providing useful information the current projection of Arctic marine-related resources. Countries in the North Pacific region are interested in the perspective of the exploitation and exploration of oil and gas and other natural resources in the eastern part of Arctic Ocean, while of course they are interested in the western part, and land areas, for finding feasible projects in the near future. Regarding projects in the eastern part of the Arctic Ocean, we are thinking of combining them with the opening of navigation on the NSR. As far as Arctic marine-related resources are concerned, transportation for the products should in the future be marine ones, and should be on a commercial basis, not as model test ones.

   On this point I would like to add that marine infrastructures and systems for natural resource exploration based on ships and sea-based facilities could reduce the total cost and environmental impact in polar areas where economic activities are seasonally concentrated. You can understand it well by noting that logging of the Taiga forests to construct land infrastructure related to resource exploitation has triggered the emergence of solifluction of the permafrost, the release of the powerful greenhouse gas methane, and various other pollution effects.

3. With regard to the implications of climate change for humankind and the natural system, Professor Corell says that the scientific consensus is now unequivocal that climate change is real, dangerous and immediate. I think sustainability is most important at this point. There are, however, many arguments in support of different definitions and interpretations of sustainability. If sustainability is the ability of future generations of mankind to inherit a healthy planet, and if the current environment of the planet is expected to exert a consistent influence over the next several centuries, then I believe we have already gone beyond the "tipping point." Seen from the time scale of our near descendants, it would be almost impossible

to restore the global environment to what it was in the early 20th century. This is clear if we see the changes in the Arctic region. The ecosystem, food, water, weather and irreversible impacts should be traced.

Assessment of the North Pacific region from this viewpoint can be appropriately conducted by following the traces in the case of the Arctic region. Regarding Japan's interests, we are observing and studying the situation in the region, including the western Bering Sea, Okhotsk Sea and the sea area close to Sakhalin Island and Hokkaido. Rises in sea and air temperatures, sea level rise, shrinking ice sheets and ocean acidification would all affect sustainability in the region.

At present, what is needed for securing sustainability is not brought up for full discussion. Instead, international society must survey, assess, share knowledge, draw up a roadmap and take action towards restoring the health of our planet.

4. Marine shipping in the Arctic Ocean has been maintained around the ice-free periphery of the ocean, as Professor Corell indicates. Northeast Asian countries are interested in the possibility of a Northern Sea Route in the Arctic Ocean becoming a commercial transport, as the northern route would make marine transport from East Asia to Europe much shorter than the current one, the southern route, saving time, money and CO_2 emissions, and freeing ships from pirate attacks. We have to carefully estimate the future ice melts and changing of ice conditions so that navigation in the Arctic Ocean can become dramatically much easier with icebreakers or, I would say, without them.

   Many issues must be addressed. As for shipping, the movement toward setting international standards for an ice navigator/ice certificate and navigation simulators is welcome. The important thing is that they should be processed in a transparent manner. In this regard, Russia should introduce a newly designed rule for navigation on the NSR as soon as possible if it needs a certain rule from the viewpoint of environment protection and safety of marine transport. Also, regarding search and rescue (SAR), while the clarification via convention of each country's area of responsibility should be applauded, there is the need for a clear roadmap to meet the necessary conditions for SAR, especially regarding systems, equipment improvement (icebreakers, airplanes), infrastructure, operations, and so on. You can get a lot of relevant information in the International Northern Sea Route Programme (INSROP) study that was carried out by my foundation, the Ocean Policy Research Foundation, in the 1990s, which took six years: (http://www.sof.or.jp/en/activities/index6_1.php)

Followed by phase two, JANSLOP, in the 2000s: (http://www.sof.or.jp/en/activities/index6_2.php).

Another implication of the NSR on the North Pacific is the possible dramatic change of the global navigation network. You may understand it if you see that more than half of marine transport between East Asia and Europe, one of the world's main navigation routes, shifts from the southern sea route to the northern sea route. Japan, Korea, China and Taiwan now have a strong interest in the NSR from this viewpoint. I think Canada and the United States also have the same kind of interest related to the western sea route.

Finally, I would like to suggest that all the issues I have discussed are interconnected, and it is expected that solutions to Arctic problems will be found in an integrated manner. Other aspects we should take into account as relevant factors besides those I referred to include delimitation disputes, security, indigenous people, and human well-being.

And I do not believe it is alright that Arctic-related issues are simply engaged by the coastal states alone. All countries, particularly those relatively close to the polar region such as those in the North Pacific, should be involved in the Arctic transformation, because it is regarded as a global issue affecting the world.

From this point of view, ocean governance for the Arctic Sea must be an agenda to be focused on further, reviewing over the function of market mechanisms, patterns of human behavior, international collaboration, legal challenges, scientific surveys and studies as the basic infrastructure.

Commentary

James Seong-Cheol Kang

Dr. Robert Corell addressed the implications of Arctic transformation for the North Pacific region from the viewpoints of world order, the North Pacific nations, and regional and global governance. In particular, the paper discussed climate change and its implications for humankind and natural systems, the opening of the Northern Sea Route (NSR) due in large part to climate change and its implications for the North Pacific region, indigenous peoples in the Arctic region affected by climate change, and governance issues affecting the Arctic and North Pacific regions. After synthesizing key points of the paper, this commentary will examine climate change in Korea and the recent situation in the Arctic to provide further supporting information. Finally, some issues for discussion will be suggested.

KEY POINTS OF THE PAPER

Earth's climate is changing. Human influences on the climate system are exceeding natural climatic variability. Global impacts from climate change include melting of glaciers, thawing of permafrost, sea level rises, intensified storms, ocean acidification, forest changes, shifting ecosystems, and adverse effects on human health and well-being.

Some of these impacts are especially evident in the Arctic. Current scientific studies suggest that the Arctic Ocean will be increasingly ice free in summer, which opens seaways along both the Canadian and Russian coastal regions. A totally ice-free Arctic Ocean in summer is likely to occur within a few decades for increasingly longer periods. And over the decades thereafter, the Arctic Ocean could become ice-free waters.

The crises caused by climate change also present some opportunities. The opening of the NSR, due to the declining Arctic sea ice, could bring about significant advantages in logistics and natural resources development. If the NSR is taken, for example, from Busan, Korea to Rotterdam, Netherlands, 40% of the travel distance (about 7,400 km) is estimated to be reduced compared to the current route that goes through the Indian Ocean and Suez Canal, which is equivalent to a saving of 10 sailing days. More detailed analyses of the impacts of the NSR on North Pacific transportation and logistics are presented in the two papers in Part II. Improved accessibility to the Arctic makes it easier to develop untapped natural resources (oil, gas, fisheries) in the area. Assessments in recent years suggest that 25% or so of the world's petroleum (i.e., oil and gas) is located in the Arctic. It has also been reported that the continental shelves of the eastern and western Bering Sea together constitute one of the world's largest and most productive fishing areas.

Arctic indigenous peoples have been resilient for thousands of years, maintaining their way of life. However, they are becoming increasingly vulnerable to the substantial changes in climate in recent decades. The opening of the NSR and subsequent developments in the Arctic region could exacerbate the negative impact on indigenous communities. Therefore the changes in the Arctic, if not unavoidable, should be adapted to and utilized in consideration of these indigenous peoples through an appropriate regional or global governance framework. The existing framework is the Arctic Council, established in 1996 by the Ottawa Declaration, with Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States being member states. The Arctic Council faces many issues and challenges related to climatic change in the Arctic and access to the NSR and natural resources in the region. Whether the Arctic Council can effectively address these issues and protect indigenous communities by reconciling their geopolitical interests remains to be seen.

CLIMATE CHANGE IN KOREA

In his paper, Corell described climate change from a global perspective.

I would like to add to his alarming information by providing some statistics on climate change in Korea in recent decades.

In Korea, the average surface temperature has increased by 1.7°C since 1912. The warming magnitude exceeds the global average. This has caused a nation-wide average increase in the frequency of extremely hot days and a decrease in the frequency of extremely cold days. The number of tropical nights (defined as days with a daily lowest temperature exceeding 25°C) during a 10-year period from 2000 to 2009 has increased by 0.6 days. In contrast, the number of frost days (defined as days with a daily lowest temperature below 0°C) has decreased by 5.6 days.

Winters became shorter by nearly a month in the 1990s compared to the 1920s, whereas summers have lengthened. In the beginning half of the 20th century, the Han River, a major river in Korea that passes through the city of Seoul, was frozen for roughly three months in winter. But it has been completely ice free in some recent years. Sea surface temperatures around the Korean Peninsula have increased by approximately 0.93°C since 1968. The sea level has risen by 2.5 mm/year over the last three decades.

Annual precipitation has exhibited an increasing trend with distinct natural variability. For the period from 1996 to 2005, the average annual precipitation (1,485.7 mm) increased by 10% compared to the normal amount. The number of wet days has more or less decreased, while the number of heavy rainfall days has significantly increased. In particular, the number of days with daily precipitation exceeding 80 mm has increased from 20 (the normal figure) to 28 days in a year for the recent 10-year period. The heavy rainfall in Seoul and nearby areas over four days from July 26 to 29 this year is a striking and worrisome example. The amount of rainfall was 700 mm, which is half the average annual precipitation, resulting in 40 deaths from landslides.

Looking ahead, under the IPCC SRES A1B scenario, temperature in the late 21st century (2071-2100), as compared to that of the late 20th century (1971-2000), is expected to increase by 4°C throughout the Korean Peninsula. Precipitation in the late 21st century, as compared to that of the late 20th century, is projected to increase by 17%. The frequency and intensity of precipitation in Korea are anticipated to increase in the future.

RECENT SITUATION IN THE ARTIC

The Korean icebreaking research vessel "Araon" is exploring the Arctic at this moment. Reports from the vessel are surprising. Last year, sea ice in the Artic was first observed at a latitude of 69° north. However, it was not encountered until the vessel reached a latitude of 73° north this year, a 500 km retreat. The NSR became available in mid-September last year, but has opened more than a month earlier this year. This is because recent temperatures in the Arctic are 5°C~8°C higher than usual. The Arctic sea ice is melting at the fastest rate ever. On average, 93,000 km^2 of ice, almost the size of South Korea, disappeared daily in August this year. The amount of Artic sea ice decreased by 30% during a recent month (from 9,500,000 km^2 in early July, 2011 to 6,700,000 km^2 in late July).

As stated in Corell's paper, the IPCC and peer-reviewed scientific publications have concluded that warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. The above information from the Arctic is a corroborating piece of evidence that climate change is indeed happening.

ISSUES FOR DISCUSSION

Curbing climate change and the opening and use of the NSR are conflicting matters: slowing down global warming would delay the opening of the NSR. The route is likely to be available soon unless the trajectory of climate change suddenly changes. So, use of the NSR needs to be approached from the perspective of adaptation to climate change. In this regard, among the important issues for deliberation are the following:

- The use of the NSR could exacerbate the melting of the Arctic sea ice. How do we strike a balance between using the Arctic region commercially and slowing down climate change in the Arctic?
- What would be the social responsibilities of the Arctic states and non-Arctic states in the North Pacific region, which could benefit from the opening of the NSR, regarding indigenous communities and parts of the world that could suffer from climate change in the Arctic?
- What is the political and environmental downside of utilizing the NSR and developing natural resources in the Arctic region?

References

Wikipedia, http://en.wikipedia.org/wiki/Arctic_Council

Han, Taek-Whan, Chung, Il-Ung, Lim, Dongsoon, Oh, Jin-Gyu, Lee, Myung-Kyoon, and Lee, Chang-Hee. 2011. *Green Growth: Climate Change*. Green Forum 2010, vol. 3, National Research Council for Economics, Humanities and Social Sciences.

MBC News, http://imnews.imbc.com/replay/nwdesk/article/2900896_5780.html

Commentary

Nancy D. Lewis

Aloha and welcome to the East-West Center. I am very pleased that the EWC is the host of this conference, Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security. I want to thank the Korea Transport Institute and the Korea Maritime Institute, as well as to EWC Senior Fellow Y.H. Kim, who has so ably served as the primary conference organizer.

I am honored to have been asked to comment on the opening address, "Consequences of the Changes across the Arctic on World Order, the North Pacific Nations, and Regional and Global Governance" by Dr. Robert Corell, former assistant director for Geosciences at the National Science Foundation, chair of the Arctic Climate Impact Assessment, and head of a New Initiative on Arctic Change Impact Assessment, about which I hope we learn more over the course of the next two days.

I am tempted to say that I am somewhat out of my depth, and that is not meant to be a climate change pun. My mother's family is from Alaska and I have visited, but as a scientist, I do not know a great deal about the Arctic. I have spent most of my academic career working in the small tropical island nations and states of the Pacific on issues related to health and the environment, and in the last decade, on how both are influenced by climate change. Time is limited and Dr. Corell's presentation was a truly outstanding introduction to the complex and interacting opportunities and challenges in the Arctic, including but not limited to climate change. He also addressed issues of governance and responsibility that face us as a global community with respect to the Arctic. I am going to yield most of my time to the other commentators in this session who have far more expertise than I do with Arctic issues.

There are parallels between the challenges of climate change for the indigenous peoples and environments of the Arctic and the challenges for the peoples and environments of tropical island states in the Pacific and elsewhere, although they are not exact mirror images of one another. One of the points that I want to make is that if we think only of the iconic images of marooned polar bears and sinking islands, or canaries in a coal mine, we deny the people of both the Arctic and the islands agency, and ignore the fact that they have been adapting to climate variability and change for centuries, in some cases thousands of years (Barnett and Campbell 2010). Dr. Corell stressed that empowering northern residents is critical in addressing climate change and other environmental and global challenges in the Arctic, and the importance of co-management and engaging indigenous and traditional knowledge in addressing these issues. Frances Ulmer also underscored these thoughts in her written comments.

Issues of governance are addressed in this meeting at multiple levels. Preparing these brief remarks, I came across a paper written for a conference, the Indigenous Peoples' Global Summit on Climate Change, which was held in Anchorage in 2009, "Artic Governance: Traditional Knowledge of Arctic Indigenous Peoples from an International Policy Perspective" (Fenge and Funston 2009). I recommend the paper for those who are not familiar with the Arctic. Island states, individually and collectively, have been highly visible in climate change debates. This is in part due to their previously mentioned iconic status, but also because of their representation in the United Nations and in the UNFCCC. Some have suggested that islands have a "moral argument" with respect to climate change or that islands are the "conscience" of climate change, an ironically heavy burden given their very small contribution to greenhouse gas emissions. Although islands are highly visible in the debates, the lack of both human and financial resources to support large diplomatic missions or delegations, limits the real power that they have in climate politics (Barnett and Campbell 2010; Lewis 2011). The indigenous peoples of the Arctic have been given voice by their status as Permanent Participants in the Arctic Council. I defer to others to address the strength of this voice. I anticipate that Dr. Maynard will expand on the concerns and issues for indigenous Arctic peoples in her comments.

The term "climate or environmental refugee" is used with reference to both peoples of the Arctic and the island states. It is complicated and contested (Hartmann 2010). One argument is that it undermines the rights and status of political refugees. Maxine Burkett, head of the University of Hawaii Center for Island Climate Adaptation and Policy and a team member in the Pacific RISA project described below, noted that the fact that climate refugees have no legal status may be an additional reason to avoid using the term. Burkett goes on to argue that the international legal community lacks the will to address the legal implications of individuals and island communities who may be forced to abandon their islands. She also posed the question of whether the climate refugees are stateless persons or landless citizens of a state that does not exist (Burkett 2011).

I want to mention one EWC activity that links us, to a small degree, to colleagues working with communities in the Arctic. The EWC hosts the Pacific RISA, or Regional Integrated Sciences and Assessments, one of 11 NOAA-supported RISA programs in the United States that strive to enhance communities' abilities to understand, plan for and respond to a changing climate through interdisciplinary research that builds partnerships with local, national and regional stakeholders. We have a particularly close relationship with another RISA, the Alaska Center for Climate Assessment and Policy, based at the University of Alaska, Fairbanks. Members of their team were in Hawaii for a meeting two weeks ago. Together, we have engaged in some preliminary efforts, linking indigenous communities in the Pacific and Alaska virtually. When I asked the ACCAP team what the issues they saw as most critical in the Arctic they stressed governance; indigenous use, including coastal erosion and coastal community relocation; safety (search and rescue); risks of oil spills; invasive species; tundra fires; marine and mammal protection; and air emissions.

The organizing theme for this conference is the changing Arctic climate and implications for sea routes, shipping and resource development. As we explored how best to organize the conference, it became clear that we needed to set the context for those discussions. This included outlining the myriad opportunities and challenges presented by the Arctic, the interests of the multiple stakeholders involved, and the need for multidisciplinary and international collaboration in addressing these issues. Bob Corell did a masterful job of setting this context.

Looking to another expert, I will close my remarks by quoting remarks by Dr. Jane Lubchenco (a marine scientist, Under Secretary of Commerce for Oceans and Atmosphere and Administrator of NOAA) in a keynote speech to the Arctic Symposium in June of this year (Lubchenco 2011) and present her six Guiding Principles, the first of which was also Dr. Ulmer's first suggested question for discussion. These principles can serve to frame our deliberations:

> *"…the loss of sea ice alone creates new opportunities, potential threats and new demands for information and services to evaluate trade-offs and ensure safety … and the loss of sea ice interacts with the plethora of other changes underway that influence Arctic ecosystems, communities and cultures. These changes affect not only the Arctic. They have global implications as*

well. More holistic approaches are needed if we are to achieve the multiple goals identified for the Arctic...."

SIX GUIDING PRINCIPLES

1. "When in doubt, err on the side of caution, especially when actions may trigger irreversible changes, ones affecting huge areas, or ones lasting for decades to centuries…"
2. "Adopt an ecosystem-based management approach that considers the interacting and collective diverse activities on the functioning of the Large Marine Ecosystems of the Arctic. This holistic approach recognizes that sectoral activities such as shipping, energy production, mining, fishing, tourism, defense, etc., affect one another and ecosystem functioning...If the goal is to use Arctic ecosystems without using them up, an integrated ecosystem approach is necessary."
3. "The people of the Arctic should have a strong voice in their future. At the same time decisions must recognize that many changes in the Arctic will have global ramifications."
4. "The challenges of operating and living safely in the rigorous and quickly changing Arctic environment require extra attention to safety, adequate communications, contingency plans and vigilance."
5. "Management and policy decisions should be firmly grounded in scientific information, with adequate attention to acquiring, disseminating and using the requisite data and information."
6. "Collaborations, openness and transparency are essential for effective expansion of the use of the Arctic."

I look forward to our discussions. Thank you.

References

Barnett, Jon and John Campbell. 2010. *Climate Change and Small Island States*. Washington, DC: Earthscan.

Burkett, Maxine. 2011. "In Search of Refuge: Pacific Islands, Climate-Induced Migration and the Legal Frontier." *AsiaPacific Issues* No. 98. Honolulu, HI: East-West Center.

Fenge, Terry and Bernard W. Funston. 2009. "Arctic Governance: Traditional Knowledge of Arctic Indigenous Peoples for an International Policy Perspective." *Indigenous Peoples' Global Summit on Climate Change*, Anchorage, Alaska, April 24, 2009.

Hartman, Betsy. 2010. "Rethinking Climate Refugees and Climate Conflict: Rhetoric, Reality and the Politics of Policy Discourse." *Journal of International Development* 22(2): 233-246.

Lewis, Nancy Davis. 2012. Is lands in a Sea of Change: Climate Change, Health and Human Security in Small Island States. In H.J.S. Fernando, Z. Klaić and J.L. McCulley, eds. *National Security and Human Health Implications of Climate Change* (pp. 13-24), NATO Science for Peace and Security Series C: Environmental Security. Dordrecht, the Netherlands: Springer.

Lubchenco, Jane. 2011. Keynote address to the June 2011 Arctic Symposium; 4th Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations, Washington, D.C. Organized by the US National Ice Center and the US Arctic Research Commission. Retrieved from http://www.noaanews.noaa.gov/stories2011/20110620_arcticice.html

Commentary

Nancy G. Maynard

INTRODUCTION

This paper addresses one aspect of the "Implications of Arctic Transformation for the North Pacific": the implications for the indigenous peoples of the region. How can we ensure that indigenous peoples will be part of and have a strong voice in the future of the Arctic, especially with the opening of the Northern Sea Route (NSR)? There is great concern by some that indigenous peoples will be pushed aside or even eliminated in the rush by Arctic and non-Arctic states and industries to exploit their resources. Indigenous peoples - the original native inhabitants of the region - are nested deeply in the center of the profound transformations taking place across the Arctic due to climate change, globalization, development, and now the opening of the NSR. The nature of the challenges facing indigenous peoples as a result of these changes is summarized in the

Conference Concept Note of the 2011 EWC/KOTI Conference as follows:

> *"...The shrinking of the Arctic's ice cap increases environmental fragility and threatens the traditional way of life for indigenous peoples. Climate change in the circumpolar region is already affecting indigenous peoples who consider the region to be their homeland. Arctic indigenous peoples are trying to protect their traditional ways of life from colonizers who seek to take advantage of new opportunities to exploit the region for oil, mineral, and forestry resources with adverse effects on their communities..."*

To fully appreciate the seriousness of the potential for major impacts by the coming transformation of the Arctic on indigenous peoples, it is important to understand the magnitude of existing stresses already impacting their communities and ways of life. To help establish a better understanding of these issues and encourage policymakers to include more indigenous peoples and their issues in related decision-making processes, this paper has provided background information, a few key questions, two examples of typical impacts on indigenous communities occurring today, and some possible solutions. The key questions are:

- Who are the "indigenous peoples?"
- What are the primary stresses on Arctic indigenous peoples?
- What are some possible solutions to improve involvement by indigenous peoples in the future of the Arctic?

WHO ARE THE "INDIGENOUS PEOPLES?"

"Indigenous peoples, or Native peoples (see map, Corell, 2013, this volume) have often been described as ethnic groups from particular regions or lands - often the original inhabitants - especially prior to the arrival of later and possibly dominating cultures (Galloway-McLean, 2010; Nakashima et al., 2011). As discussed by Nakashima et al. (2011), while there is no universally accepted definition of indigenous or native peoples, most include the following set of basic criteria:

- "maintenance of social and cultural traits that are distinct from those of mainstream or dominant society (which may include distinct

languages, production systems, social organization, political and legal systems, spirituality and worldviews, amongst other aspects);
- unique ties to ancestral territories and to the natural resources of these places;
- self-identification and recognition by others as being part of a distinct cultural group." (Nakashima, et al., 2011)

Worldwide, there are approximately 300-350 million indigenous individuals and 5,000 distinct peoples (McLean-Galloway, 2010). Indigenous peoples are approximately 5% of the world's population, manage 11% of the world's forest lands and occupy, own, or use 22% of the surface area of the land (McLean-Galloway, 2010). Although several countries in the Arctic do not identify indigenous peoples specifically, there are some estimates of numbers which suggest that the Arctic is home to approximately 375,000 indigenous peoples in five different countries (Bogoyavlenskiy and Siggner, 2004). The percentage of the populations of indigenous peoples in the Arctic range from 3-4% in Russia to 80% in Greenland (Galloway-McLean, 2010). Bogoyavlenskiy and Siggner (2004) list the following indigenous groups in Arctic countries: the Saami, who inhabit circumpolar areas of Norway, Sweden and Finland; the Inuit in Greenland; American Indians and Alaskan Natives in the United States; North American Indian, Inuit, and Metis in Canada; and the Saami, Nenets, Khanty, Sel'kup, Enets, Nganasan, Dolgan, Evenk, Even, Yukagir, Chukchi, Chuvan and Eskimo/Inuit-Yupik in Russia. They also list the following distribution of estimated population numbers in the Arctic regions by country: USA, 110,000; Canada, 66,000 Denmark, Greenland, 50,000; Norway, Sweden, and Finland, 50,000; and Russia, 90,000 (data from 2002 census). A detailed map of the locations of indigenous groups may be found in Corell, 2013, this volume. Settlements range from small, nomadic villages that follow a traditional lifestyle to larger industrialized cities (Galloway-McLean, 2010).

Indigenous peoples are considered especially vulnerable to climate change and development in the Arctic because of their strong relationship with the natural resources and environment for their cultural, social, and physical well-being (Ford and Furgal, 2009; Parkinson, 2009). In addition, over many years, indigenous peoples across the world have tended to maintain cultural and political separation from surrounding mainstream governments and systems, and therefore there has often developed a political domination by those surrounding nation states (Galloway-McLean, 2010; Nakashima et al., 2011). Significant concern about the historic injustices that have occurred has resulted in the United Nations issuing a "Declaration on the Rights of Indigenous Peoples" to protect the rights of indigenous peoples and their culture, language, health, identity, employment, natural resources, and education (United Nations, 2008). Thus, it is important to take into account the consequences to, as well as the role of, Arctic indigenous peoples in the coming "Transformation of the Arctic."

WHAT ARE THE PRIMARY STRESSES ON ARCTIC INDIGENOUS PEOPLES?

To underscore the seriousness of the additional potential impacts to indigenous peoples resulting from opening of the NSR, this paper presents information about some of the stresses already affecting indigenous peoples from climate and development changes in the context of several of the categories of the 4th IPCC Assessment (ecosystems, food, human health, water and extreme weather). An overall summary of some of the existing stresses in these categories on indigenous peoples has been summarized as follows:

> *"…Resident indigenous populations of the Arctic are uniquely vulnerable to climate change because of their close relationship with, and dependence on, the land, sea and natural resources for their cultural, social, economic and physical well-being. Climate change will affect sustainable development of these communities through its impact on the sanitation and water infrastructure, food supply, transportation infrastructures and the prevalence of infectious diseases. Without addressing these basic public health needs, Arctic communities are not sustainable….*
>
> *(Parkinson, 2009)*

Ecosystems

For many indigenous communities, hunting, fishing, and herding are central to the culture and well-being of the community – maintaining a strong connection to the environment – as well as nutritionally for the ability to supply nutritional traditional foods such as seals, marine mammals, reindeer/caribou, and fish for family and community (Huntington et al., 1998; Poppel, 2006). As changing sea ice conditions and warming oceans in turn change the distribution of the fish, seabirds, marine mammals, and other animals that are harvested by Arctic peoples, the availability of a predictable food supply is being threatened (Nuttal et al., 2005; Ford and Furgal, 2009). These factors are being exacerbated by the accompanying decrease in predictability of weather patterns along with low water levels and timing of snow, ice, and storms, which also influence the potential for successful hunting, fishing, herding, and access to food, as well as increasing the possibility of accidents (Nuttal et al., 2005; Ford and Furgal, 2009).

Food

Food security is a crucial factor for the survival of indigenous peoples, and currently many Arctic people are concerned about how they will adapt to impacts on their food supplies caused by climate change and development, as well as resultant changes in their diets (Ford and Berrang-Ford, 2009). For example, Inuit communities are trying to adjust the timing of their travels by land, sea, and ice due to changes in thawing and freeze-up of the ice for safety, as well as animal location changes due to changes in the environment (McLean-Galloway, 2010; Gearheard et al., 2006). Compounding these issues are impacts on traditional food preservation methods like the drying of meat, fish, fermentation, and storage in ice cellars – all of which are being affected by warming temperatures and thus reducing available food for communities (Parkinson and Evengard, 2009; Virginia and Yalowitz, 2011). Globalization influences in some communities are causing a loss of knowledge in younger generations on how to preserve traditional foods, again forcing families to rely on more expensive and less healthy Western foods, which in turn is increasing health issues normally associated with processed food such as diabetes, cardiovascular diseases, dental problems, and obesity (Berrang-Ford et al., 2011; Virginia and Yalowitz, 2011).

Extreme Weather

There are many impacts of climate change-related extreme weather on the indigenous peoples – who characteristically hunt, fish, and herd out in the Arctic environment - including potential for increasingly unpredictable extreme weather events and storms, which can cause risks to travel and activities related to subsistence food gathering, risk of becoming trapped away from home communities, or risks to very isolated rural villages (Ford and Furgal, 2009; Brubaker et al., 2011; Berner et al., 2005). Other direct impacts include physical and mental injuries, disease, and even mortality from rapid changes in weather that can cause problems such as blizzards, avalanches, and premature ice melt (Berner et al., 2005; Ford and Pearce, 2010). In addition, loss of land-fast ice and increased open water are also causing less-predictable sea ice and fog conditions, which can create dangerous coastal travel conditions (Nuttal et al., 2005).

Human Health

Climate change is only one of the factors determining vulnerability or health status in indigenous communities, as the impacts vary among the widely diverse communities (ranging from small, remote settlements to large industrial cities), but it is a factor that can complicate other stresses (Anisimov et al., 2007; Revich, 2008; Brubaker et al., 2011). In addition to impacts from extreme weather, climate-related potential health impacts include temperature- and weather-related injuries or stress (frostbite, hypothermia, injury, accidents), UV-B radiation (immune suppression, cataracts, skin cancer), and cardiomyopathy associated with low temperatures and/or stress (Berner et al., 2005; Revich, 2008; Ford and Furgal, 2009; Parkinson and Evengard, 2009; Abryutina, 2009). Examples of other climate-related health issues are possible increases in new plant and animal species, infectious diseases, and zoonotic diseases (Revich, 2008; Parkinson, 2009; Brubaker et al., 2011). It is also important to consider background conditions that are already operating in the region, and although perhaps subtle in appearance, they are profound in impact. These factors include additional stressors such as the presence of serious levels of contaminants (e.g., POPs or persistent organic pollutants, radioactivity, and heavy metals such as mercury) (AMAP, 2009; AMAP, 2011). Studies by AMAP have documented significant health hazards to Arctic residents from the long-range transport of these contaminants to the Arctic from both local and distant industrialized sources, as well as their accumulation in plants and animals, with serious effects on the central nervous system, immune system, and cardiovascular system (UNEP/AMAP, 2011; Abryutina, 2009). This is an especially important threat to indigenous peoples because the contaminants are biomagnified up the food chain to traditional subsistence foods (UNEP/AMAP, 2011). Climate impact studies also show that as indigenous peoples are losing the ability to practice their traditions and cultures and provide food for their families and communities, there are related increases in psychological distress and anxiety, accompanied by such issues as domestic violence and high suicide rates (Portier et al, 2010; Coyle and Susteren, 2011).

Water

The effects of climate change are starting to threaten drinking water and infrastructure in communities – especially in low-lying coastal towns (e.g., Shishmaref, Newtok, and Kivalina) and areas of thawing permafrost where not only are buildings crumbling, but also water sources are being impacted through increased river and coastal erosion and flooding, saltwater intrusion, loss of reservoirs, bacterial contamination, and sewage contamination (Anisimov et al., 2007; Parkinson et al. 2008; Virginia and Yalowitz, 2011). Disease incidence from contact with human waste can increase with flooding and infrastructure damage and limited availability of safe water for drinking, cooking and hygiene, and these conditions can result in increased rates of respiratory infections, skin conditions, pneumonia, and other diseases (Berner et al., 2005 Parkinson and Evengard, 2009).

TWO EXAMPLES OF CURRENT IMPACTS ON INDIGENOUS PEOPLES IN EURASIA

Example #1 Oil and gas development in Northern Russia: impacts and solutions

The purpose of this example is to help demonstrate the impact that extensive oil and gas development can have on local reindeer populations and associated indigenous peoples, as well as an example of a possible adaptation strategy through the sharing of knowledge among indigenous reindeer herders and Norwegian, Russian, and NASA scientists. The Yamal-Nenets Autonomous Okrug (YNAO) is one of the largest reindeer husbandry regions in the North, where traditional family reindeer herding has remained. However, very aggressive development of the Yamal oil and gas fields has also been taking place, and is expected to dramatically increase. In recent years, industrial development has begun to collide with major reindeer herding areas, and local reindeer herders are already experiencing negative impacts such as loss of traditional migration routes and campsites to pipelines, roads, buildings, and pollution (Degteva, 2006; Mathiesen et al., 2010; Oskal et al., 2010; Maynard et al., 2011). A collaboration among members of an EALAT team from the International Centre for Reindeer Husbandry, St. Petersburg State University, Nenets indigenous reindeer herders, and NASA has co-produced maps and images that could be used to find alternate routes and for planning purposes with industry and the government regarding development of new oil and gas fields, to assure that access to migration routes will be sustained (Degteva, 2006; Mathieson et al., 2010; Oskal et al., 2010; Bongo et al., 2011; Maynard et al., 2011a,b).

Example #2 Impacts of large-scale mining infrastructure development in Russia on local reindeer populations and the indigenous peoples who depend upon them

The purpose of this example is to help demonstrate the type of impact that large-scale mining (increased gold mining and related development) can have on local reindeer populations and the indigenous people who depend on them. Nizhniy Kuranakh is one of the main gold mining regions in Russia. Up to 80% of the town's workforce has been employed at the open-cut gold mine since mining began as the town's leading industry in 1932. The area, however, is also used by Evenki reindeer herders who have historically migrated for thousands of years through the region from their nearby village, Khatystyr, to reach seasonal pastures (Pogodaev, personal communication). The growth in major infrastructure from the mining operations in the area is now blocking seasonal migration of large herds of reindeer and the Evenki herders through the entire area (Pogodaev, personal communication; Mathiesen et al., 2010). The Russian government and industry are currently planning to do massive development in the area. Pressures on now-fragmented pasturelands left available to reindeer and associated indigenous communities in Russia are expected to increase as a direct result of increased gold mining, other development, and accompanying pollution in the region (Pogodaev, personal communication; Maynard et al., 2011a). It is suggested that one solution to mitigate against total disruption of the herd migration by infrastructure could be the increased use of remote sensing studies, combined with the knowledge and expertise of indigenous people as well as other Russian colleagues, making it possible to find alternate migration routes for the herders using collaborative maps and space-based observations (Degteva, 2006; Pogodaev, personal communication; Mathiesen et al., 2010; Maynard et al., 2011a, b).

WHAT ARE SOME POSSIBLE SOLUTIONS TO IMPROVE INVOLVEMENT BY INDIGENOUS PEOPLES IN THE FUTURE OF THE ARCTIC?

"Indigenuity" is a term coined by Dr. Dan Wildcat of Haskell Indian Nations University in Lawrence, Kansas, U.S., a leader in Native American studies in climate change, to describe some possible solutions or strategies in which indigenous knowledge in any location is combined with ingenuity to create even smarter solutions, especially for indigenous peoples (Wildcat, 2009).

Below are a number of examples of potential solutions compiled by the EALAT Yamal team when considering future strategies and adaptations for the Yamal reindeer herders as they try to deal with rapidly increasing oil and gas development and climate changes taking place across their traditional migration routes. Although the solutions in this case were prepared to address issues of local indigenous reindeer herders, it is suggested that many of the solutions could apply in general to cooperative arrangements among all indigenous peoples and states or parties as they increase their activities in the Arctic in the coming years (Degteva, 2006; Mathiesen et al., 2010; Oskal et al., 2010; Maynard et al., 2011a,b).

- Establish meaningful agreements between indigenous reindeer herders and oil and gas industries and governments to ensure "adaptive access" to historical pasturelands and migration routes so they can coexist in changing climates
- Create strong partnerships between the reindeer herding community and industry and government
- Create mechanisms for clear and ongoing communications between reindeer herders and oil and gas industry and governments for co-managing land use
- Ensure that indigenous knowledge and peoples are included in

decision-making that impacts the herding community

- Ensure that industry, governments and reindeer herders work together to help preserve the language, culture, and well-being of indigenous peoples
- Utilize all best available data for decision-making and predictions: indigenous knowledge, science, remote sensing, technologies, weather, etc.
- Collaborate and co-produce data and solutions
- Utilize the EALAT Observation and Monitoring Network for Reindeer Pastoralism at the International Center for Reindeer Husbandry to ensure strong input of indigenous knowledge for decision-making and predictions
- Create assessments and adaptation strategies to address impacts of climate change, development, pollution, and loss/changes in pasturelands on indigenous reindeer herder communities
- Expand and enhance educational opportunities in reindeer herders communities as well as industry and government employees out on Arctic lands

References

Abryutina, L. 2009. “Indigenous Peoples of the Russian North: Social and Climate Change.” *Climate Change and Arctic Sustainable Development: Scientific, Social, Cultural and Educational Challenges*. UNESCO. 164-173.

Albrecht, G., G. Sartore, L. Connor, N. Higginbotham, S. Freeman, B. Kelly, H. Stain, A. Tonna, and G. Pollard, “2007: Solastalgia: the distress caused by environmental change.” *Australasian Psychiatry* 15. S95-S98.

AMAP. 2010. *AMAP Assessment 2009: Radioactivity in the Arctic*. Arctic Monitoring and Assessment Programme (AMAP) Oslo, Norway. Xii and 92 pp.

AMAP, 2011. *Arctic Pollution 2011*. Arctic Monitoring and Assessment Programme (AMAP). Oslo, Norway. Vi and 38 pp.

Anisimov, O.A., Vaughan, D.C., Callaghan, R.V., Furgal, C., Marchant, H., Prowse, T.D., Vilhjalmsson, H., and Walsh, J.E. 2007. *Polar Regions (Arctic and Antarctic) Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. 653-685.

Barber, D.C., Lukovich, J.V. Keogak, J., Baryluk, S., Fortier, L. and Henry, G. 2008. "The Changing Climate of the Arctic." *Arctic* (Coastal Zone Canada Special Issue) Vol. 61, suppl. 1. 7-26.

Berner, J., Furgal, C., Bjeerregaard, P., Bradley, M., Curtis, T., De Fabo, E., Juhani, H., Keating, W., Kvernmo, S. Nayha, S., Rintamaki, H. Warren, J. 2005. "Human Health." *ACIA Science Report*. Cambridge University Press. 863-906.

Berrang-Ford, L., J.D. Ford, and J. Paterson. 2011. "Are we adapting to climate change?" *Global Environmental Change* 21(1): 25-33.

Bogoyavlenskiy, D. and Siggner, A. 2004. "Arctic Demography." *AHDR (Arctic Human Development Report)*. Akureyri: Stefansson Arctic Institute. 27-42.

Bongo, M. P., A. Degteva, I. M. G. Eira, I. Hanssen-Bauer, A. Ivanoff, O. H. Magga, S. D. Mathiesen, N. G. Maynard, A. Oskal, M. Pogodaev, M. N. Sara, D. V. Schuler, E. I. Turi, and R. W. Corell. 2011. "Eurasian Reindeer Herding, Traditional Knowledge and Adaptation to Climate Change." In: UNESCO. Indigenous Peoples and Climate Change: Vulnerability, Adaptation and Traditional Knowledge. Report of workshop on Indigenous Peoples, Marginalized Populations and Climate Change: Vulnerability, Adaptation and Traditional Knowledge, Mexico City, Mexico. UNESCO: Paris. 1-17.

Brubaker, M., J. Berner, R. Chavan, and J. Warren. 2011. Climate change and health effects in Northwest Alaska. *Global Health Action* 4, 10.3402/gha.v4i0.8445.

Corell, R. 2013. Implications of Arctic Transformation for the North Pacific: Consequences of the Changes across the Arctic on World Order, the North Pacific Nations and Regional and Global Governance. This volume.

Coyle, K.J. and Susteren, L.V. 2011. The Psychological Effects of Global Warming on the United States: its Stresses, Traumas, and Societal Costs. Publication of the National Wildlife Federation Climate Education Program. 43 pp.

Degteva, A. 2006. Oil industry and reindeer herding: the problems of implementing indigenous rights in the Nenets Autonomous Okrug, Russia. Thesis. Master of Philosophy in Indigenous Studies. University of Tromsø. Tromsø, Norway. 24 pp.

Ford, J.D. and L. Berrang-Ford, 2009. "Food Security in Igloolik, Nunavut: an Exploratory Study." *Polar Record* 45(03): 225.

Ford, J. and C. Furgal. 2009. "Foreword to the Special Issue: Climate Change Impacts, Adaptation and Vulnerability in the Arctic." *Polar Research* 28(1): 1-9.

Ford, J.D. and T. Pearce. 2010. "What We Know, Do Not Know, and Need to Know about Climate Change Vulnerability in the Western Canadian Arctic: A Systematic Literature Review." *Environmental Research Letters* 5(1), 014008.

Galloway-McLean, K. 2010. *Advance Guard, Climate Change Impacts, Adaptation, Mitigation, and Indigenous Peoples – A Compendium of Case Studies*. UN

University. Darwin, Australia. 124 pp.

Gearheard, S., W. Matumeak, I. Angutikjuaq, J. Maslanik, H.P. Huntington, J. Leavitt, D.M. Kagak, G. Tigullaraq, and R.G. Barry. 2006. "It's not that simple": A collaborative comparison of sea ice environments, their uses, observed changes, and adaptations in Barrow, Alaska, USA, and Clyde River, Nunavut, Canada. *Ambio* 35(4): 203-211.

Gearheard, S., C. Aporta, G. Aipellee, and K. O'Keefe. 2011. "The Igliniit Project: Inuit Hunters Document Life on the Trail to Map and Monitor Arctic Change." *Canadian Geographer / Le Grégraphe Canadien* 55(1): 42-55.

Huntington, H.P., Mosli, J.M. and Shustov, V.B. 1998. "Peoples of the Arctic: Characteristics of Human Populations Relevant to Pollution Issues." AMAP assessment report: Arctic pollution issues. Oslo: Arctic Monitoring and Assessment Programme. 141-182.

Larsen, J. and Huskey, L. 2009. Material Well-being in the Arctic. Chapter 3 in ASI (Arctic Social Indicators) NORD. Copenhagen: Nordic Council of Ministers. 47-66.

Mathiesen, S.D., N.G. Maynard, A. Oskal, I.M.G. Eira, A. Degteva, M. Pogodaev, A. Ivanoff. 2010. "Defining Adaptation Strategies and Resiliency of Reindeer Herding Communities to Climate and Development Changes in the Eurasian Arctic." *IPY Oslo Science Conference 2010*. June 8-12, 2010. Oslo. Norway.

Maynard, N.G., A. Degteva, A. Oskal, I.M.G. Eira, A. Ivanoff, M. Pogodaev, and S. Mathiesen. 2011a. "IPY EALAT Project: Indigenous Traditional Knowledge & Science Working Together for Adaptation Strategies." Presentation at the UN University Workshop on Indigenous Peoples, Marginal Populations and Climate Change: Vulnerability, Adaptation and Traditional Knowledge, Mexico City, Mexico. July 19-21, 2011.

Maynard, N.G., A. Oskal, J.M. Turi, S.D. Mathiesen, I.M.G. Eira, B. Yurchak, V. Etylin, and J. Gebelein. 2011b. *Impacts of Arctic Climate and Land Use Changes on Reindeer Pastoralism: Indigenous Knowledge and Remote Sensing*. In: Gutman, G. and Reissell, A. (Eds.). Eurasian Arctic Land Cover and Land use in a Changing Climate. 177-205.

Nakashima, D.J., Galloway McLean, K., Thulstrup, H.D., Ramos Castillo, A. and Rubis, J.T. 2011. Indigenous Knowledge, Marginalized Peoples and Climate Change: Foundations for Assessment and Adaptation. Technical Report prepared for the Intergovernmental Panel on Climate Change – Working Group II. UNESCO/UNU: Paris/Darwin. 82 pp.

Nuttal, M, F. Berkes, B.C. Forbes, G. Kofinas, T. Vlassova and G. Wenzel. 2005. *Hunting, Herding, Fishing and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic*: In: Arctic Climate Impact Assessment. Cambridge:

Cambridge University Press. 649-690.

Oskal, A. 2008. Old Livelihoods in New Weather: Arctic Indigenous Reindeer Herders Face the Challenges of Climate Change. In: Development Outreach, World Bank Institute Special Paper. World Bank. 22-25.

Oskal, A., N. Maynard, A. Degteva, S. Mathiesen, M. Pogodaev, and A. Ivanoff. 2010. "Oil and Gas Development in Reindeer Pastures in Northern Eurasia: Impacts and Solutions." *2010 State of the Arctic Conference IPY*. March 16-19, 2010. Miami, Florida.

Parkinson, A.J., M.G. Bruce, and T. Zulz. 2008. International Circumpolar Surveillance, an Arctic Network for the Surveillance of Infectious Diseases. 14(1).

Parkinson, A.J. 2009. Sustainable Development, Climate Change and Human Health in the Arctic. UNESCO: Climate Change and Arctic Sustainable Development: Scientific, Social, Cultural and Educational Challenges. 156-163.

Parkinson, A. and B. Evengåd. 2009. "Climate Change, Its Impact on Health in the Arctic and the Public Health Response to Threats of Emerging Infectious Diseases." *Global Health Action* 2(0).

Pogodaev, M. Personal communication.

Poppel, B. 2006. Interdependency of subsistence and market economies in the Arctic. In: Solveig Glomsrod and Iulie Aslaksen (Eds). The Economy of the North. Statkstisk Sentralbyra/Statistics Norway. Pp. 65-80.

Portier, C.J., T.K. Thigpen, S.R. Carter, C.H. Dilworth, A.E. Grambsch, J. Gohlke, J. Hess, S.N. Howard, G. Luber, J.T. Lutz, T. Maslak, N. Prudent, M. Radtke, J.P. Rosenthal, T. Rowles, P.A. Sandifer, J. Scheraga, P.J. Schramm, D. Strickman, J.M. Trtanj, and P. Whung, 2010. *A Human Health Perspective On Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change*. Research Triangle Park, NC: Environmental Health Perspectives/National Institute of Environmental Health Sciences. 1-72.

United Nations. 2008. *United Nations Declaration on the Rights of Indigenous Peoples*. United Nations. 07-58681. 18 pp.

Virginia, R.S. and K.S. Yalowitz (Editors). 2011. "A New Paradigm for Arctic Health: Challenges and Responses to Rapid Climate, Environmental, and Social Change." Workshop Report for May 23-25, 2011, Dickey Center for International Understanding, and the University of the Arctic Institute for Applied Circumpolar Policy, Dartmouth College, Hanover, N.H.

West, J. and G.K. Hovelsrud. 2010. "Cross-Scale Adaptation Challenges in the Coastal Fisheries: Findings from Lebesby, Northern Norway." *Arctic* 63(3).

Wildcat, D. 2009. *Red Alert! Saving the Planet with Indigenous Knowledge*. Fulcrum Publishing. 143 pp.

Commentary

Frances Ulmer

Dr. Robert Corell has summarized the current state of arctic climate science and the results of numerous research projects, including the Arctic Climate Impact Assessment. The paper includes a discussion of the historical records and observations of climate change, the differences in the regional rates of change, and the probable consequences, including sea level rise, coastal erosion, ocean acidification, extreme storms, changing weather and drought. My comments will focus on the impacts and implications of these changes.

The nature of change is change

There is nothing new about changing patterns of climate, species evolution and adaptation. Change is the only constant on Earth. I was reminded of this recently during a visit to the University of Alaska Fairbanks Museum, viewing the bones of dinosaurs and mastodons that previously roamed Alaska's plains. What is different now is the rate of change and the extreme pressure that the rapid rate of change puts on species and ecosystems to adapt quickly or become extinct (as many are becoming). There is an excellent discussion by Professor Lee Kump in the July 2011 *Scientific American* describing the extraordinary rate of current warming by comparing recent changes to the Paleo-Eocene Thermal Maximum, 56 million years ago. Warming periods that come on suddenly are much harder on life than more gradual changes. This is particularly true for northern species that cannot move further north, unlike many more temperate flora and fauna that can migrate to higher latitudes or greater altitudes as temperatures warm. Ice dependent species like polar bears are particularly vulnerable.

It is important to remember that the four million people who live in the Arctic rely on the natural systems that are being dramatically stressed by these rapid changes. Subsistence hunting, fishing and gathering provide the majority of calories consumed by indigenous people of the North. Those activities provide the cultural foundation of people and are essential to preserve the social, economic and physical health of their communities. Walrus, seals, whales, bears, waterfowl, fish, berries, and many other subsistence foods and materials derived from them are jeopardized by the sea ice retreat and warmer conditions. From the perspective of the people whose ancestors have lived in this region for thousands of years, this is a catastrophic change. Human health concerns are related to the health and availability of these species, which are threatened by a number of things, including the presence of persistent organic pollutants, the bioaccumulation of toxic substances, and the influence of invasive species. As noted in the paper, health concerns are widespread, not only in the Arctic, but are particularly significant where people are tightly connected to the land through subsistence harvests.

Coastal erosion is another significant threat to local people. In Alaska, over thirty villages have been identified as vulnerable and are in various stages of assessing response options from building retaining walls to moving the entire community. Increased coastal erosion has been attributed to a number of factors, including higher sea level, later onset of ocean freeze up, thawing permafrost, and stronger storms. A significant contribution to the erosion has been the retreat of sea ice and the longer season of open water adjoining coastal communities. Sea ice normally freezes up against the coastline in fall and the ice acts like a giant blanket on the ocean. This blanket reduces the open water fetch over which winds whip up large waves that erode the coastline. Without this protection, communities like Shishmaref (one of the communities that are being relocated) have lost houses and essential infrastructure to the sea. The significant social and economic costs of this trend are rarely acknowledged because our political system has been unable to make much progress in either mitigating or financing the adaptation required by climate change impacts. States and nations face large financial burdens from thawing permafrost (replacing buildings that have crumbled due to unstable foundations, rebuilding roads and airports that have buckled and cracked), and from coastal erosion. How can these expenses be factored into the analysis of mitigation and adaptation?

SHIPPING AND NAVIGATION

The potential for increased ship traffic in the Arctic is very real for a variety of reasons. In addition to less ice, economics make the area more attractive: interest in natural resources, oil and gas, fisheries, tourism, research and security. There are several important issues to discuss under the heading of "shipping." We should start by differentiating among three different types of ship traffic: *intra-Arctic, destinational and trans-Arctic (transit)*. So far, most of the increase in ship activity is intra-Arctic(from one place in the Arctic to another) and *destinational* (from outside the Arctic coming to deliver something, pick up something or visit the area and return). Very few ships have been *trans-Arctic (transit)* traffic (from somewhere outside the Arctic to somewhere else outside the Arctic...just passing through because of a shorter route). At a recent conference called "The Arctic Imperative" in Girdwood, Alaska, representatives of the marine container shipping industry offered the opinion that arctic transit shipping is unlikely to expand in the near future in either the Northern Sea Route or the Northwest Passage (even less likely due to shallower depths and more ice) due to the following: at least for the foreseeable future, other routes like the Panama Canal will remain dominant because of convenience, predictability, depths, infrastructure, connectivity to rail and the realities of the Arctic. By contrast, destinational shipping is on the rise in the Arctic.

In order to navigate safely in the Arctic, mariners must plan for ice, cold, wind, weather, aids to navigation, marine communications, marine charting, etc. Even during summer months, the term "ice free" is relative, as icebergs are possible and challenging. We cannot dismiss as a minor inconvenience the nearly total absence of essential infrastructure to support shipping, tourism, and all other commercial, recreational, or governmental activity in the Pacific-sector Arctic Ocean. Ports, docks, refueling stations, communications, search and rescue and ports of refuge are functionally difficult and expensive to provide. In Alaska, the Coast Guard station closest to Barrow (the largest community on the North Slope) is in Kodiak, a thousand miles away. The challenges of providing essential infrastructure in remote areas of Alaska are legion, including shallow waters, few protected areas, small villages, few roads, a variety of ice conditions, including winter ice pileups that can reach several stories high, darkness, extreme cold and hurricane-force windstorms.

Another important building block for safe navigation is the Polar Code, which is being revised by the International Maritime Organization (IMO). The code now operates as a guideline for mariners, but many believe it must become mandatory. Given the unique conditions in the Arctic, most people agree that special rules should apply for ships and navigators in this region. It is important to train and educate those who will pilot ships about navigating in ice conditions, and assure pilot house competency through the "Standards of Training, Certification and Watch keeping" process. Bathymetric mapping and charting in the Arctic Ocean are not sufficient and will require the collaboration of many entities and governments to make navigation safer. Another piece of the safety puzzle is domain awareness; it is essential to know the locations of ships, particularly in areas with few recognizable features, long periods of darkness, intense storms, inadequate communication coverage and incomplete mapping. Who will assure the international integration of information and continual improvement of these systems?

The state of search and rescue is problematic throughout the Arctic. A public safety official in Iceland told several of us visiting in Reykjavik in June that their best strategy for assuring the safety of tourists on large tour ships (which are coming to Iceland in increasing numbers) is to require the ships to travel in pairs. If one has an accident, the other can assist. This is similar to what actually happened in the Antarctic when the "M/V Explorer" hit an iceberg and sank. Fortunately, another cruise ship was close enough to rescue all of the passengers. The Canadian Coast Guard recently announced a significant investment in new ships and other assets to improve their response capacity. The Arctic Council adopted a SAR agreement at the last Ministerial in Nuuk, Greenland. Progress is being made, but the realities of this region demand a much larger commitment by the Arctic nations if they are going to be prepared for future accidents. For additional discussion of these challenges and recommendations, please see the Arctic Marine Shipping Assessment, prepared for and adopted by the Arctic Council in 2009: http://www.pame.is/images/stories/AMSA_Status_on_Implementation_of_the_AMSA_2009_Report_Recomendations-May_2011.pdf

FISHERIES IN THE REGION

Commercial fishing in the Bering Sea, North Pacific and Arctic Ocean is difficult to summarize, due to the wide variety of species, gear types, catching and processing technologies, regulatory regimes, jurisdictions, laws and international treaties. We should first distinguish between coastal areas where state and national fishing regimes and regulations are in place, and areas beyond the Exclusive Economic Zone (EEZ) and Extended

Continental Shelf (ECS) where there may be international agreements, as in the North Pacific, or may not be covered at all, such as in the Central Arctic Ocean. We must also clarify that the eastern and western arctic waters are different, with extensive fisheries in the east (Barents Sea) and no commercial fishing in the west. The Chukchi and the Beaufort Seas have subsistence fishing, but the North Pacific Fisheries Management Council (NPFMC) adopted a Fisheries Management Plan for the region in 2007 that prohibits commercial fishing. NPFMC recognized the lack of available information about species abundance in the area. If regulators don't know what is there, it is hard for them to manage resources sustainably.

In June, a group of scientists knowledgeable about North Pacific stocks and concerned about the state of scientific knowledge about the Arctic Ocean gathered in Anchorage to discuss next steps. It is clear that there is both interest in and commitment to improve the observing and understanding of fish abundance, prey/predator species relationships, survival, migration patterns, and other data needed for sustainable management of fishing. What is missing? Sufficient financial support for the research that needs to be done, and inadequate mechanisms to coordinate and collaborate among the nations' fish experts. There are a number of successful efforts that have developed in the North Pacific, including the BASIS program undertaken by the North Pacific Anadromous Fish Commission and the North Pacific Research Board's research programs like BEST-BSIERP, among others. The Alaska Ocean Observing System is another example of a program that helps integrate available information for a variety of uses. The challenge is to take examples like these to another level of effectiveness for areas that have had less active research, and make the information available to both private and public sector managers and decision makers.

A number of organizations have suggested international agreement to extend a moratorium on commercial fishing to all of the Arctic Ocean beyond national jurisdictions (or including them, where no current fishery exists). This is an important topic for the Arctic Eight to consider before access to the area becomes any easier. Even exploratory fishing can become a problem, as that would begin to establish catch history that could later be used to leverage permits to harvest prematurely. Given the need for more information about how the Arctic Ocean ecosystems work, additional observing networks, synthesis research programs and international cooperation must be undertaken if new commercial fisheries are to be established.

CHANGES IN THE ARCTIC REGION THAT IMPACT LOCAL PEOPLE

Empowering northern residents is an important topic in this paper, given the presence of indigenous people with long records of living on and off the waters and land in the Arctic. The traditional uses must be respected, and in many places they are legally protected in some way. The Canadian Inuvialuit Agreement of 1984 is mentioned, but there is no discussion of the significant Alaska Native Claims Settlement Act of 1971, which in many ways was the "trailblazing agreement" for many land claims.

ANCSA provided for a significant grant of land, money and self-determination for Alaska natives; 44 million acres and a billion dollars were part of a settlement that was facilitated by the government's desire to construct the Trans-Alaskan Pipeline to carry North Slope crude to the Port of Valdez. In an effort to resolve what otherwise would have been long and protracted litigation over the land rights for the 900-mile pipeline route, the United States government found it possible to grant long overdue rights. The creation of regional and village corporations as the vehicles for managing the lands and the resources was unique in U.S. history. It has become a model elsewhere, attractive as a mechanism for empowering indigenous people through both land ownership and economic development. The corporations have an obligation to use and develop their lands to provide economic development opportunities for their shareholders, and as a result, several are actively engaged in tourism, timber harvesting, mining, and oil and gas support industries. An interesting provision of ANCSA requires the revenues from natural resource extraction to be shared with all of the ANCSA Corporations. The ANCSA Corporations have developed into a powerful force in Alaska's economy.

Complex factors (including the urbanization of Alaska Natives, which is consistent with the trend in other northern societies) have changed the predominantly village life of many Alaska Natives into a mix of cash-based economies with subsistence-based foods and culture. In spite of the economic development initiatives, subsistence foods are still essential to the majority of the region's peoples, and there is growing concern about changing climate conditions putting those foods at risk. The complexity of this changing social and economic situation in arctic communities is not unique to Alaska, as was demonstrated over a decade ago in the landmark social science research project called the Survey of Living Conditions in the Arctic (SLICA)[1]. This international social science research project provided insight into the complexity of modern society and traditional culture in Arctic communities.

Consistently across the Arctic, the major determinant of the quality of life of indigenous people is the relationship to the land and waters of the region, and the traditional food gathering practices that were part of the culture. For more information see: http://www.iser.uaa.alaska.edu/Publications/researchsumm/SLiCA_07.pdf

SCIENTIFIC RESEARCH

Scientific research and exploration are significant activities in the Arctic. They need to be considered as governments attempt to adopt appropriate policies in the Arctic. If you look at current users of the Arctic Ocean, the research/explorer community is a major user, in addition to subsistence hunters, navy ships and submarines, occasional tour ships and supply ships for coastal areas. For decades, the research/explorer community has helped the rest of the world understand why the Arctic is mysterious, challenging and valuable to the world.

Research in the Arctic is expensive, difficult and dangerous. Trips are long, and the area is extremely remote. With various amounts and types of ice, special ships are required. Many research trips are international collaborations, a trend that should be encouraged and supported. Additional ice-capable vessels are being constructed (by China, Russia, and Canada) or refurbished (by the U.S.). New and old technologies (remote sensing, GIS, balloons, buoys, unmanned aircraft, etc.) are being creatively deployed to obtain as much information about the region as can be afforded. The research sector is essential to add to our understanding of the Arctic and its unique ecosystems. Decisions by both the private and public sectors can be improved by scientific research in the region if done in timely and scale-appropriate ways. Investment by the nations of the world is needed in a variety of key areas, including essential infrastructure, such as ice-capable research vessels.

The U.S. Arctic Research Commission issues a biannual report identifying goals and objectives for arctic research. The five areas identified are: 1) environmental change of the Arctic, Arctic Ocean and Bering Sea; 2) arctic human health; 3) civil infrastructure; 4) natural resources assessment and earth science; 5) indigenous languages, cultures and identities. For additional discussion of these priority areas, please visit www.arctic.gov.

Creating a zone of scientific cooperation in the Arctic has been suggested by several entities, including the recently released Aspen Institute's Commission on Arctic Climate Change Report. See www.aspeninstitute.org/ee. It recommends the development of an open architecture for data and information sharing, and an agreement on common standards. Evolving networks of scientists who can collaborate across international boundaries and share their expertise, similar to what has been done with National Ice Centers, would be useful. Sustaining Arctic Observing Networks (SAONS) are designed to observe and understand change and enable others to respond to change. Investment in such international networks is needed to link and interpret complex data sets, and to make the improved understanding of system change available to managers and local people living close to the land and water. Developing coastal management plans and marine spatial plans that integrate complex data sets and balance multiple uses of the resources should become a priority for the Arctic.

GOVERNANCE[2]

Contrary to popular media stories about the Arctic, stability is on the rise. The exaggerated version of Arctic states' conflicts (planting flags, adding submarines and icebreakers as acts of sovereign aggression, etc.) does not reflect the current reality of cooperation among the Arctic Eight. A few important examples are mentioned in the paper: the Arctic Council's approval of the Arctic Marine Shipping Assessment Report in April 2009, the Arctic Council's adoption of a joint Search and Rescue Agreement in Nuuk in May 2011, the recent resolution of the offshore boundary dispute between Russia and Norway, and joint projects by several working groups on issues like oil spill response.

Existing governance: Most of the Arctic Eight have issued comprehensive statements of arctic policy in recent years. Examples include Norway's High North Policy, Canada's Northern Strategy, Russia's Vision of the Arctic Future, the U.S. Navy's Arctic Roadmap and State Department's Arctic Policy, and others. Some of these are statements of national pride in a region that has not attracted much attention previously; some are declarations of sovereignty and control; some are efforts to focus energy and financial commitment to policies and programs that have lacked sufficient support; and most are recognition of future potential for the region that may provide important resources and wealth. All of them appear to recognize that international cooperation is essential in the Arctic. Russian Prime Minister Vladimir Putin's language is reflective of this shared vision:"zone of peace and international cooperation," "arctic arrangements that can mutually benefit the countries of the region."

The United Nations Convention on the Law of the Seas (UNCLOS) provides a fundamental framework for boundaries and regulation of marine pollution and resolving a variety of disputes. The IMO is the appropriate UN agency for maritime safety and for changing voluntary guidelines into mandatory ones in a Polar Code. The International Seabed Authority has responsibility for licensing and permitting mineral development, and conducting research in the area beyond the ECS areas. Can any of these bodies provide sufficient guidance and/or control for safe cruise and tourist traffic, or oil and gas development? Should specific regulatory and governance regimes be negotiated and adopted by treaties for different uses of the Arctic, or should each nation simply impose its own rules, in spite of the international nature of much of the arctic development that is on the horizon? These and many other questions about governance are important and unanswered at this time. Many ideas have been offered, and the paper mentions a few. What are the drivers behind the discussion about enhanced governance and the desire to "fill in the blanks" about rights and responsibilities?

Access: Concerns have been expressed by both Arctic and non-Arctic states about four kinds of access: 1. Legal access to the waters and the subsurface lands and resources in and beyond the EEZs. 2. Physical access to the Arctic Ocean for a variety of uses, from tourism to shipping, made possible by retreating ice, but made difficult by the challenging arctic conditions. 3. Economic access to development opportunities like natural resource extraction, which is more difficult for investors when there is uncertainty about the rules and the realities of a frontier area. 4. Intellectual access to assure that scientists are able to move freely across national boundaries (since ecosystems do not recognize borders) and to develop a better understanding of how the natural systems of the Arctic function in rapidly changing conditions.

Expansion of the Arctic Council: Since 1996, the Arctic Council (Canada, Russia, the U.S., and the five Nordic States) has dealt with a variety of issues and created several working groups to address key challenges. Indigenous groups serve as Permanent Participants in a way that is quite unique among international bodies, and Observers bring additional perspectives and resources to the table. However, non-Arctic states are interested in being recognized as Permanent Participants. As countries like China, Japan, Korea, India and the European Union move forward their arctic agendas, the pressure to include them will mount. The counter pressure comes from a concern that their addition as Permanent Participants would dilute the impact of the indigenous groups and people who live in the Arctic. Balancing these interests and opportunities will continue to provide engaging dialogue.

The question remains, however, about how much farther the Arctic Council can take cooperation, particularly in controversial areas like fishing, oil and gas development, security, and other uses where a more uniform regime of requirements and limitations might make sense, but might be difficult to negotiate. I believe it is essential that the countries of the region and the world engage in dialogue about how to chart the future of a region that is quite unique, both vulnerable and valuable.

QUESTIONS FOR THE PANEL

- Should the Precautionary Principle apply, at least to the Central Arctic Ocean, which is only now becoming accessible to humans?
- Should marine protected areas be established or biologically significant areas be designated?
- How do NGOs, multinational corporations, indigenous people, and political subdivisions participate in the decisions that are being made at the national level? Do they have any standing in resource claims conflicts?
- What is the appropriate balance between Arctic and non-Arctic states in decisions that impact the Arctic?
- Should the Arctic Council membership be expanded? Should it be empowered to do more than it currently does, in order to fill a perceived vacuum in international decision authority?

- How does a region of the planet that is remote, previously inaccessible, and that contains very few people successfully engage "outsiders" in meaningful dialogue about the future of the region and its impact on the world?

Notes

1. SLICA was funded by the Nordic Council of Ministers (NMR), the Greenland Home Rule Government, the Commission for Scientific Research in Greenland (KVUG), the Barents Secretariat, the Nordic Arctic Research Programme (NARP), the Danish Research Council for the Social Sciences (SSF), the Swedish Research Council for the Social Sciences, Ministry of the Interior – Dept. of Municipalities, Norway, the Joint Committee on Research Councils for Nordic Countries (NOSS), the Social Sciences and Humanities Research Council of Canada (SSHRC), the National Science Foundation (NSF), and Statistics Canada.
2. In 2013, the Arctic Council granted six nations observer status to the Arctic Council: India, Italy, Singapore, China and South Korea.

PART II

OPENING OF THE NORTHERN SEA ROUTE AND CHANGES IN NORTH PACIFIC TRANSPORTATION AND LOGISTICS

3. Benefits of the Northern Sea Route to the North Pacific

Sung-Woo Lee

Overview: Global warming and climate change have brought a new issue in the Arctic Sea: a profound transformation of ice meltdown. This has enabled us to explore a new shipping route through the Arctic instead of the previously existing commercial shipping routes. In particular, the Northern Sea Route (NSR) is now becoming one of the feasible shipping routes. The increasing shipping frequency using the NSR has brought tremendous shipping benefits. If the NSR becomes commercialized, we will be able to save about 5,000 nautical miles (NM) and sailing time compared to the existing route via the Suez Canal. This study highlights some important findings on the feasibility of commercializing the shipping route through the Arctic. The NSR can definitely bring positive economic effects in terms of shipping distance and time, but we need to consider the expensive passage toll fee currently imposed by Russia. A key issue lies in whether or not the NSR can be commercialized as a popular shipping route. In the NSR, the maximum cargo traffic between Asia and Europe is expected to be around 46 million TEU. This provides us enough grounds to promote the commercialization of the NSR. Regarding transportation of natural resources, the NSR has an economical effect in terms of distance for supplying oil, natural gas, fishery and mineral resources, but still, all of these benefits are rely heavily on the level of the toll fee for using the NSR. In conclusion, we need to explore every possible avenue to bring a possible economic effect to North Pacific countries in terms of logistics, keeping up with efforts for the environmental protection of the Arctic.

INTRODUCTION

The economic concept of globalization has acquired wide recognition among countries since the 1970s. This has stimulated world trade as well as having brought a revolution in transport, such as containerization and intermodalism.[1] In particular, the area of sea transport has been noticeable, handling more than 90% of global trade movement. Due to the continuous dependence of world trade on sea transport, the function of port and logistics facilities has dramatically changed (Lee and Ducruet, 2009, p.163). However, the major commercial shipping routes have changed very little, as there has been no remarkable geographical change since the 20th century.

As we enter the second decade of the 21st century, global warming has been one of the factors directly affecting our lives and the environment. The effects of climate change and global warming have brought a new issue in the Arctic Sea area since this area started experiencing a profound transformation of ice meltdown. This enabled us to explore a new shipping route through the Arctic instead of the previously existing commercial shipping routes. In particular, the NSR, which is located between the North Atlantic and the Northern Pacific along the Arctic Sea, is gradually becoming one of the feasible international shipping routes. The year 2010 saw a keen rise in the number of ships passing through the NSR, and we are expecting even more vessels to use the route in 2011. The shipping frequencies of the NSR will increase with tremendous benefits. The NSR can save about 5,000 nautical miles and a week in shipping time compared to the existing route via the Suez Canal if it becomes a common shipping route.

In spite of its importance, we have ignored the preparation work on how to bring the issue of realizing the commercialization of the NSR into the academic field. There have been some studies on the Arctic's sea ice extent, but only a few studies, such as Jerome Verny's (2009) focused on utilization of the shipping route in the Arctic Sea. Notably, the specific data and information on how long and often we can ship via this route seems not to be available yet.

Having the aforementioned in mind, this research will discuss how the NSR can benefit East Asian countries and global shipping companies in terms of logistics, cargo traffic, economic effects and the development of natural resources. This study consists of five sections. Section 2 will address the evaluation of distance and time-saving effects by using the NSR. Section 3 will examine the possible scenarios of container shipping via the NSR, as well as forecast container traffic in the targeted regions through origin/destination (O/D) analysis. Section 4 will frame the verified benefits of shipping resources via the NSR. In section 5, we will sum up our major findings and suggest conclusions.

EVALUATING SAVINGS IN DISTANCE AND TIME BY USING THE NSR

Selecting a Target Area

One of the most representative routes that were proved to save shipping distance via the NSR is the one from Yokohama in Japan to Rotterdam in Europe. In this study, we are going to examine the specific countries benefiting from distance-saving effects via the NSR in their geographic scope.

First, we have divided Europe into three geographic scopes. We have nine countries along the Scandinavian/Baltic Sea: Norway, Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland and Denmark, and seven countries in Northern Europe such as Ireland, Germany, Netherland, Belgium, England and France. Also, we have considered the representative ports of three countries on the Iberian Peninsula and west Mediterranean Sea, Portugal, Spain, and Italy. As for Asia, we have considered eight major ports in China and countries such as Korea, Japan, Taiwan, Hong Kong, the Philippines, Cambodia, Thailand, Singapore, and Indonesia. In other words, we have selected the northwest region in Europe and the countries on the right side of Singapore in Asia.

The shipping distance from the ports in selected countries to the Suez Canal can be measured by the Netpas Program[2] designed to professionally measure shipping routes. However, we still have difficulty in measuring the distance of the NSR, since the commercial use of the NSR has not yet been undertaken. So far, we have a research result of 3,184 NM[3] measured for the distance between the westernmost of routes, Murmansk, and the easternmost, Provideniya. Therefore, if we add the distance from European ports to Murmansk, 3,184 NM, and the one from Provideniya to Asian ports with the Netpas Program, we can derive the total shipping distance via the NSR.

Distance-Saving Effects via the NSR

We were able to derive a distance-saving effect by following the above logic. The route from China turned out to save shipping distance to the region along the Scandinavian/Baltic and eight major ports in the Northern Europe. From Portugal on the Iberian Peninsula and the west Mediterranean Sea, shipping distance can be reduced to five ports from Dalian to Ningbo. Busan in Korea also can benefit from distance-saving effects to Lisbon, Portugal. Japan also can see a positive result for shipping to Valencia, Spain.

Table 3.1 Saved shipping distance by NSR (Unit: NM)

		China								Korea	Japan
		Dalian	Tianjin	Qingdao	Shang-hai	Ningbo	Xiamen	Shen-zhen	Guang-zhou	Busan	Tokyo
Russia	St. Petersburg	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,706	4,464
Poland	Gdynia	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,706	4,464
Sweden	Gothenburg	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,706	4,464
Norway	Oslo	3,356	3,348	3,254	3,016	2,992	2,055	1,536	1,536	3,737	4,495
Denmark	Aarhus	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,706	4,464
Finland	Helsinki	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,706	4,464
Estonia	Tallinn	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,716	4,464
Latvia	Riga	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,716	4,464
Lithuania	Klaipeda	3,325	3,317	3,223	2,986	2,961	2,024	1,505	1,505	3,716	4,464
Iceland	Reykjavik	3,397	3,389	3,295	3,057	3,033	2,096	1,577	1,577	3,787	4,536
Germany	Bremen/ Bremerhaven	2,992	2,984	2,890	2,652	2,628	1,690	1,172	1,172	3,373	4,131
Nether-lands	Rotterdam	2,701	2,693	2,599	2,361	2,337	1,400	881	881	3,082	3,840
Belgium	Antwerp	2,629	2,621	2,527	2,289	2,265	1,328	809	809	3,010	3,768
UK	Felixstowe	2,621	2,614	2,519	2,282	2,257	1,320	801	801	3,002	3,760
Ireland	Dublin	2,487	2,479	2,385	2,147	2,123	1,185	667	667	2,868	3,626
France	Le Havre	2,343	2,336	2,241	2,004	1,980	1,042	524	524	2,725	3,483
Portugal	Lisbon	682	675	580	343	319	-619	-1,138	-1,138	1,063	1,822
Spain	Valencia	-520	-527	-622	-859	-884	-1,821	-2,340	-2,340	-139	620
Italy	Gioia Tauro	-1,864	-1,871	-1,966	-2,203	-2,227	-3,165	-3,683	-3,683	-1,482	-724

Source: Netpas Distance Program; Mulherion, N.D. (1996).

Other than the areas of Korea, China and Japan, the countries benefiting from these distance-saving effects are Taiwan, Hong Kong, and the Philippines, which can get shorter shipping routes up to the region along the Scandinavian/Baltic and Northern Europe. However, Vietnam, Cambodia, Thailand, Singapore, and Indonesia turned out to have no effect of saving distance.

Table 3.1 Saved shipping distance by NSR (cont.) (Unit: NM)

		Taiwan	Hong Kong	Philippines	Vietnam	Cambodia	Thailand	Singapore	Indonesia
		Kaohsiung		Manila	Ho Chi Minh	Sihanou-kville	Lame Chabang		Tanjung Priok
Russia	St. Petersburg	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Poland	Gdynia	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Sweden	Gothenburg	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Norway	Oslo	1,990	1,566	1,230	-331	-372	-415	-1,177	-187
Denmark	Aarhus	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Finland	Helsinki	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Estonia	Tallinn	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Latvia	Riga	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Lithuania	Klaipeda	1,959	1,535	1,199	-362	-403	-446	-1,208	-218
Iceland	Reykjavik	2,031	1,607	1,271	-290	-331	-374	-1,136	-146
Germany	Bremen/ Bremerhaven	1,625	1,202	865	-696	-736	-779	-1,541	-552
Nether-lands	Rotterdam	1,335	911	575	-986	-1,027	-1,070	-1,832	-842
Belgium	Antwerp	1,263	839	503	-1,058	-1,099	-1,142	-1,904	-914
UK	Felixstowe	1,255	832	495	-1,066	-1,107	-1,150	-1,912	-922
Ireland	Dublin	1,121	697	360	-1,200	-1,241	-1,284	-2,046	-1,056
France	Le Havre	977	554	217	-1,344	-1,385	-1,427	-2,190	-1,200
Portugal	Lisbon	-684	-1,107	-1,444	-3,005	-3,046	-3,088	-3,851	-3,400
Spain	Valencia	-1,886	-2,309	-2,646	-4,207	-4,248	-4,291	-5,053	-3,524
Italy	Gioia Tauro	-3,230	-3,653	-3,990	-5,551	-5,592	-5,634	-6,396	-5,407

Source: Netpas and Mulherion (1996).

Time-Saving Effects via the NSR

There are also conflicting opinions that say the distance-saving effects do not fully guarantee the reduction of shipping time. The main reason for this opinion is that vessel speed can fall remarkably in the ice-water section of the Arctic. In general, we applied 18 nautical miles per hour as a fuel-efficient speed for container ships. However, we need to adjust the sailing speed to 3 nautical miles per hour in the ice-water section in order to gain stability for shipping operations and noise level.

In addition, if we assume that non-ice water in the Arctic Sea will be open for three months and will enable us to ship through the NSR, we can apply 700 nautical miles per hour. If the route is open for six months, we will apply 300 nautical miles per hour,[4] and last, we put zero nautical miles if it is open all year round.

Based on this assumption, we can estimate shipping time-saving effects as shown below in Table 3.2. For example, none of the Chinese ports experience any time-saving effect if the NSR is available only for three months. Korea also has only a minimal time-saving effect of less than one day for the Scandinavian/Baltic and the Northern Europe bound. In the

Table 3.2 *Saved shipping time by NSR: 3-month sailing* (Unit: Days)

		China								Korea	Japan
		Dalian	Tianjin	Qingdao	Shang-hai	Ningbo	Xiamen	Shen-zhen	Guang-zhou	Busan	Tokyo
Russia	St. Petersburg	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Poland	Gdynia	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Sweden	Gothenburg	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Norway	Oslo	-0.3	-0.4	-0.6	-1.1	-1.2	-3.3	-4.5	-4.5	0.5	2.3
Denmark	Aarhus	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Finland	Helsinki	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Estonia	Tallinn	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Latvia	Riga	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Lithuania	Klaipeda	-0.4	-0.4	-0.6	-1.2	-1.2	-3.4	-4.6	-4.6	0.5	2.2
Iceland	Reykjavik	-0.2	-0.3	-0.5	-1.0	-1.1	-3.3	-4.5	-4.5	0.7	2.4
Germany	Bremen/ Bremerhaven	-1.2	-1.2	-1.4	-2.0	-2.0	-4.2	-5.4	-5.4	-0.3	1.5
Nether-lands	Rotterdam	-1.8	-1.9	-2.1	-2.6	-2.7	-4.9	-6.1	-6.1	-1.0	0.8
Belgium	Antwerp	-2.0	-2.0	-2.3	-2.8	-2.9	-5.0	-6.2	-6.2	-1.1	0.6
UK	Felixstowe	-2.0	-2.1	-2.3	-2.8	-2.9	-5.0	-6.2	-6.2	-1.2	0.6
Ireland	Dublin	-2.3	-2.4	-2.6	-3.1	-3.2	-5.4	-6.6	-6.6	-1.5	0.3
France	Le Havre	-2.7	-2.7	-2.9	-3.5	-3.5	-5.7	-6.9	-6.9	-1.8	-0.0
Portugal	Lisbon	-6.5	-6.5	-6.8	-7.3	-7.4	-9.5	-10.7	-10.7	-5.6	-3.9
Spain	Valencia	-9.3	-9.3	-9.5	-10.1	-10.1	-12.3	-13.5	-13.5	-8.4	-6.7
Italy	Gioia Tauro	-12.4	-12.4	-12.7	-13.2	-13.3	-15.4	-16.6	-16.6	-11.5	-9.8

case of Japan, one to two days can be saved if it ships to countries located on the northern side of France.

Taiwan, Hong Kong, and the Philippines do not benefit from a time-saving effect via the NSR if the Arctic Sea is only open for three months.

Table 3.2 Saved shipping time by NSR: 3-month sailing (cont.) (Unit: Days)

		Taiwan	Hong Kong	Philippines	Vietnam	Cambodia	Thailand	Singapore	Indonesia
		Kaohsiung		Manila	Ho Chi Minh	Sihanou-kville	Laem Chabang		Tanjung Priok
Russia	St. Petersburg	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Poland	Gdynia	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Sweden	Gothenburg	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Norway	Oslo	-3.5	-4.5	-5.3	-8.9	-9.0	-9.1	-10.8	-9.6
Denmark	Aarhus	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Finland	Helsinki	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Estonia	Tallinn	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Latvia	Riga	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Lithuania	Klaipeda	-3.6	-4.5	-5.3	-8.9	-9.0	-9.1	-10.9	-9.7
Iceland	Reykjavik	-3.4	-4.4	-5.2	-8.8	-8.9	-9.0	-10.7	-9.5
Germany	Bremen/ Bremerhaven	-4.3	-5.3	-6.1	-9.7	-9.8	-9.9	-11.7	-10.4
Nether-lands	Rotterdam	-5.0	-6.0	-6.8	-10.4	-10.5	-10.6	-12.3	-11.1
Belgium	Antwerp	-5.2	-6.2	-6.9	-10.6	-10.6	-10.7	-12.5	-11.3
UK	Felixstowe	-5.2	-6.2	-7.0	-10.6	-10.7	-10.8	-12.5	-11.3
Ireland	Dublin	-5.5	-6.5	-7.3	-10.9	-11.0	-11.1	-12.8	-11.6
France	Le Havre	-5.8	-6.8	-7.6	-11.2	-11.3	-11.4	-13.2	-11.9
Portugal	Lisbon	-9.7	-10.7	-11.4	-15.1	-15.2	-15.3	-17.0	-15.8
Spain	Valencia	-12.5	-13.4	-14.2	-17.8	-17.9	-18.0	-19.8	-18.6
Italy	Gioia Tauro	-15.6	-16.6	-17.3	-21.0	-21.0	-21.1	-22.9	-21.7

However, if we assume the Arctic Sea is open all year, a vessel can operate at a speed of 18 nautical miles per hour for the entire NSR. This can actually convert the distance-saving effect of the NSR into a positive time-saving effect. The Chinese ports from Dalian to Ningbo can save as much as about five to eight days in shipping time to Northern Europe above France. Shipping time from Busan, Korea, to France can be reduced by approximately six to nine days. Japan can also benefit from time-saving effects of eight to ten days by using the NSR.

Table 3.3 Saved shipping time by NSR in case of 12-month sailing

(Unit: NM)

		China								Korea	Japan
		Dalian	Tianjin	Qingdao	Shang-hai	Ningbo	Xiamen	Shen-zhen	Guang-zhou	Busan	Tokyo
Russia	St. Petersburg	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Poland	Gdynia	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Sweden	Gothenburg	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Norway	Oslo	7.8	7.8	7.5	7.0	6.9	4.8	3.6	3.6	8.7	10.4
Denmark	Aarhus	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Finland	Helsinki	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Estonia	Tallinn	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Latvia	Riga	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Lithuania	Klaipeda	7.7	7.7	7.5	6.9	6.9	4.7	3.5	3.5	8.6	10.3
Iceland	Reykjavik	7.9	7.8	7.6	7.1	7.0	4.9	3.7	3.7	8.8	10.5
Germany	Bremen/ Bremerhaven	6.9	6.9	6.7	6.1	6.1	3.9	2.7	2.7	7.8	9.6
Nether-lands	Rotterdam	6.3	6.2	6.0	5.5	5.4	3.2	2.0	2.0	7.1	8.9
Belgium	Antwerp	6.1	6.1	5.8	5.3	5.2	3.1	1.9	1.9	7.0	8.7
UK	Felixstowe	6.1	6.0	5.8	5.3	5.2	3.1	1.9	1.9	6.9	8.7
Ireland	Dublin	5.8	5.7	5.5	5.0	4.9	2.7	1.5	1.5	6.6	8.4
France	Le Havre	5.4	5.4	5.2	4.6	4.6	2.4	1.2	1.2	6.3	8.1
Portugal	Lisbon	1.6	1.6	1.3	0.8	0.7	-1.4	-2.6	-2.6	2.5	4.2
Spain	Valencia	-1.2	-1.2	-1.4	-2.0	-2.0	-4.2	-5.4	-5.4	-0.3	1.4
Italy	Gioia Tauro	-4.3	-4.3	-4.6	-5.1	-5.2	-7.3	-8.5	-8.5	-3.4	-1.7

Taiwan, Hong Kong, and the Philippines will all see one to five days of time-saving effects to countries located to the north of France.

Table 3.3 Saved shipping time by NSR in case for 12-month sailing (cont.)

(Unit: Days)

		Taiwan	Hong Kong	Philippines	Vietnam	Cambodia	Thailand	singapore	Indonesia
		Kaohsiung		Manila	Ho Chi Minh	Sihanou-kville	Laem Chabang		Tanjung Priok
Russia	St. Petersburg	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Poland	Gdynia	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Sweden	Gothenburg	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Norway	Oslo	4.6	3.6	2.8	-0.8	-0.9	-1.0	-2.7	-1.5
Denmark	Aarhus	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Finland	Helsinki	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Estonia	Tallinn	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Latvia	Riga	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Lithuania	Klaipeda	4.5	3.6	2.8	-0.8	-0.9	-1.0	-2.8	-1.6
Iceland	Reykjavik	4.7	3.7	2.9	-0.7	-0.8	-0.9	-2.6	-1.4
Germany	Bremen/ Bremerhaven	3.8	2.8	2.0	-1.6	-1.7	-1.8	-3.6	-2.3
Nether-lands	Rotterdam	3.1	2.1	1.3	-2.3	-2.4	-2.5	-4.2	-3.0
Belgium	Antwerp	2.9	1.9	1.2	-2.4	-2.5	-2.6	-4.4	-3.2
UK	Felixstowe	2.9	1.9	1.1	-2.5	-2.6	-2.7	-4.4	-3.2
Ireland	Dublin	2.6	1.6	0.8	-2.8	-2.9	-3.0	-4.7	-3.5
France	Le Havre	2.3	1.3	0.5	-3.1	-3.2	-3.3	-5.1	-3.8
Portugal	Lisbon	-1.6	-2.6	-3.3	-7.0	-7.1	-7.1	-8.9	-7.7
Spain	Valencia	-4.4	-5.3	-6.1	-9.7	-9.8	-9.9	-11.7	-10.5
Italy	Gioia Tauro	-7.5	-8.5	-9.2	-12.8	-12.9	-13.0	-14.8	-13.6

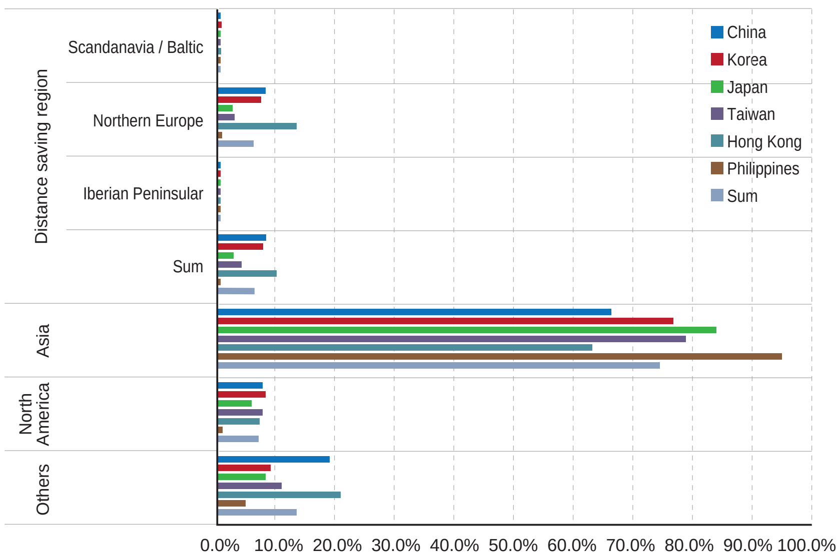
EXAMINING POSSIBLE SCENARIOS OF CONTAINER SHIPPING BY USING THE NSR

Container Traffic from Asia to Europe

In this section, we are going to use data from Lloyd's Marine Intelligence Unit (LMIU) in order to estimate the future container traffic volume between countries that benefit from time- and cost-saving effects by using the NSR. LMIU data is based on the calculation of multiplying container traffic between ports by vessel capacity and its frequency. We can estimate the weight of origin and destination (O/D) of traffic volumes by using this data. The table below shows container traffic origins and destinations, focusing primarily on the Asian countries China, Korea, Japan, Taiwan, Hong Kong and the Philippines. We can find that container traffic within the Asian area 5 is the busiest. The attainable weight of container traffic that can bring distance-saving effects to target countries via the NSR is about 6 %.

We can also get the forecasted container traffic volumes of the six Asian countries by adjusting real the GDP growth rate of each country on actual performed traffic data in 2010. Then, we multiply the data gained by each weight of traffic O/D of target European countries in order to get the final traffic volume that can be converted into the NSR.

The results are shown in Table 3.4 below. It indicates that China is expected to have the overwhelming volume of container traffic. We are expecting 13 million TEU of cargo traffic to possibly change its route to the NSR in 2010, and 46 million TEU will use the NSR in 2030. The weight of China is about 78%, with 10 million TEU in 2010, and is expect to reach about 87%, with 40 million TEU, in 2030.



Note: reorganizing traffic, the product of vessel capacity * sailing frequency.
Source: Lloyd's Marine Intelligence Unit (LMIU), 2006.

Figure 3.1 Container traffic O/D between targeted countries

Table 3.4 Container traffic forecast by targeted countries (Unit: 1,000 TEU)

	China	Korea	Japan	Taiwan	China (SAR HK)	Philippines	Total
2010	10,043	1,416	376	296	636	123	12,890
2015	15,171	1,715	407	376	804	154	18,627
2020	21,882	2,284	516	503	1,075	209	26,469
2025	29,980	2,635	526	583	1,276	260	35,261
2030	39,555	2,982	534	666	1,494	317	45,549
2010-2030	7.1%	3.8%	1.8%	4.1%	4.4%	4.9%	6.5%

Note: applying traffic O/D after forecasting national traffic using real GDP growth.
Source: traffic–CI online, GDP growth: Global Insight.

Setting up Scenarios of Using the NSR with Variables of Time and Costs

We have conducted an SP survey in order to gain the expected shares of using the ESR and NSR in the future. The SP survey is a method that provides better estimates by asking respondents to select choices or prioritize options by a particular scenario that has not happened yet.

The survey respondents consist of forwarders and logistics companies excluding shipping liners. We also exclude manufacturing companies since their level of understanding for using the NSR is currently low, and this can possibly ruin the accuracy of the survey. Also, shipping liners are excluded from this survey due to the characteristics that they can open up new shipping routes following the shipper’s demands.

The factors we took into consideration are costs and time, which are the most important ones when it comes to choosing a shipping route. Besides these, we excluded some other factors like sea waves in the Arctic, port infrastructure, the stability of shipping operations, shipping regularity, how to secure a supply of vessel items, and whether oil supply bases and port service are available. This is because it is difficult to convert this data into specific numbers, and the complexity of the questionnaire can ruin the accuracy of responses by making respondents misunderstand the questions.

As for the scenarios with time variables, we need to consider the maximum10 days saving effects brought about by using the NSR as shown in the case of Japan. Therefore, we have set up three scenarios: a zero time-saving effect that is the same as the current level, a five-day saving effect, and a ten-day saving effect. As for scenarios by cost, we have considered the advice of experts on asymmetric demand price elasticity. Therefore, we have set up five scenarios, spreading out the shipping costs of the NSR by 120%, 110%, 100%, 80% and 70% of the costs for the existing the Suez Canal route (SCR).

The next table shows the results of analysis of the SP survey. We asked respondents about their willingness to use the NSR by varying its cost and time conditions under the assumption that the cost per TEU is fixed at USD 1,000-USD 1,500 per TEU (or unit costs) and the NSR is open for 30 days.

The analysis indicates that the share of the NSR is expected to be about 20% if the shipping time through the NSR stays at the same level as the one through the SCR. If five days of shipping time through the NSR is saved, with the same shipping costs taken for the SCR, the share of the NSR will be about 72%. Also, it turns out that 96% of respondents will choose the NSR if they can save 10 days under the condition of having the same costs taken for the SCR.

Table 3.5 *NSR shares by scenario*

NSR cost	NSR time	NSR shares
120%	30 days	1%
110%	30 days	5%
100%	30 days	20%
80%	30 days	86%
70%	30 days	97%
120%	25 days	10%
110%	25 days	34%
100%	25 days	72%
80%	25 days	98%
70%	25 days	100%
120%	20 days	52%
110%	20 days	84%
100%	20 days	96%
80%	20 days	100%
70%	20 days	100%

Forecasted Traffic Volume via the NSR

The cost analysis of the NSR and the SCR can be complicated due to many other factors that can affect the cost. However, we can utilize the already driven numbers in the previous section for the time-saving effects of the NSR.

The time-saving effects via the NSR rely highly rely on the length of the ice-class section of the Arctic, as well as on how long the NSR can be open. There is no available data for the opening period of the NSR year on year. However, according to AMSA (2009), it is forecasted that it would open about 90 to 100 days by 2080. Also, Ragner (2008) mentioned the possibility that the Arctic Sea would be open for 170 days at maximum in 100 years, as the technology evolves. Mark Serreze at the NSIDC in the United States also predicted that the Arctic's ice would completely melt out by 2030 if we keep the current trend. Also, the current ice extent as of July 2011 has been observed to be even lower than it was during the same period in 2007,[6] showing no sign of slowing down its melting speed.

In this respect, we applied three stages of opening of the Arctic: three months in 2015, six months in 2020, and nine months in 2025, taking the perspective that the NSR will be commercialized by 2030. We put the expected saved time using the routes to Europe from each of the six Asian countries into these scenarios, and estimated the container traffic share of the NSR, as seen in Table 3.6. The container traffic is forecasted to reach about 29,000 TEU in 2015 and around 3 million TEU in 2030 under the condition that the sailing cost through the NSR stays at the same level as the cost of the SCR. Also, the share of the NSR would be 1.6% in 2015 and 64.1% in 2030.

Table 3.6 *Container Traffic Forecast and Share of NSR* (Unit: 1,000 TEU)

NSR cost	Container traffic forecast				Share			
	2015	2020	2025	2030	2015	2020	2025	2030
120%	1	31	163	442	0.1%	1.2%	4.6%	9.7%
110%	6	132	596	1,438	0.3%	5.0%	16.9%	31.6%
100%	29	423	1,417	2,920	1.6%	16.0%	40.2%	64.1%
80%	249	1,145	2,457	4,304	13.3%	43.3%	69.7%	94.5%
70%	376	1,252	2,542	4,392	20.2%	47.3%	72.1%	96.4%

Cases for Analysis of the Cost Price via the NSR

In order to review the possible five scenarios of using the NSR, we need to analyse the cost price for shipping. We selected the route between Tokyo and Rotterdam since it is the route that can save the most considerable amount of time and distance via the NSR. The length of the SCR is 11,285 NM while the NSR is expected to be 7,445 NM. We divided the sailing costs into four categories: the charterage, representing capital expenses, ship operating costs including labor costs and insurance fees, fuel costs, and passage toll fees. The passage toll fee is called the Suez Canal toll for the route passing through the Suez Canal, and also as an ice-breaking service fee for the NSR.

The NSR has poor surroundings and extremely low temperatures. Therefore, an ice-class vessel requires more capital expenses compared to operating general ships. Also, labor costs and insurance fees can go up as the risk increases on this route. The increased rate of capital expenses and operating costs of the NSR is generally estimated to be at the level of 20% to 30%. In this study, we have applied a 20% increase in its costs. This analysis was done based on 8,000 TEU vessels, which are mainly used on the sailing route between Asia and Europe. Also, we utilized the general idea that the charterage per day stays at a level of around USD 45,000 and the ship operating cost would be at around USD 23,000.

The fuel consumption is based on the assumption that ships operate at an economical speed. Therefore, the fuel consumption will be 0.3 ton per NM. The fuel cost is based on Fujairah Bunker C oil of IFO 380 cst. We deducted the lowest level of USD 445 from the highest level of USD 720 during past 12 months, and added this difference of USD 275 to USD 720 again in order to derive the future oil price, reflecting a possible rise in the price. Therefore, we have set up three scenarios: USD 444, USD 720 and USD 995.[7]

The Suez Canal toll fee is known to be around USD 550,000, based on an 8,000 TEU vessel with a 60% load factor. Also, as for ice-breaking service fees imposed by Russia, the publicly announced tariffs in 2005 will be applied. This Russian fee is schemed to be imposed on the tonnage of shipments and the whole shipping route, respectively. For the container shipments, 1,048 roubles per tonnage have been applied. When it comes to transit cargo along the waterways of the NSR, 1,000 roubles have been applied per ton of full displacement.[8] Even if it has not been announced in public, Russia is known to regard one TEU as 24 tons.[9] Based on this, if the 8,000 TEU vessel transports a container shipment with 60% capacity, the fee imposed on the shipment would amount to USD 3.9 million. Also, in the case of 110,000 deadweight tons the fee will be USD 3.6 million. The total fee for a single passage through the NSR amounts to USD 7.6 million. In the case of the Murmansk shipping company, it has been said that it paid around USD 220,000 in 2010 for 5,300 TEU vessels, and around USD 420,000 for 10,000 TEU vessels.[10] However, this seems to show a preferential treatment for Russian shipping companies and will not apply to vessels from other countries.

In addition, we need to estimate shipping frequency on a yearly basis. We applied a vessel speed of 18 NM per hour for ice water and 3 NM per hour for non-ice water. The waiting time for the SCR and the NSR would be four days and eight days per trip, respectively. As a result, we derived a total of 30.1 shipping days per trip for the SCR. The expected shipping days will be 33.3 days if the NSR is open for three months, and 28.7 days in the case of a six-month open period, 26.4 days for an opening period of nine months, and 25.2 days for a twelve-month open period. In the case the NSR is not open, we assumed the use of the SCR by chartering other vessels. The analysis shows that the shipping frequency per year will be 12.1 times via the SCR. Also, the shipping frequency via the NCR will be 11.9 times when the Arctic is open for three months, 12.4 times for a six-month opening, 13.4 times for a nine-month opening, and 14.5 times for a twelve-month opening. In order words, this analysis indicates that the speed reduction effect of vessels in ice water is bigger than the shipping distance-saving effects when the NSR is only open for three months. Therefore, the shipping frequency ends up decreasing.

If we divide the total costs by the possible shipping frequency per year, we are able to gain the cost price per TEU. It turns out that the cost price of the NSR can be less expensive than that of the SCR if we exclude ice-breaking service fees. If the total costs include the ice-breaking service fee, the cost price of the NSR will increase by 25% to 160%, while the NSR

Table 3.7 Sailing cost per TEU between Tokyo and Rotterdam

Fuel cost	Cost/ Rates	Suez Canal route (including toll)	NSR excluding ice-breaking service fees				NSR including ice-breaking service fees			
			3 months	6 months	9 months	12 months	3 months	6 months	9 months	12 months
445 USD/ton	Cost	855.2	748.3	717.3	674.8	636.0	1,200.4	1,578.8	1,922.2	2,213.1
	Rate		12.5%	16.1%	21.1%	25.6%	-40.4%	-84.6%	-124.8%	-158.8%
720 USD/ton	Cost	1,049.1	927.0	877.6	817.7	764.0	1,379.1	1,739.0	2,065.1	2,341.0
	Rate		11.6%	16.4%	22.1%	27.2%	-31.5%	-65.8%	-96.8%	-123.1%
995 USD/ton	Cost	1,243.1	1,105.7	1,037.9	960.5	892.0	1,557.9	1,899.3	2,207.9	2,469.0
	Rate		11.1%	16.5%	22.7%	28.2%	-25.3%	-52.8%	-77.6%	-98.6%

can be 11% to 28% less costly with no ice-breaking fees.

For further studies related to the cost price of the NSR, we have to recognize that critical issues come from not only the high price level of oil, but also from how much the ice-breaking fees imposed will cost. In order to make the cost price of the NSR more competitive than the one of the SCR, we need to keep the ice-breaking fees at a rational level and discuss this issue on a constant basis.

BENEFITS OF RESOURCES SHIPPING VIA THE NSR

Analysis of Background and Purpose

The Arctic is very well known for its enriched repository of energy, fishery and mineral resources. According to USGS's research of 2008,[11] about 22% of the world's oil and gas resources are found in the Arctic Sea. Also, 13% of the world's oil (90 trillion barrels) and 30% of the world's LNG (47 trillion cubic meters) are reserved there. In addition, the Arctic area occupies 3% of the world's oceans and the fishery resources of this area are expected reach to 40% of the world's output. As for mineral resources, it has 16% of the world's iron ore and others such as nickel, copper, uranium, diamonds, etc., which is equivalent to USD 2 trillion.

With continuous oil price hikes, the accelerated Antarctic ice meltdown due to global warming, and the development of oil drilling techniques, we have started to shed a light on the idea of shipping Arctic resources through the NSR. In this context, this study will deal with the issues of commercializing the NSR, and then compare shipping costs by using the existing shipping route (ESR) with the NSR under the condition of the same shipping operations. This will help us to estimate the costs of each shipping route for resources. Last, but not least, we will also examine the alternatives of shipping resources via the NSR, which is one of the purposes of this paper.

This study mainly focuses on four categories of resources: LNG, oil, coal, and iron ore. Those are the major resources that Korea imports from foreign countries and distributes over the Arctic.

Setting up of Sea Routes

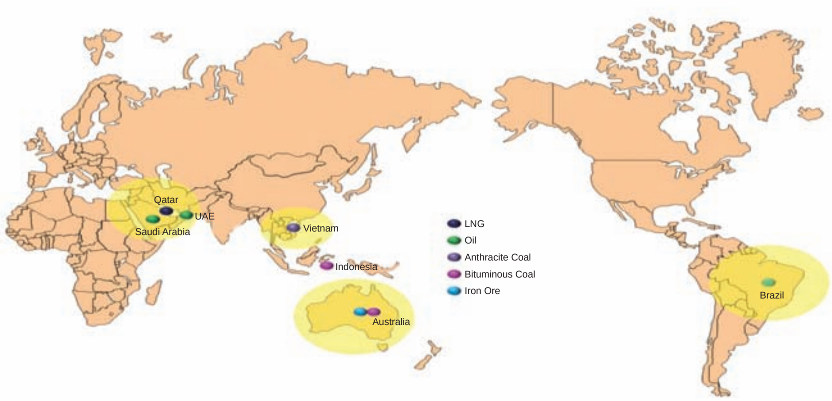
The ESR for resources was set up by the top countries Korea imports resources from and the NSR, which is based on the top natural resources reserves in the Arctic.

As for the ESR, a starting point was set from major ports located in the top countries from which Korea imports resources. The figure above shows the major countries that import resources into Korea. The biggest LNG-importing country for Korea is Qatar, therefore its most representative port, Doha Port, was selected as a starting point for the ESR. The starting point of the NSR for LNG shipping is Khatanga Port, the nearest port from the East Siberian area, which is an enriched LNG reserve.

Likewise, the starting points of shipping each resource can be designed with both the ESR and the NSR. The next figure and table show each detailed shipping route.

Standards of Shipping Costs

To compare each cost for shipping resources through the ESR and the NSR, we need to set some variables: vessel types (size), charterage, fuel costs, operating costs, shipping distance and shipping time. In addition, we need to consider an ice-breaking fee in the Arctic.



Source: illustrated by Korea Maritime Institute based on information from the Korea International Trade Association.

Figure 3.2 *Major importers of resources into Korea*

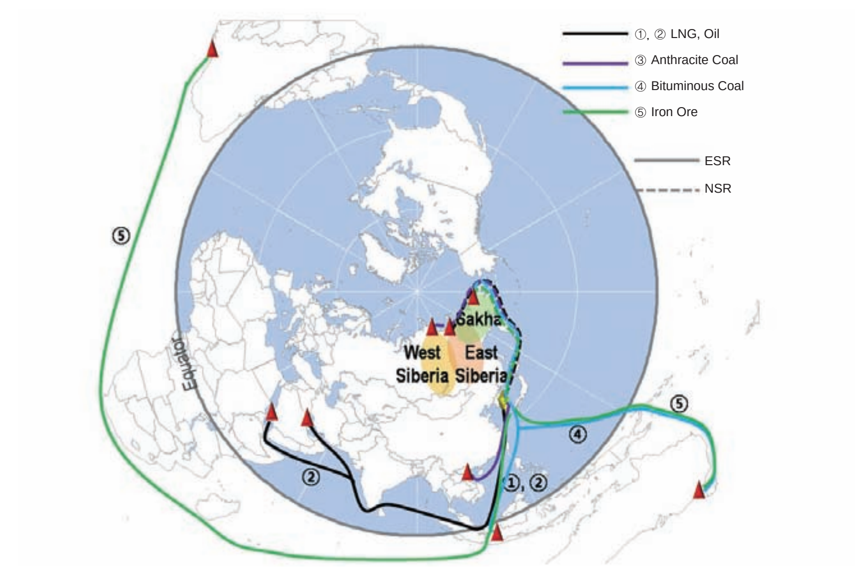
Representative Vessel Types

Each resource's representative vessel was selected based on interview information from shipping carriers. As for each vessel's speed, we referred to Drewry's annual report. Mostly, we applied 14 knots for maximum speed. LNG is relatively lighter than other resources, so we expected the carrier to speed up to 19.5 knots. As noted above, this paper assumes that vessel speeds for both the ESR and the NSR will be the same.

Table 3.8 *Vessel type and speed*

Classification	Vessel type	Size (ton)	Speed (knot)
LNG	LNG carrier	77,500	19.5
Oil	VLCC tanker	300,000	14
Coal	Capesize vessel	180,000	14
Iron Ore	Capesize vessel	180,000	14

Source: 1) Vessel type: interview information fromshipping companies.
2) Speed: Drewry, Ship Operating Cost Annual Review and Forecast, Annual Report, 2010. 11.



Source: illustrated by Korea Maritime Institute based on information fromthe Korea International Trade Association.

Figure 3.3 *Each resource's shipping route*

Shipping Distance and Days

After fixing the vessel type and its speed, we can derive the shipping distance and time for each shipping route. If we put the port name and the vessel speed into the Netpas Program, we can get the total shipping distance and shipping days. In order to estimate the distance of the NSR, we calculated the distance of the existing route starting from the Bering Sea and the route from the Bering Sea to the Arctic and finally added them up.

As you can see below, most of the NSRs turned out to be more effective than the ESR in terms of shipping distance and time. However, there are some exceptions: the ESR for anthracite coal from Haiphong to Samchek and the ESR 2 for bituminous coal from Tanjung Priok to Samcheok. The main reason for this is the fact Haiphong and Tanjung Priok belong to the intra-Asian region, being quite close to Korea. Except for these cases, taking the NSR is more effective than the ESR and saves three to 23 days of shipping time.

Table 3.9 Each resource route's distance and shipping days

Classification			Route (port to port)	Distance (NM)			Shipping days		
				ESR	NSR	Sum	ESR	NSR	Sum
LNG		ESR	Doha-Ulsan	6,125	-	6,125	18.23	-	18.23
		NSR	Khatanga-Ulsan	3,066	1,707	4,773	9.13	5.08	14.21
Oil		ESR 1	Jeddah-Ulsan	6,944	-	6,944	20.67	-	20.67
		ESR 2	Dubai-Usan	5,949	-	5,949	17.71	-	17.71
		NSR	Olenyok-Ulsan	3,032	1,328	4,360	9.02	3.95	12.97
Coal	Anthracite	ESR	Haipong-Samcheok	1,747	-	1,747	4.85	-	4.85
		NSR	Tiksi-Samcheok	3,066	1,375	4,441	9.13	4.09	13.22
	Bituminous	ESR 1	Melbourne-Samcheok	5,211	-	5,211	15.51	-	15.51
		ESR 2	Tanjung Priok-Samcheok	2,941	-	2,941	8.75	-	8.75
		NSR	Pevek-Samcheok	3,066	523	3,589	9.13	1.56	10.69
Iron Ore		ESR 1	Melbourne-Pohang	5,140	-	5,140	15.3	-	15.30
		ESR 2	Santos-Pohang	11,336	-	11,336	33.74	-	33.74
		NSR	Pevek-Pohang	3,100	523	3,623	9.23	1.53	10.76

Source: 1) Distance and shipping days: using the Netpas Distance Program.
2) Speed: refer to Table 2.

Fuel Costs

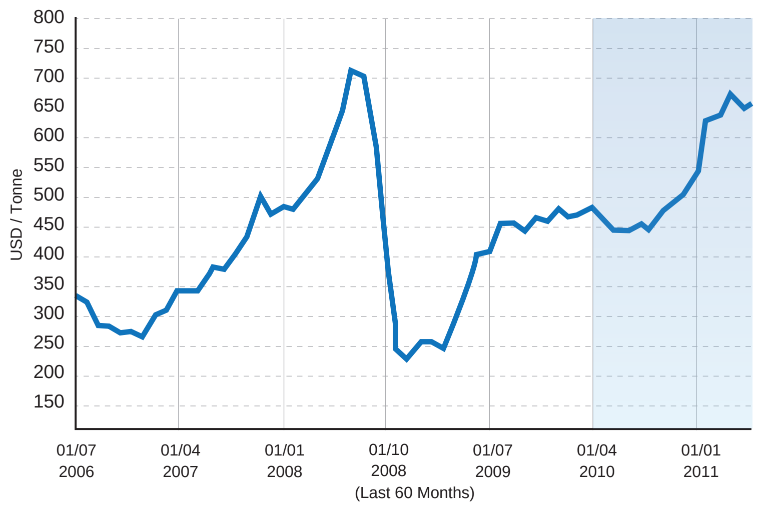
According to shipping carriers, the fuel costs for each vessel can vary from 40 to 100 tons. This paper assumed an additional 20% in fuel expenses for the NSR, considering future oil price hikes along with environmental changes, according to the interviews with the shipping carriers.

Table 3.10 *Fuel expenses*

Classification	Vessel type	Size (ton)	Fuel expenses/day (ton)	
			ESR	NSR
LNG	LNG carrier	77,500	100	120
Oil	VLCC tanker	300,000	90	108
Coal	Capesize vessel	180,000	40	48
Iron Ore	Capesize vessel	180,000	40	48

Note: 20% additional expenses on the NSR.
Source: interview information from shipping companies.

We can calculate the fuel costs per day by multiplying the fuel consumption amount per day by the oil price. This estimation is based on Fujairah bunker C oil (IFO 380 cst which is the cheapest). We also divided



Source: www.clarksons.net

Figure 3.4 *380 cst bunker price, Fujairah* fuel costs into three: the lowest price of USD 445 per day, the highest price of USD 720 per day during past 12 months according to data from the Clarkson website, and a third price of USD 995 per day. The third price was calculated in order to consider any future oil price hikes, adding the difference between the two other prices (USD 275) to the maximum price of USD 720.

With the derived fuel costs on the basis of these standards, we were able to complete the table below.

Table 3.11 *Total fuel costs*

Classification	Route	Shipping days			Fuel expenses (ton)			Fuel costs (USD): 445 USD/ton			Fuel costs (USD): 720 USD/ton			Fuel costs (USD): 995 USD/ton		
		ESR	NSR	Sum	ESR	NSR	Sum	ESR	NSR	Sum	ESR	NSR	Sum	ESR	NSR	Sum
LNG	ESR	18.23	-	18.23	1,823	-	1,823	811,235	-	811,235	1,312,560	-	1,312,560	1,813,885	-	1,813,885
	NSR	9.13	5.08	14.21	913	610	1,523	406,285	271,272	677,557	657,360	438,912	1,096,272	908,435	606,552	1,514,987
Oil	ESR 1	20.67	-	20.67	1,860	-	1,860	827,834	-	827,834	1,339,416	-	1,339,416	1,850,999	-	1,850,999
	ESR 2	17.71	-	17.71	1,594	-	1,594	709,286	-	709,286	1,147,608	-	1,147,608	1,585,931	-	1,585,931
	NSR	9.02	3.95	12.97	812	427	1,238	361,251	189,837	551,088	584,496	307,152	891,648	807,741	424,467	1,232,208
Anthracite Coal	ESR	4.85	-	4.85	194	-	194	86,330	-	86,330	139,680	-	139,680	193,030	-	193,030
	NSR	9.13	4.09	13.22	365	196	562	162,514	87,362	249,876	262,944	141,350	404,294	363,374	195,338	558,712
Bituminous Coal	ESR 1	15.51	-	15.51	620	-	620	276,078	-	276,078	446,688	-	446,688	617,298	-	617,298
	ESR 2	8.75	-	8.75	350	-	350	155,750	-	155,750	252,000	-	252,000	348,250	-	348,250
	NSR	9.13	1.56	10.69	365	75	440	162,514	33,322	195,836	262,944	53,914	316,858	363,374	74,506	437,880
Iron Ore	ESR 1	15.3	-	15.30	612	-	-	272,340	-	272,340	440,640	-	440,640	608,940	-	608,940
	ESR 2	33.74	-	33.74	1,350	-	-	600,572	-	600,572	971,712	-	971,712	1,342,852	-	1,342,852
	NSR	9.23	1.53	10.76	369	73	443	164,294	32,681	196,975	265,824	52,877	318,701	367,354	73,073	440,427

Note: Fuel Costs = Shipping days × Fuel expenses.

Charterage

The charterage of each vessel varies from USD 12,500 to USD 90,000 per day, according to Fearn research's weekly data. We also considered the current charterage as of the third week of July, 2011, and applied an equal cost amount to both the ESR and the NSR. The recent earthquake in Japan made the demand for LNG go higher, and the charterage of LNG has rapidly risen up to USD 90,000 per day.

Table 3.12 Ship charterage

Classification	Vessel type	Size (ton)	Charter/day (USD)
LNG	LNG carrier	77,500	90,000
Oil	VLCC tanker	300,000	23,000
Coal	Capesize vessel	180,000	12,500
Iron Ore	Capesize vessel	180,000	12,500

Source: www.fearnresearch.com

Operating Costs

Besides fuel costs and charterage, we also need to calculate operating costs. The operating costs consist of manning, insurance fees, repair and maintenance, stores and spares, and so on. This data is based on Drewry's annual report, and we assume 20% in additional costs for the NSR.

The total operating costs are in the table below. The operating cost per

Table 3.13 Ship operating costs/day

Vessel type	Details	Ship operating costs/day (USD)	
		ESR	NSR
LNG carrier (140-150,000 CBM)	Manning	5,112	6,134
	Insurance	1,676	2,011
	Repair & Maintenance	556	667
	Stores & Spares	1,613	1,936
	Others	2,671	3,205
	Sum	11,628	13,954
Oil tanker (VLCC)	Manning	3,797	4,556
	Insurance	1,527	1,832
	Repair & Maintenance	470	564
	Stores & Spares	1,830	2,196
	Others	2,500	3,000
	Sum	10,124	12,149
Dry cargo carrier (180,000 DWT)	Manning	2,648	3,178
	Insurance	1,030	1,236
	Repair & Maintenance	300	360
	Stores & Spares	764	917
	Others	1,343	1,612
	Sum	6,085	7,302

Note: 1) Others = Management & Administration + Lubricating Oil.
2) Additional expenses of 20% on the NSR.
Source: Drewry, Ship Operating Coast Annual Review and Forecast, Annual Report, 2010. 11.

Table 3.14 Ship's operating costs (Unit: Dollar)

Classification	Route	Shipping days	Manning	Insurance	Repair & Maintenance	Stores & Spares	Others	Sum	Costs/ day
LNG	ESR	18.23	93,192	30,553	10,136	29,405	48,692	211,978	11,628
	NSR	14.21	87,170	28,579	9,481	27,505	45,546	198,281	13,954
Oil	ESR 1	20.67	78,484	31,563	9,715	37,826	51,675	209,263	10,124
	ESR 2	17.71	67,245	27,043	8,324	32,409	44,275	179,296	10,124
	NSR	12.97	59,097	23,766	7,315	28,482	38,910	157,570	12,149
Anthracite Coal	ESR	4.85	12,843	4,996	1,455	3,705	6,514	29,512	6,085
	NSR	13.22	42,008	16,340	4,759	12,120	21,305	96,532	7,302
Bituminous Coal	ESR 1	15.51	41,070	15,975	4,653	11,850	20,830	94,378	6,085
	ESR 2	8.75	23,170	9,013	2,625	6,685	11,751	53,244	6,085
	NSR	10.69	33,969	13,213	3,848	9,801	17,228	78,058	7,302
Iron Ore	ESR 1	15.30	40,514	15,759	4,590	11,689	20,548	93,101	6,085
	ESR 2	33.74	89,344	34,752	10,122	25,777	45,313	205,308	6,085
	NSR	10.76	34,191	13,299	3,874	9,865	78,570	139,798	12,992

Note: 1) Total costs = Ship's Operating Costs/day × Shipping days.
2) Additional expenses of 20% on the NSR.

day is more expensive on the NSR, but the total operating cost is higher than the ESR's.

Ice-Breaking Service Fees

All ships passing through the NSR are required to pay ice-breaking service fees imposed by Russia. The fees have been double charged both for the cargo type and the sailing route. The table below shows ice-breaking service fees according to cargo type.

Table 3.15 Ice-breaking service fee by cargo type

Classification	Rubles/ton	Dollars/ton
Bulk Cargo	707	23.2
Liquid bulk Cargo	530	17.4

Note: The exchange rate is 30.48 rubles per U.S. dollar (Russian Central Bank, as of the end of 2010).
Source: Russian Federation, "On the changes of rates for services of the icebreaker fleet on the NSR," 2005. 09.

Also, the ice-breaking service fees will be imposed depending on the sailing route. This fee is applied to the Laptev Sea & East Siberian Service since the NSR for resources passes through this line.

Table 3.16 *Ice-breaking service fees by shipping area*

Classification	Rubles/ton	Dollars/ton
Waterways of the NSR	1,000	32.8
Laptev Sea & East Siberian Service	690	22.6
Kara, Ob, & Yenisei Rivers Service	200	6.6

Note: 1) The exchange rate is 30.48 rubles per U.S. dollar (Russian Central Bank, as of the end of 2010).
2) Applied full displacement per ton.
3) Waterways of the NSR: transit along the waterways of the Northern Sea Route.
4) Laptev Sea & East Siberian Service: To ports onthe Laptev Sea from the west or east, and to the ports of the East Siberian Sea from west or east.
5) Kara, Ob, & Yeniseirivers Service: To ports of the Kara Sea and to ports situated on the Ob and Yenisei rivers from the west.
Source: Russian Federation, "On the Changes of Rates for Services of the Icebreaker Fleet on the NSR," 2005. 09.

From the above two tables, the total ice-breaking service fees can be calculated. The unit cost of ice-breaking service fees are USD 40 for liquid cargo and USD 45.8 for dry bulk cargo.

Table 3.17 *Total ice-breaking fees of the NSR*

Classification			Vessel size (ton)	Ice breaking fee/ton (USD)		Total ice breaking fees (USD)			
				Cargo	Area	Cargo	Area	Sum	Cost/ton
LNG		NSR	77,500	17.4	22.6	1,348,500	1,751,500	3,100,000	40.0
Oil		NSR	300,000	17.4	22.6	5,220,000	6,780,000	12,000,000	40.0
Coal	Anthracite	NSR	180,000	22.6	22.6	4,176,000	4,068,000	8,244,000	45.8
	Bituminous	NSR	180,000	22.6	22.6	4,176,000	4,068,000	8,244,000	45.8
Iron Ore		NSR	180,000	22.6	22.6	4,176,000	4,068,000	8,244,000	45.8

Note: 1) Total ice-breaking service fees by cargo type = ice-breaking service fee by cargo type per ton × vessel size.
2) Total ice-breaking service fees by shipping area = ice breaking service fee by shipping area per ton × vessel size.
Source: Russian Federation, "On the Changes of Rates for Services of the Icebreaker Fleet on the NSR," 2005. 09.

Comparison of Shipping Costs

Based on the previous data, we can derive the total shipping costs for resources. Surprisingly, it turns out that there is no significant cost-saving effect for the NSR compared to the ESR regardless of the distance and time-saving effects of the NSR.

Table 3.18 *Total resources shipping costs*

Classification	Fuel price	Route	Port to port	Distance	Shipping days	Charter	Fuel costs	Operating costs	Ice-breaking fee	Sum	Changes of total costs (%)	
LNG	445 USD	ESR	Doha~Ulsan	6,125	18.23	1,640,700	811,235	211,978	-	2,663,913	△97.3	x
		NSR	Khatanga~Ulsan	4,773	14.21	1,278,900	677,557	198,281	3,100,000	5,254,738		
	720 USD	ESR	Doha~Ulsan	6,125	18.23	1,640,700	1,312,560	211,978	-	3,165,238	△79.2	x
		NSR	Khatanga~Ulsan	4,773	14.21	1,278,900	1,096,272	198,281	3,100,000	5,673,453		
	955 USD	ESR	Doha~Ulsan	6,125	18.23	1,640,700	1,813,885	211,978	-	3,666,563	△66.2	x
		NSR	Khatanga~Ulsan	4,773	14.21	1,278,900	1,514,987	198,281	3,100,000	6,092,168		
Oil	445 USD	ESR 1	Jeddah~Ulsan	6,944	20.67	475,410	827,834	209,263	-	1,512,507	△760.0 △903.7	x
		ESR 2	Dubai~Ulsan	5,949	17.71	407,330	709,286	179,296	-	1,295,912		
		NSR	Olenyok~Ulsan	4,360	12.97	298,310	551,088	157,570	12,000,000	13,006,968		
	720 USD	ESR 1	Jeddah~Ulsan	6,944	20.67	475,410	1,339,416	209,263	-	2,024,089	△559.4 △669.6	x
		ESR 2	Dubai~Ulsan	5,949	17.71	407,330	1,147,608	179,296	-	1,734,234		
		NSR	Olenyok~Ulsan	4,360	12.97	298,310	891,648	157,570	12,000,000	13,347,528		
	955 USD	ESR 1	Jeddah~Ulsan	6,944	20.67	475,410	1,850,999	209,263	-	2,535,672	△439.8 △530.0	x
		ESR 2	Dubai~Ulsan	5,949	17.71	407,330	1,585,931	179,296	-	2,172,557		
		NSR	Olenyok~Ulsan	4,360	12.97	298,310	1,232,208	157,570	12,000,000	13,688,088		
Anthracite Coal	445 USD	ESR	Haipong~Samcheok	1,747	4.85	60,625	86,330	29,512	-	176,467	△4861.6	x
		NSR	Tiksi~Samcheok	4,441	13.22	165,250	249,876	96,532	8,244,000	8,755,659		
	720 USD	ESR	Haipong~Samcheok	1,747	4.85	60,625	139,680	29,512	-	229,817	△3777.0	x
		NSR	Tiksi~Samcheok	4,441	13.22	165,250	404,294	96,532	8,244,000	8,910,077		
	995 USD	ESR	Haipong~Samcheok	1,747	4.85	60,625	193,030	29,512	-	283,167	△3010.1	X
		NSR	Tiksi~Samcheok	4,441	13.22	165,250	558,712	96,532	8,244,000	9,064,495		
Bituminous Coal	445 USD	ESR 1	Melbourne~Samcheok	5,211	15.51	193,875	276,078	94,378	-	564,331	△1433.1 △2617.5	x
		ESR 2	Tanjung Priok~Samcheok	2,941	8.75	109,375	155,750	53,244	-	318,369		
		NSR	Pevek~Samcheok	3,589	10.69	133,625	195,836	78,058	8,244,000	8,651,519		
	720 USD	ESR 1	Melbourne~Samcheok	5,211	15.51	193,875	446,688	94,378	-	734,941	△1093.6 △2015.8	x
		ESR 2	Tanjung Priok~Samcheok	2,941	8.75	109,375	252,000	53,244	-	414,619		
		NSR	Pevek~Samcheok	3,589	10.69	133,625	316,858	78,058	8,244,000	8,772,541		
	955 USD	ESR 1	Melbourne~Samcheok	5,211	15.51	193,875	617,298	94,378	-	905,551	△882.1 △1640.9	x
		ESR 2	Tanjung Priok~Samcheok	2,941	8.75	109,375	348,250	53,244	-	510,869		
		NSR	Pevek~Samcheok	3,589	10.69	133,625	437,880	78,058	8,244,000	8,893,563		

Table 3.18 Total resources shipping costs (cont.)

Classification		Route		Distance	Shipping days	Charter	Fuel costs	Operating costs	Ice-breaking fee	Sum	Changes of total costs (%)	
	Fuel price		Port to port									
Iron Ore	445 USD	ESR 1	Melbourne~Samcheok	5,140	15.30	191,250	272,340	93,101	-	556,691	△1465.6	x
		ESR 2	Tanjung Priok~Samcheok	11,336	33.74	421,750	600,572	205,308	-	1,227,630	△609.9	
		NSR	Pevek~Samcheok	3,623	10.76	134,500	196,975	139,798	8,244,000	8,715,273		
	720 USD	ESR 1	Melbourne~Samcheok	5,140	15.30	191,250	440,640	93,101	-	724,991	△118.9	x
		ESR 2	Tanjung Priok~Samcheok	11,336	33.74	421,750	971,712	205,308	-	1,598,770	△452.7	
		NSR	Pevek~Samcheok	3,623	10.76	134,500	318,701	139,798	8,244,000	8,836,999		
	955 USD	ESR 1	Melbourne~Samcheok	5,140	15.30	191,250	608,940	93,101	-	893,291	△902.9	x
		ESR 2	Tanjung Priok~Samcheok	11,336	33.74	421,750	1,342,852	205,308	-	1,969,910	△354.8	
		NSR	Pevek~Samcheok	3,623	10.76	134,500	440,427	139,798	8,244,000	8,958,725		

The main reason for this result is the highly imposed ice-breaking service fees. The major part of the overall cost, almost 90%, comes from ice-breaking service fees. Therefore we need to examine the total costs excluding the ice-breaking fees in order to separately analyze the cost benefits of the NSR.

The estimated cost benefits for shipping main resources are shown in Table 3.19.

This table shows that we can cut down total shipping costs via the NSR. However, the ice-breaking service fees imposed by Russia turned out to be a major factor that raises the total cost. Therefore, we need to keep it at a reasonable level to facilitate the commercialization of the NSR.

Korea can choose its importing countries by analyzing the amount of passage toll fees Russia imposes and the quality level of resources in the Arctic. However, if the demand for resources is consistent in spite of its limited reserves, Korea needs to participate in resource development in the Arctic and the use of the NSR in the long run. This can be a move to secure a stable supply of resources by diversifying transport routes.

***Table 3.19** Total resources shipping costs except ice-breaking fees*

Classification	Fuel Price	Route	Port to port	Distance	Shipping days	Charter	Fuel costs	Operating costs	Sum	Changes of total costs (%)	
LNG	445 USD	ESR	Doha-Ulsan	6,125	18.23	1,640,700	811,235	211,978	2,663,913	▽19.1	x
		NSR	Khatanga-Ulsan	4,773	14.21	1,278,900	677,557	198,281	2,154,738		
	720 USD	ESR	Doha-Ulsan	6,125	18.23	1,640,700	1,312,560	211,978	3,165,238	▽18.7	x
		NSR	Khatanga-Ulsan	4,773	14.21	1,278,900	1,096,272	198,281	2,573,453		
	955 USD	ESR	Doha-Ulsan	6,125	18.23	1,640,700	1,813,885	211,978	3,666,563	▽18.4	x
		NSR	Khatanga-Ulsan	4,773	14.21	1,278,900	1,514,987	198,281	2,992,168		
Oil	445 USD	ESR 1	Jeddah-Ulsan	6,944	20.67	475,410	827,834	209,263	1,512,507	▽33.4 ▽22.3	x
		ESR 2	Dubai-Ulsan	5,949	17.71	407,330	709,286	179,296	1,295,912		
		NSR	Olenyok-Ulsan	4,360	12.97	298,310	551,088	157,570	1,006,968		
	720 USD	ESR 1	Jeddah-Ulsan	6,944	20.67	475,410	1,339,416	209,263	2,024,089	▽33.4 ▽22.3	x
		ESR 2	Dubai-Ulsan	5,949	17.71	407,330	1,147,608	179,296	1,734,234		
		NSR	Olenyok-Ulsan	4,360	12.97	298,310	891,648	157,570	1,347,528		
	955 USD	ESR 1	Jeddah-Ulsan	6,944	20.67	475,410	1,850,999	209,263	2,535,672	▽33.4 ▽22.3	x
		ESR 2	Dubai-Ulsan	5,949	17.71	407,330	1,585,931	179,296	2,172,557		
		NSR	Olenyok-Ulsan	4,360	12.97	298,310	1,232,208	157,570	1,688,088		
Anthracite Coal	445 USD	ESR	Haipong-Samcheok	1,747	4.85	60,625	86,330	29,512	176,467	△189.9	x
		NSR	Tiksi-Samcheok	4,441	13.22	165,250	249,876	96,532	511,659		
	720 USD	ESR	Haipong-Samcheok	1,747	4.85	60,625	139,680	29,512	229,817	△189.8	x
		NSR	Tiksi-Samcheok	4,441	13.22	165,250	404,294	96,532	666,077		
	995 USD	ESR	Haipong-Samcheok	1,747	4.85	60,625	193,030	29,512	283,167	△189.8	x
		NSR	Tiksi-Samcheok	4,441	13.22	165,250	558,712	96,532	820,495		
Bituminous Coal	445 USD	ESR 1	Melbourne-Samcheok	5,211	15.51	193,875	276,078	94,378	564,331	▽27.8 △28.0	x
		ESR 2	Tanjung Priok-Samcheok	2,941	8.75	109,375	155,750	53,244	318,369		
		NSR	Pevek-Samcheok	3,589	10.69	133,625	195,836	78,058	407,519		
	720 USD	ESR 1	Melbourne-Samcheok	5,211	15.51	193,875	446,688	94,378	734,941	▽28.1 △27.1	x
		ESR 2	Tanjung Priok-Samcheok	2,941	8.75	109,375	252,000	53,244	414,619		
		NSR	Pevek-Samcheok	3,589	10.69	133,625	316,858	78,058	528,541		
	955 USD	ESR 1	Melbourne-Samcheok	5,211	15.51	193,875	617,298	94,378	905,551	▽28.3 △27.1	x
		ESR 2	Tanjung Priok-Samcheok	2,941	8.75	109,375	348,250	53,244	510,869		
		NSR	Pevek-Samcheok	3,589	10.69	133,625	437,880	78,058	649,563		
Iron Ore	445 USD	ESR 1	Melbourne-Samcheok	5,140	15.30	191,250	272,340	93,101	556,691	▽15.3 ▽61.6	x
		ESR 2	Tanjung Priok-Samcheok	11,336	33.74	421,750	600,572	205,308	1,227,630		
		NSR	Pevek-Samcheok	3,623	10.76	134,500	196,975	139,798	471,273		
	720 USD	ESR 1	Melbourne-Samcheok	5,140	15.30	191,250	440,640	93,101	724,991	▽18.2 ▽62.9	x
		ESR 2	Tanjung Priok-Samcheok	11,336	33.74	421,750	971,712	205,308	1,598,770		
		NSR	Pevek-Samcheok	3,623	10.76	134,500	318,701	139,798	592,999		
	955 USD	ESR 1	Melbourne-Samcheok	5,140	15.30	191,250	608,940	93,101	893,291	▽20.0 ▽63.7	x
		ESR 2	Tanjung Priok-Samcheok	11,336	33.74	421,750	1,342,852	205,308	1,969,910		
		NSR	Pevek-Samcheok	3,623	10.76	134,500	440,427	139,798	714,725		

CONCLUDING REMARKS

Due to global warming and the progressive lifting of technical constraints on navigation, the era of opening the NSR will come in the near future. An increase in sea trade volume resulting from deepening globalization and international specialization reinforces the advantages of the NSR. Another reason to utilize the NSR comes from the fact that the entire industrialized world has pushed us to explore the untapped natural resources in the Arctic Sea area. In this respect, this study addresses the possibility of commercial use of the route based on the current data of shipping operations based on some assumptions. It also highlights some important findings on the feasibility of container shipping via the NSR.

The findings of this paper are as follows:

(a) The NSR has an economical effect in terms of distance and time, but we also need to consider the factor of expensive NSR toll fees imposed by Russia. A key issue lies in whether the NSR will become a popular shipping route or not because of these heavily imposed fees. The expected maximum cargo volume between Asia and Europe via the NSR is around 46 million TEU in 2030. This provides us enough grounds to promote the NSR as a commercial shipping route.
(b) The SP survey collected replies from 20% of respondents, Korean shippers and forwarders. Of these, 72% acknowledged the use of the NSR if it can save five days, and 96% said they will choose the NSR if it can bring 10 days of time-saving effects. We have also forecasted traffic volume via the NSR in consideration of the shipping time for each country. The survey results indicate that the expected traffic volume will be 60,000 TEU in 2015, and 14 million TEU in 2030 if the NSR is 10% less expensive than the SCR. Also, a 20% decrease in shipping costs via the NSR will be expected to bring traffic of 249,000 TEU in 2015 and 4.3 million TEU in 2030.
(c) If we exclude the icebreaker fees and apply USD 720 as the fuel costs, 27.2% will be saved per unit TEU. If we put an increased amount of USD 995 as the fuel cost, 28.2% of the shipping cost can be saved. However, if the total shipping cost includes the toll fees with same fuel of USD 995, the shipping cost will go up by 34.9%

when the Arctic is open for three months, and the cost will increase by 14.1% for a non-ice water opening period of 12 months.

(d) Regarding transport of natural resources, the NSR has an economical effect in terms of distance for supplying oil, natural gas, fishery, and mineral resources, but it is also related to the level of the NSR toll fee. The substitution effect of moving resources by using the NSR can solve a part of the Asia Premium problem when Northeast Asian countries import oil from overseas. However, the pattern of currently using the NSR has encountered low economic feasibility due to the heavy tolls imposed by Russia.

In this context, we should need to discuss an appropriate toll level in order to commercialize the NSR as a common shipping route. In addition, we expect to reduce CO_2 to protect the global environment as well as gain an economical effect if the level of ice-breaking fees stays at a reasonable level.

We hope to make a few suggestions by summing up the results of this study. First of all, we need to discuss more how to keep the toll fees at an appropriate level for the commercial use of the NSR, as mentioned above. Second, we need to establish laws and an amendment system related to the NSR. Third, we need to develop appropriate vessels for the NSR at the earliest possible time. Fourth, we need to establish global cooperation to reinvigorate the use of the NSR. Fifth, we need to develop a sailor training program for the NSR. Sixth, we need to develop appropriate ports along the coastal area in the Arctic. Lastly, we need to seek cooperative ways to link natural resources development matters to the promotion of using the NSR.

In this study we tried to figure out how to make commercialization of the NSR feasible. However, we are still facing a number of weaknesses and limitations in doing this. As the economic situation continuously evolves, any results driven by the analysis in this study are subject to change. The expenses can vary according to the shipping operation costs and can always change depending on uncontrollable external factors such a soil prices, supply and demand of vessels, political situations, the level of technology, etc. That is why we all find difficulty in addressing and delivering an accurate result.

This survey is limited in that of the number of respondents to our survey was small, and all the respondents are Korea-based forwarding companies. The sensitivity for time and costs of shippers and forwarders differs depending on where the companies are located. Thus, we need to cover more respondents from region to region in order to gain more accuracy. In addition, we only considered two variables: time and costs. There can in reality be other factors such as shipping regularity and port infrastructure that actually influence the decision-making of shippers and forwarders.

Furthermore, the study regarding transport of natural resources only focused on the case of Korea. We need to further address the case of China, as well as Japan, in order to get more general results. We hope that more qualitative and quantitative studies will be done for the use of the NSR, over coming the limitations we are currently facing.

In addition, we hope to explore every possible avenue to bring a possible economic effect to North Pacific countries in terms of logistics, keeping up with global efforts to protect the environment of the Arctic.

ACKNOWLEDGMENTS

The authors would like to thank Prof. Y.H. Kim and President S.J. Kim for their useful comments in the conference. This research has benefited from financial support from a pilot study fund of the Korea Maritime Institute.

Notes

1. Intermodalism is a system whereby standard-sized cargo containers can be moved seamlessly between different "modes" of transport, typically specially adapted ships known as containerships, barges, trucks and trains.
2. The Netpas Program calculates the distance between any ports on Earth.
3. Mulherion (1996), p. 33.
4. Miaojia Liu et al. (2009), p. 9.
5. This area includes all of North East Asia, North Asia and South East Asia.
6. http://nsidc.org/icelights/2011/07/14/heading-towards-the-summer-minimum-ice-extent/
7. Based on advice from experts and interviews with industry leaders.
8. The exchange rate as of 2010 is 30.46 roubles per dollar, therefore 1,048 roubles

is equivalent to around USD 34.4 and 1,000 roubles to around USD 32.8.

9. Miaojia Liu et al. (2009), p. 7.

10. Based on data from interviews and observation trips by KMI.

11. U.S. Geological Survey (USGS), "Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of Arctic Circle," USGS Fact Sheet 2008-3049, Washington, DC, 2008.

References

Arctic Council. 2009. *Arctic Marine Shipping Assessment 2009 Report*.

Arctic Transform. 2009 (Feb.). *Background Paper on Arctic Shipping*.

BP. 2009 (June). *Statistical Review of World Energy*.

Drewry. 2010 (November). "Ship Operating Cost Annual Review and Forecast." *Annual Report*.

EU. 2010 (August). *Opening of New Arctic Shipping Routes*.

EU Northern Maritime Corridor. 2003 (October). "Arctic Transportation System of Export of Oil from Northwest Russia." *Report No. 4-07*.

Global Insight. 2011 (June). *World Trade Service*.

Jerome Verny. 2009 (May). "Container Shipping on the Northern Sea Route." In *International Transport Forum*.

Korea International Trade Association. internal data (2011).

Kvaerner Masa-Yards Inc. (KMY). 2006. *ARCOP Final Report*. Deliverable D016/017.

Kjerstad, N., Routing, communication, and IT-customizing. 1994. *International Northern Sea Route Programme Working Paper I.1.1*, No. 2. Lysaker, Norway: Fridtj of Nansen Institute.

Lawson Brigham & Ben Ellis. 2004 (September). Arctic Marine Transport Workshop.

Lee, S-W, Ducruet, C. 2009. "Spatial Glocalization in Asia-Pacific Hub Port Cities: A Comparison of Hong Kong and Singapore." *Urban Geography* 30(2): 162-181.

Lloyd's Marine Intelligence Unit (LMIU). Shipping Data (2006).

Mulherin, N. D. 1996 (April). "The Northern Sea Route - Its Development and Evolving State of Operations in the 1990s." *CRREL Report* 96-3.

Miaojia Liu, Jacob Kronbak. 2009. "The Potential Economic Viability of Using the

Northern Sea Route (NSR) as an Alternative Router between Asia and Europe." *Journal of Transport Geography*.

Nepas Distance Program, 2011, http://www.netpas.net/products/product_detail_DT_EN.phpRagner, C.L., Northern Sea Route Cargo Flows and Infrastructure – Present State and Future Potential. Fridtjof Nansens Institutt (FNI) Report 13/2000, 2000.

Ragner, C. L. 2008. "The Northern Sea Route." *Norden Association's Yearbook*. Stockholm.

Russian Federation. 2005 (May). On the Changes of Rates for Services of the Icebreaker Fleet on the NSR.

Somanathan, S., Flynn, P., Szymanski, J. "2009. Northwest Passage: A simulation." *Transportation Research Part A* 43: 127–135.

Svetlanan Chernova, Anton Volkov. 2010. *Economic Feasibility of the Northern Sea Route Container Shipping Development*. Logistics and Transport BE 303E 003.

U.S. Geological Survey (USGS). 2008. "Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of Arctic Circle." *USGS Fact Sheet* 2008-3049. Washington, DC.

Valdimir Mikhailchenko. 2000. Non-commercial Partnership of the Coordination of the Northern Sea Route Usages. Russia.

http://ec.europa.eu/enterprise/networks/eic/eic.html

http://www.ci-online.co.uk/

http://www.clarksons.net/

http://www.fearnresearch.com/

http://www.fni.no/insrop/defaultINSROP.html

http://www.morflot.ru/about/sevmorput

http://nsidc.org/icelights/2011/07/14/heading-towards-the-summer-minimum-ice-extent/

http://www.nasa.gov

http://www.pame.is/amsa

http://www.suezcanal.gov.eg/

4. Strategy for Maximization of the Northern Sea Route Effects by Formulating Regional Port-Industry Clusters

Hong-Seung Roh

Overview: The development of shipping technology and fierceness of port competition brought various developments to shipping and port networks in the Northeast Asian region. Tramp shipping networks changed into liner shipping networks and Hub & Spoke systems transferred into Multi-Order Network Systems (MONS).

Recently, as the possibility of the Northern Sea Route (NSR) has increased, the importance of the pan-East Sea economic region has been receiving new attention.

Like the shipping network on the Mediterranean Sea, which led the Renaissance in Europe, the pan-East Sea economic region's meaning is hoped to be reinterpreted as the East Asia Mediterranean. This is because the possibility that the region could be a new center has also grown, since the probability of the NSR's commercial use has increased.

One of the recent important trends in the transport and logistics field is the development of intermodalism.[1] In the future this trend will be further enforced. Consequently, a regional development strategy using the full scale of the NSR effect should be found from the intermodalism perspective.

From the intermodalism point of view, passive transport and logistics functions just connect each developed area, whereas active transport and logistics functions lead to the development of the new area.

The reason why intermodalism has to be mentioned at this point is that passive transport and logistics functions are changing to active ones as time passes. If a stupendous revolution like the Suez Canal, the Panama Canal, or the NSR happens, it will accelerate this transition.

Additionally, this study proposes a strategy for North East Asia to maximize the added value of the port area, which is the development of Port & Industry Clusters.

INTRODUCTION

The current global warming tendency is toward the thawing of the polar ice caps. Consequently, many experts at NASA in the United States and Laval University in Canada foresee that the NSR, starting from the Northern East Sea Route, could be used for commercial purposes within five to 10 years.

The NSR is the third-biggest revolution of the shipping industries since the Panama Canal (which opened in 1914) and the Suez Canal (which opened in 1896).

This is because almost 40% of the voyage distance from Far East Asia and Europe can be saved by the NSR. The saved distance reaches 8,300 km between the port of Busan and the port of Rotterdam.

China, Japan and Korea are known as the "Far East Asia region." However, if the NSR gets connected, then the Far East Asia region might change into "the Nearest East Asia region." Most of the Europe-bound cargo starting from the east part of Singapore in Asia will then use the NSR. Due to these kinds of changes, another hub port competition among Asian ports is expected to grasp the position of the huge businesses of transit ports, from South East Asia into North East Asia.

Of course, the global warming tendency cannot be good news for everybody, but there is no time for sorrow either. We definitely have to try our best to slow down the tempo of the global warming tendency, but we cannot lose the golden opportunity to save 40% of the voyage distance.

Therefore, this study aims to figure out what significance the NSR

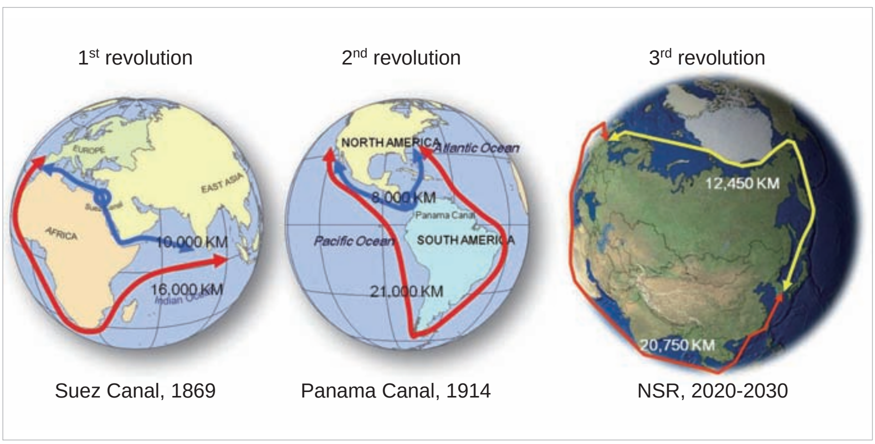
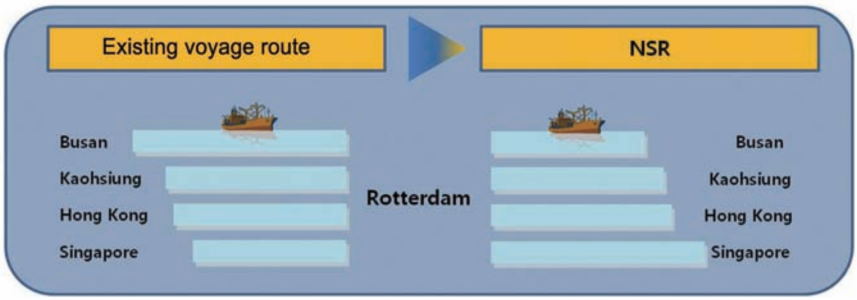


Figure 4.1 The NSR as the third revolution of the global shipping networks



Source: Roh (2010a).

Figure 4.2 The distance between European ports and Asian ports reverses

has among the regional shipping networks changes. The second aim of this study is to reinterpret the pan-East Sea economic region as the NSR's commercial use is realized.

Additionally, this study proposes a regional strategy for maximization of the NSR effects from an intermodalism perspective, which is the recent hot issue in the transport and logistics field.

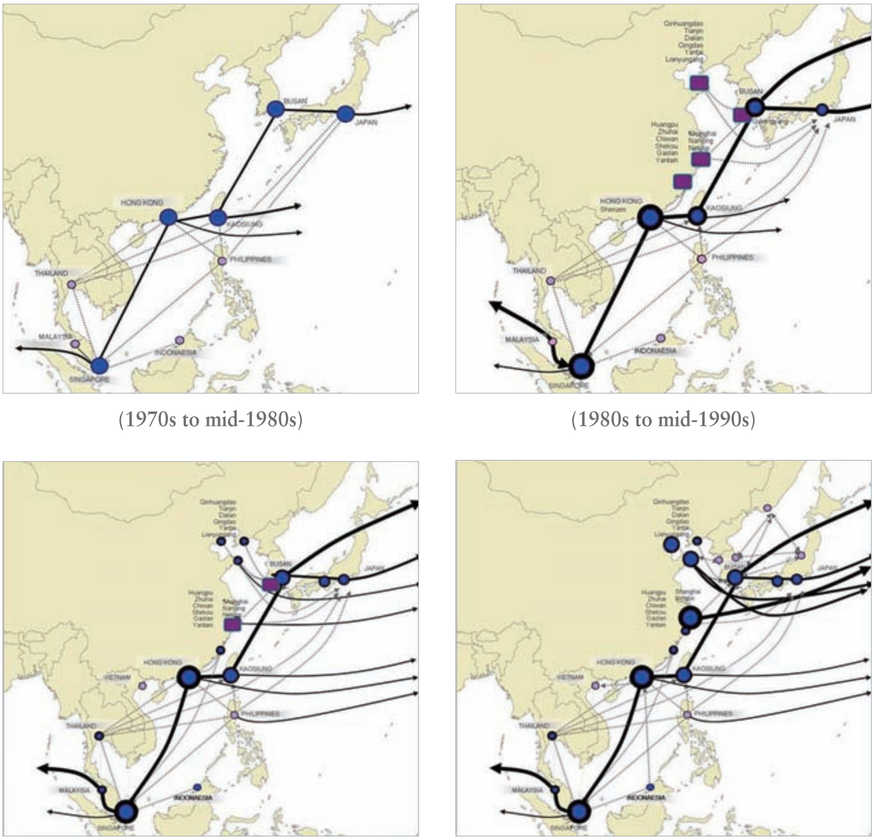
TRANSFORMATION PROGRESS OF ASIAN SHIPPING NETWORKS AND IMPORTANCE OF THE NSR

For a deeper understanding of the NSR's importance, it is necessary to understand the transformation of shipping routes in the Asian region first.

Before the mid-1980s, when container shipping was generalized, there weren't any fixed shipping routes in Asia. On the selective shipping route, a non-linear ship called a "tramper" visited the ports, of which there was a certain level of port facility in the region.

From the 1980s to the mid-1990s, container ships appeared in Asian shipping routes (See Figure 4.3 (upper right)). It was the period when China started opening a door to the world. Eastern coastal cities also started to build up ports used for feeder ships connected to the hub ports, such as Singapore, Hong Kong, Kobe and Busan. It was also the period when the hub ports' function started to emboss.

The Hub & Spoke system was settled in the Asian region from the



(1970s to mid-1980s) (1980s to mid-1990s)

(mid-1990s to 2000s) (2000 to present)

Source: Roh (2007b).

Figure 4.3 Transformation of Asian shipping routes

mid-1990s to 2000. Singapore, Hong Kong, Kaohsiung and Busan took possession of the leader group at that time (See Figure 4.3 (lower left)). The port of Kobe was also in the leader group until the mid-1980s, but was eliminated after the Kobe earthquake in 1995.

Since 2000, the Hub & Spoke became more complicated. The feeder ports (small and medium size ports) did not just depend on the hub ports, but also started to connect the port network by themselves. Consequently, the shape of the port networks seemed to be more complex than the Hub & Spoke system. Park et al. (2007) named this phenomenon the "Multi-Order Network System" (MONS)

This trend seems to be continuing even after the NSR opens. The

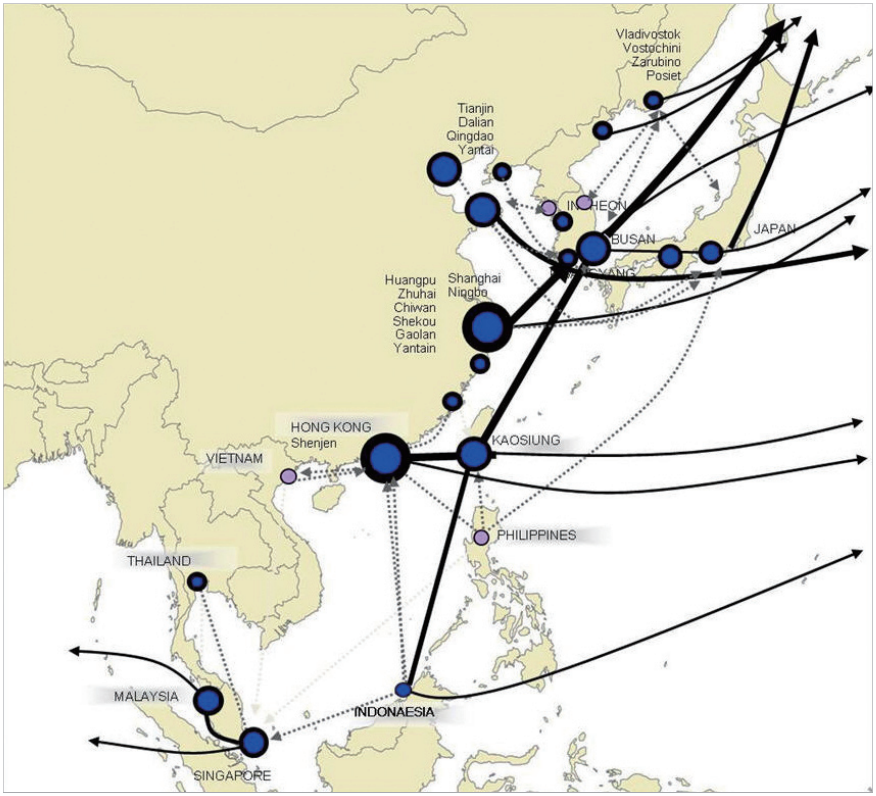


Figure 4.4 *Foreseeing Asian shipping routes after NSR*

only difference from before is that most of the shipping routes connecting Northeast Asia and Southeast Asia would fade out and be moved into the east-bound ones. As a result, the importance of the pan-East Sea economic region is receiving new attention (See. Figure 4.5).

The evidence for the opinion that the local feeder network will be developed around the pan-East Sea is related to the features of the recent manufacturing process: that is, changing the philosophical background to an economy of scope-based post-Fordism from an economy of scale-based Fordism (See Figure 4.6).

In addition, this trend also has a deep relation to the expanding multinational manufacturing trend, Global Production Network (GPN), in which the manufacturing, assembling and distributing activities are conducted in different countries. It is also strongly related to the trends that unavoidably happen in the maritime industry, such as bulk shipping, unit

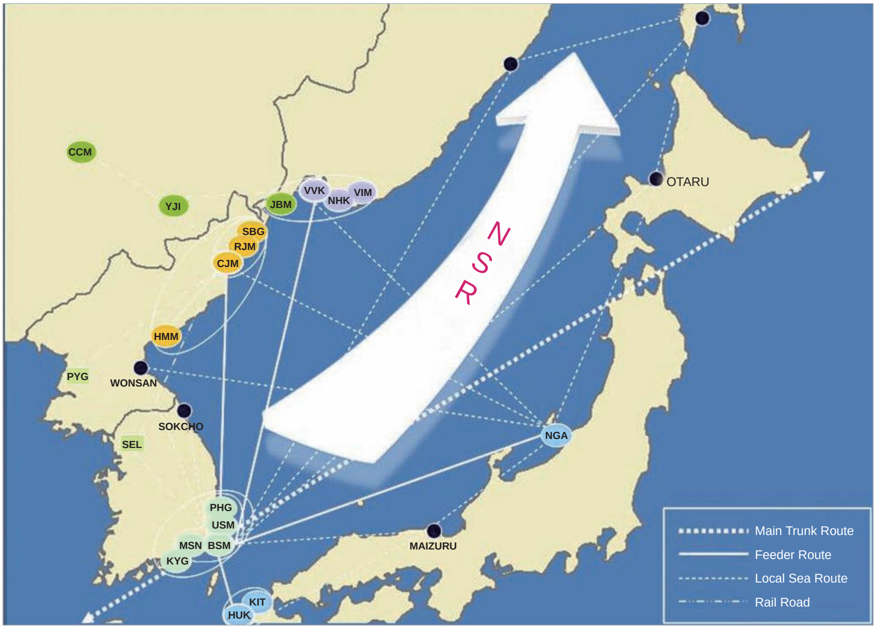
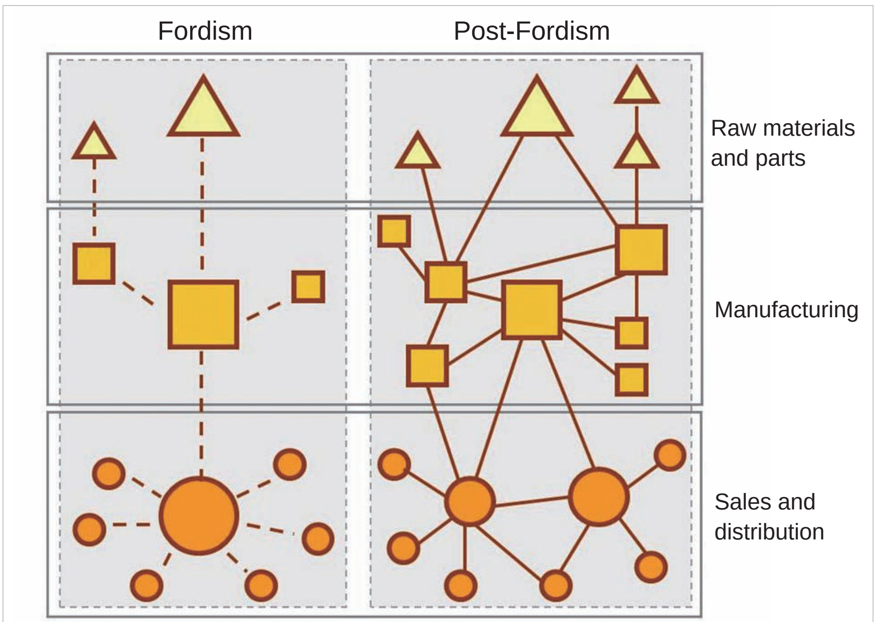
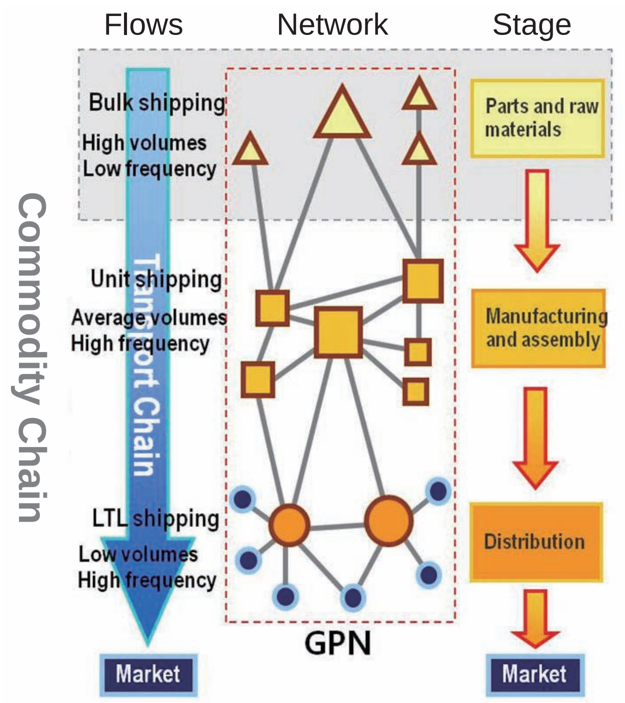


Figure 4.5 New hub of dynamic Northeast Asia – pan-East Sea economic region



Source: Rodrigue J., P. Comtois C. and Slack B. (2006).

Figure 4.6 Change of the philosophical background of the manufacturing industries



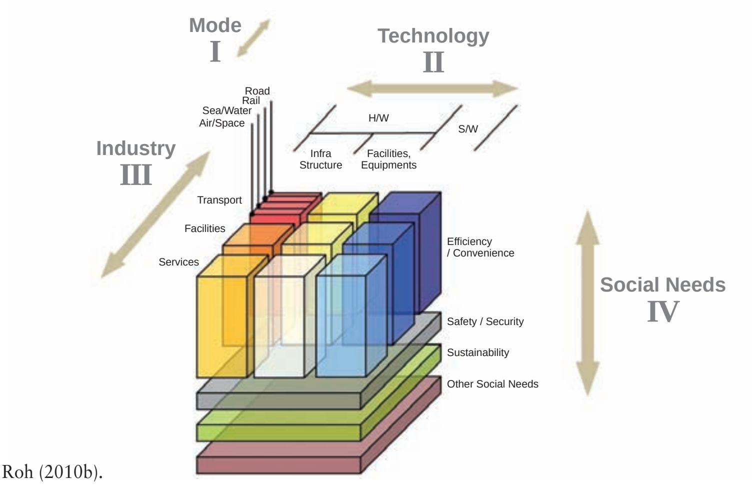
Source: Rodrigue J., P. Comtois C. and Slack B. (2006).

Figure 4.7. The philosophical background of the maritime industries relevant to the manufacturing industries

shipping, and less than truckload (LTL) shipping happening simultaneously (See Figure 4.7). Besides these, there is much more evidence to support the Pan-East Sea's possibility to be developed, such as the constant development of China's economy and the possibility of North and South Korea's unification.

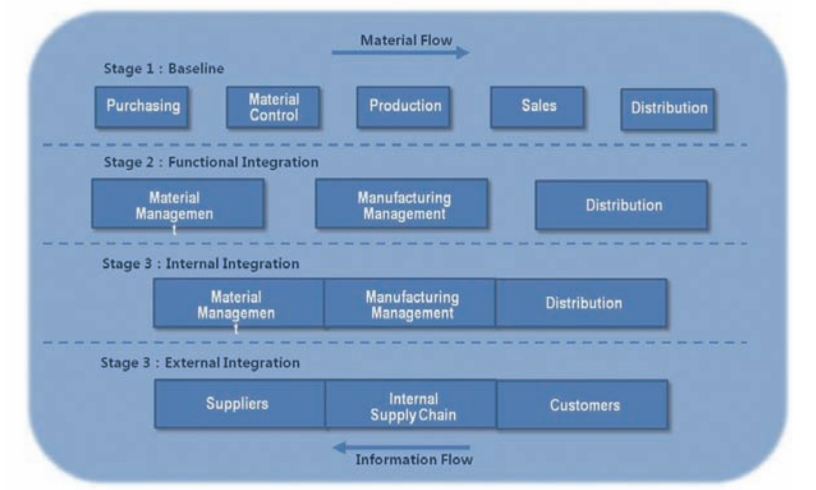
PARADIGM SHIFT OF THE TRANSPORT & LOGISTICS FIELD - INTERMODALISM

Nowadays one of the typical trends of transport and logistics is "intermodalism." Furthermore, the intermodalism paradigm has been making rapid progress. At the beginning, the concept was simply limited within the movement of containers. Current intermodalism is, however,



Source: Roh (2010b).

Figure 4.8 *Four phases of intermodalism from topological perspectives*



Source: Rodrigue J. P. Comtois C. and Slack B. (2006).

Figure 4.9 *Integration process of supply chain management*

developing and the concept has expanded from transport mode integration to seamless systems (See Phase I in Figure 4.8), and each mode within that system is used for the purposes for which it is best suited.

Similar to any industries, transport and logistics industries are also facing a convergence era. A transport company is trying to merge with a facility operating company and with a service providing company (See Phase II in Figure 4.8 and Figure 4.9).

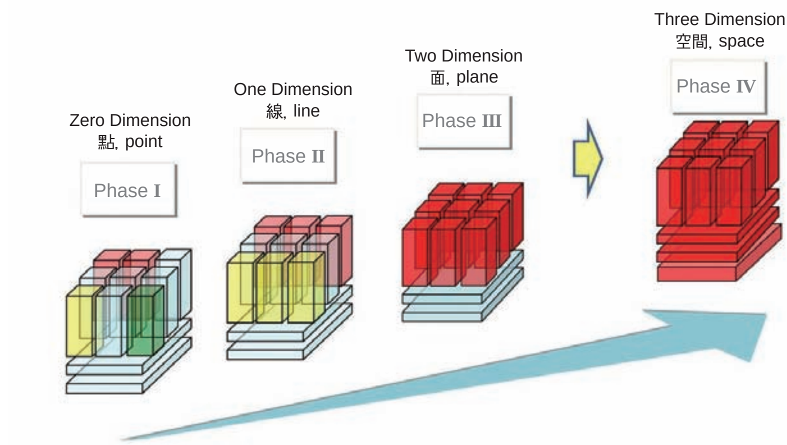
There are two kinds of integration in the industry. One is horizontal integration, the process in which several steps in the production and/or distribution of a product or service are controlled by a single company or entity, in order to increase that company's or entity's power in the marketplace. The other is vertical integration, where usually each member of the supply chain produces a different product or (market-specific) service, and the products combine to satisfy a common need. It contrasts with horizontal integration. Vertical integration is one method of avoiding the hold-up problem. A monopoly produced through vertical integration is called a vertical monopoly, although it might be more appropriate to speak of this as some form of cartel.

Depending on technology developments, various technologies are integrated and products, in which several devices have been amalgamated, contribute to the development of intermodalism (See Phase III in Figure 4.8).

These days, so many assignments have accumulated around the transport and logistics field that we need to consider. For example, minimization of the environmental impact and the use of energy, the maximization of efficiency, the promotion of safety and security, offering more choices for personal and freight mobility and promoting sustainable development. The integration of these social needs is the reason for the intermodalism (See Phase IV in Figure 4.8).

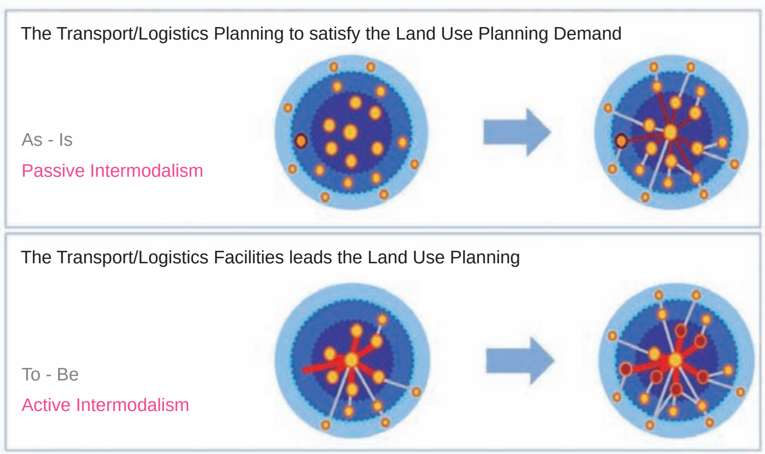
Figure 4.10 shows the conceptual development progress of intermodalism, of which the development procedure could be divided into four phases from topological perspectives, as proposed by Roh (2010). According to Roh's topological perspectives, in Phase I, integration activities are seldom and they are restricted within the sector like a point shape. However, if the integration activities expand to all of the industry, the integrated industrial activities form a line – called one dimension – in Phase II. If the integrated industrial activities then meet technologies, they form a plane – called two dimensions – in Phase III. Finally, several social needs reflected to the integration activities then form a space – called three dimensions – in Phase IV. According to the evolution of the dimension of the concept, the level of the intermodalism can also be developed.

As seen in Figure 4.11, in the passive intermodalism perspective, constructing the transport and logistics infrastructure by following the land use plan is general.



Source: Roh (2010b).

Figure 4.10 *Conceptual development progress of intermodalism*



Source: Roh (2010b).

Figure 4.11 *Passive intermodalism vs. Active intermodalism*

However, there are times when the intermodalism development has to follow the huge transport and logistics infrastructure development (the active intermodalism in Figure 4.11).

Good examples are when new towns are constructed around new highways or new high-speed train stations.

By the same token, we can estimate that new land use demands will be generated, since we can understand the NSR's opening as a kind of a huge supply of infrastructure.

As mentioned before, when an infrastructure supply leads the demands, the demands have a tendency to be broken suddenly depending on the intermodalism development process. In other words, connection of the transport modes, industrial integration and various social needs can happen at once in the region. Meanwhile, to have the intermodalism development process accomplished smoothly and systematically, it is important to attend sophistical land use plans and industrial plans based on intermodalism.

SUGGESTIONS FOR THE MAXIMIZATION OF THE NSR'S EFFECTS

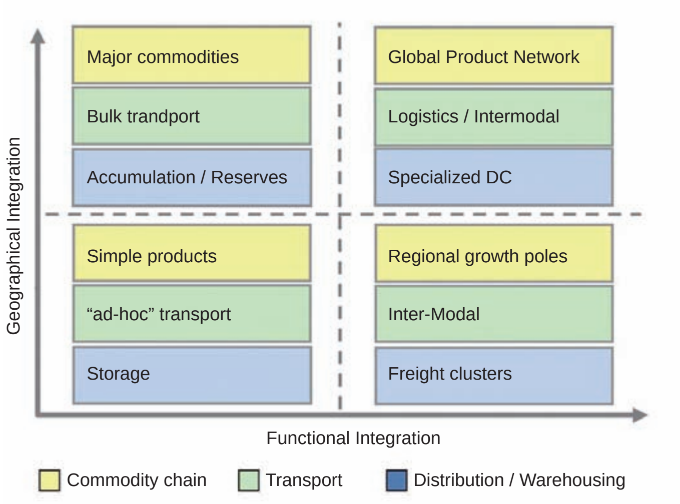
Depending on the intermodalism development, geographical integration of the port networks and functional integration of the logistics activities in the region has been accelerated and will be continued (See Figure 4.12).

Ultimately, the GPN cannot avoid using such shipping as bulk shipping, unit shipping and LTL shipping, and it should be connected to inland transport using advanced intermodal transport systems. For better connectivity, therefore, a specialized distribution center should also be constructed around a port area. At this point, you must understand that it does not simply mean cargo handling areas connecting sea and land transport.

The Port Working Group in the Commission of the European Communities (1975) recognized a port as the reception of ships, their loading and unloading, the storage of goods, the receipt and delivery of these goods by inland transport, and the activities of businesses linked to sea transport.

Frankel (1987) stated that a port is "a connection point or joining area between ocean traffic and land traffic," while Goss (1990a) defined a port as "a gateway through which goods and passengers are transferred between ships and the shore." Button (1993a) viewed a "seaport" as a self-contained, organized place where goods and passengers are exchanged between ships and the shore. However, from time to time, there is growing recognition that a port should be considered as a component or set of components of a broader technological system (Hayuth, 1993, in Haezendonck, 2001).

Nevertheless, the ports of developing countries in the Asia region



Source: Rodrigue J. P. Comtois C. and Slack B. (2006).

Figure 4.12 Geographical integration vs. Functional integration

have a slightly different development background and history from those in developed countries. Port development is strongly connected to their industrialization, and they are recognized as another source of economic benefits. Therefore, it is necessary to understand the ports in developing countries more broadly rather than merely by traditional concepts.

Yet, even this definition fails to successfully give a more comprehensive explanation as to what exactly is carried out by a modern port. A more comprehensive explanation was given by Lee (1998), who defined a port as “A common connecting area linking shipping and inland transport. It is also an economical base for development of the hinterland from logistics, production, living, information generating and international trade perspectives.” Lee (1998) also categorized ports into seven different types: commercial port, fishery port, industrial port, ferry port, refuge port, marina and naval harbor, depending on their usage.

Definitions of ports have continued to develop as transformations in the transport industry occur. According to the IAPH (1996), a seaport should offer a complex as its key function, such as a Distripark,[2] rather than solely a trans-shipment center. Notteboom (2000, in Van De Voorde et al., 2002) incorporated logistics into a new port definition:

> *"A seaport is a logistics and industrial center of outspokenly maritime nature that plays an active role in the global transport system and that is characterized by a spatial and functional clustering of activities that are directly and indirectly involved in 'seamless' transportation and information processes in production chains."*

Notteboom et al. (2001) also indicates that the gateway position of major seaports offers opportunities for the development of value-added logistics.

Robinson, R. (2002) recognized that a port is no longer simply a place for cargo exchange, but also an important functional element in dynamic logistics chains.

Ports are playing an ever more pivotal role in the development and operation of industrial supply chains. Nevertheless, port management has historically been reactive to legislative and customer pressures.

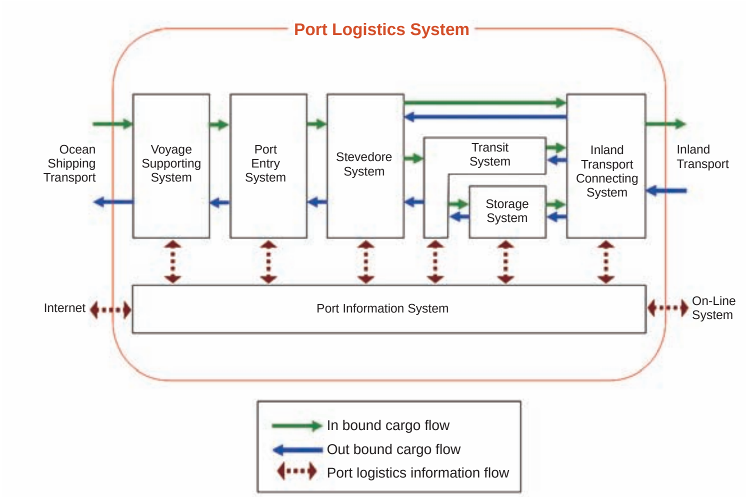
Such a reactive approach has resulted in the creation of ad hoc port-related companies, including government agencies. Thus, ports may be viewed as large-scale complex systems where there is a need to define a more holistic perspective of their design and operations. Even so, ports continue to be considered as a group of competing units.

Through the conceptual model, they issued a port as a simple nodal point for the cargo shipment progresses into a port of which hinterland function is highlighted, and again into a port that combines industrial clusters to generate its own cargo volume.

Even if we have an interest in what kind of related industries work at port clusters, then we can estimate what kind of industry might be induced in the new port and industrial cluster.

Conceptual models of port logistics systems were defined by Moon and Lee (1983) and Park (1997). However, these conceptual models contain a number of weaknesses. Firstly, voyage support cannot be found in either model. Also, it is inappropriate that both the ship and the berth should be considered part of the stevedore system, as they have altogether different functions. Further, the models only include cargo shared at the port, excluding transshipment from sea to land transport. Finally, neither model takes cargo flows into account, but only the relationship between each subsystem.

Therefore Roh (2006) suggested a new port logistics system model, as shown in Figure 4.13. Roh's model consists of seven subsystems: Voyage



Source: Roh (2006).

Figure 4.13 *Conceptual model of a port logistics system*

Supporting System, Port Entry System, Stevedoring System, Transit System, Storage System, Inland Transport Connection System and Port Information System. In this study, the Urban System included in the port logistics system was removed since it is beyond the scope of this research.

This conceptual model has six distinctive characteristics compared to the prior research: This model includes not only the relationship between each subsystem, but also cargo flows, divided into inbound (import) and outbound (export) movements.

The seven subsystems are related to several industries that work for each subsystem and relevant industries, as below.

In the conceptual model, the relevant industries that belong to each subsystem stand for the possible activities of the port cluster.

Voyage Supporting System-Relevant Industries

The role of the voyage supporting system among the seven subsystems is to support and supply goods or services to a ship regardless of port entry. This includes such activities as the supply of physical goods or services to a ship and the shipbuilding or repairing that belongs to the subsystem category. First, if we list the companies that support the voyage of the ship and are directly relevant to the port, it would include the Bunkering Service, Cargo

Lashing Service, Disinfection Service, Hold Cleaning Service, Logistics Equipment Repairer, Nautical Chart Distributor, Rubbish Disposal Service, Ship Chandler, Ship Repair Shop and Spare Parts Supply.

Second, the companies that support the voyage of the ship and are indirectly relevant to the port are: Chartering Agents, Logistics Equipment Lease/Hire, Logistics Equipment Manufacturing, Manning Service, P&I Club, Salvage Service, Seaman's Medical Service, Ship Broker, Ship Building, Ship Management, Shipping Agent and Shipping Insurance.

Third, the port users in the stage of the voyage support are Freight Forwarder, Ocean Shipping Company and Shipper.

Finally, the public institutions that are involved in port logistics activities and also directly or indirectly involved in voyage support are the Marine Police, the Maritime Safety Tribunal, and the Navy (See upper left of Figure 4.14).

Port Entry System-Relevant Industries

The role of the port entry system is to support safe and convenient port entry of a ship to the port. First, if we list the companies that support the port entry of the ship and are directly relevant to the port, they are Customs Clearance Service, Launch Boat Service, Line Handling Service, Pilot Service, Port and Waterway Management, Port Communication Service, Ship Security Service, Shipping Agent and Tug Boat Service.

Second, there are no companies that support port entry indirectly.

Third, the port users in the stage of the port entry are Freight Forwarder, Ocean Shipping Company and Shipper.

Finally, the public institutions involved in port logistics activities and either directly or indirectly involved to the port entry are the Customs Office, Harbor Fire Station, the Immigration Office, the Ministry Office, the Port Authority, the Port State Control Office (PSC), the Quarantine Office and the Vessels Traffic Station Office (VTS) (See upper center of Figure 4.14).

Stevedore System-Relevant Industries

The role of the stevedore system is to support safe and speedy cargo loading and discharging between a ship and the port. First, the companies that support the stevedore directly are the Harbor Labor Union, Measure

Service, Shipping Agent, Shipping Cargo Handling Service, Tally Service and Terminal Operating Company.

Second, the companies that support the stevedoring and are indirectly relevant to the port are Barge Service, Crane-Ship Service, Packing Service, Stevedoring Facility/Equipment Lease/Hire and Surveyor Service.

Third, the port users in the stage of the stevedoring are Freight Forwarder, Ocean Shipping Company and Shipper.

Finally, the public institutions that are involved in port logistics activities and directly or indirectly linked to stevedoring are the Customs Office and the Port Authority (See upper right of Figure 4.14).

Transit System Relevant Industries

The role of the transit system is to support safe and speedy transit between stevedore and storage (or inland transport). First, the companies that support the transit directly are the Harbor Labor Union, Shipping Agent and Shipping Cargo Handling Service.

Second, the companies that support the transit and are indirectly relevant to the port are Barge Service, Cargo Transportation Labor Union, Coastal Shipping, Pipe-Line, Railways Company and Truck Company.

Third, the port users in the transit stage are Freight Forwarder, Ocean Shipping Company and Shipper.

Finally, the public institution that is involved in port logistics activities and linked directly or indirectly to the transit is the Customs Office (See lower left of Figure 4.14).

Storage System-Relevant Industries

The role of the storage system is to support the safe storage of cargo until the shippers need them. First, the companies that directly support storage are Container Freight Service (CFS), Dangerous Articles Warehouse, Farm Warehouse, General Warehouse (including CY - Container Yard), Harbor Labor Union, Refrigeration /Freezing Warehouse, Shipping Agent, Shipping Cargo Handling Service, Tally Service, Tanker and other warehouses.

Second, the companies that support storage and are indirectly relevant to the port are Measure Service, Packing Service and Surveyor Service.

Third, the port users in the storage stage are Freight Forwarder, Ocean Shipping Company and Shipper.

Finally, the public institution that is involved to the port logistics activities and linked directly or indirectly involved to the storage is the Customs Office (See lower center of Figure 4.14).

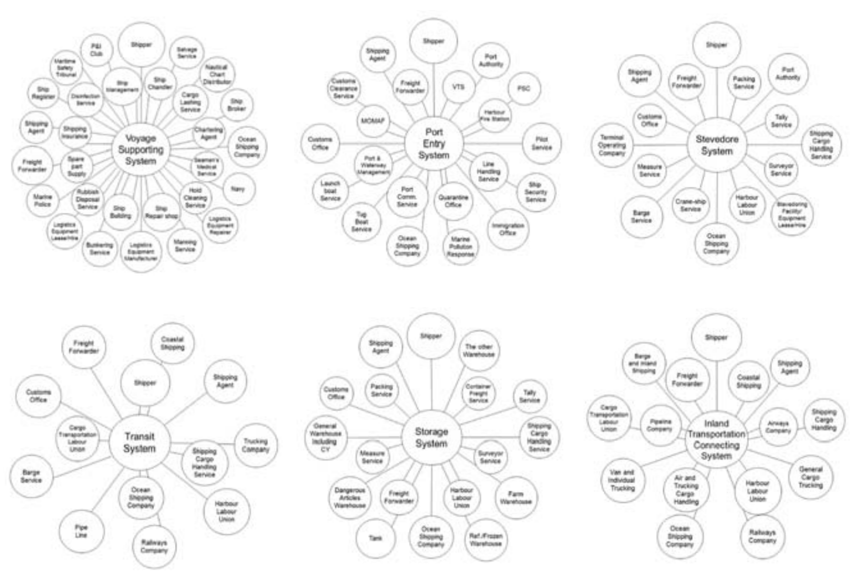
Inland Transport Connecting System-Relevant Industries

The role of the inland transport connecting system is to support safe and speedy connecting between stevedoring (and transit) and inland transportation. First, the companies that directly support the inland transport connection are the Harbor Labor Union, Shipping Agent and Shipping Cargo Handling Service.

Second, the companies that support the inland transport connection indirectly relevant to the port are Barge/Inland Shipping, Pipeline Company, Cargo Transportation Labor Union, Van and Individual Trucking, Air and Trucking Cargo Handling, Railways Company, General Cargo Trucking, Airways Company and Coastal Shipping.

Third, the port users in the inland transport connection stage are Freight Forwarder, Ocean Shipping Company, and Shipper.

Finally, no public institutions are involved in inland transport



Source: Roh (2007).

Figure 4.14 *Port cluster consists of port-relevant industries* connection activities (See lower right of Figure 4.14).

Port Information System

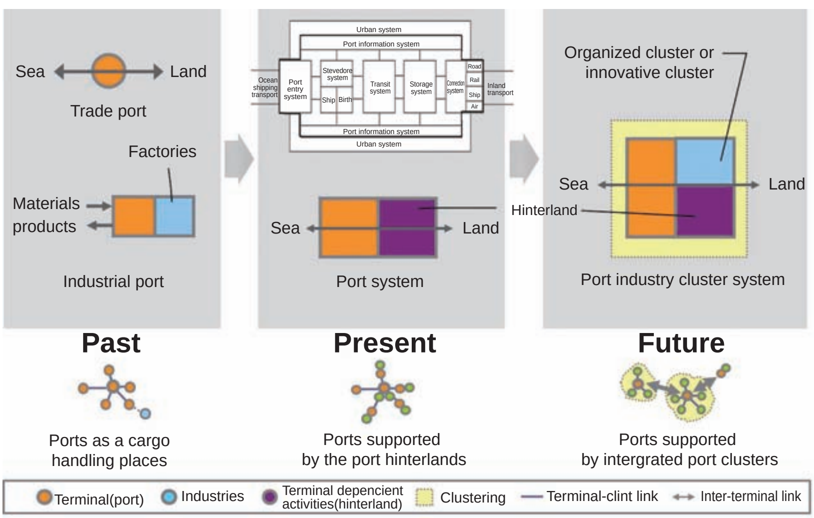
The role of the port information system is to supply correct and speedy information to the shipper and the relevant companies. First, no company directly supports port information.

Second, the companies that support port information and are indirectly relevant to the port are Port Logistics-Relevant Consulting Company, Port Logistics IT Company, e-Customs Company and Port-Relevant e-business Company.

Third, the port users connected to the port information system not only include Freight Forwarder, Ocean Shipping Company and Shipper, but also all the companies working in the port.

Finally, the public institutions that are involved in port logistics activities and directly or indirectly linked to the port information are port logistics-relevant universities and port logistics-relevant research institutes.

Park et al. (2007) said that it is not sufficient to generate added value by only constructing port logistics complexes in port hinterland areas.



Source: Park. H., Roh H. S., Kang S.G. (2007), "For the Cooperation System between Port of Incheon and Pyeongtaek," *Journal of Korean Management Consulting Review*, vol. 7 No. 3, pp.27-36.

Figure 4.15 Evolution of ports and port hinterlands

They said that to secure the cargo volume of the port, not only are passive logistics complexes essential, but also aggressive industrial complexes in the port hinterlands.

They called this kind of complex a “Port & Industrial Cluster” (PIC) and also proposed a conceptual model for the evolution of ports and port hinterlands, combined with Michael Porter’s “Cluster Theory” and the port development process (See Figure 4.15).

Regarding the PIC, this study gives suggestions, as below:

As for strategies from a facilities and networks perspective, co-investment and cross investment in PICs for multimodal transport in North East Asia (NEA) is important. Of course, increasing the utilization of PICs (seaport or airport) and promoting pan-East Sea multimodal transport networks are also crucial. However, it is necessary that gradual developments have to be commensurate with industrial and transport development tempos rather than rapid development. The participation of the DPRK also has to be considered for the future. We also have to do our best to cooperatively establish a logistics information database within the countries.

Applying a new technology for intermodal transport is not to be ignored. Co-marketing and co-works among those near the port (seaport or airport) are necessary to increase intermodal transport demand (Roh called this the “united port system”).

The standardization of logistics facilities, equipment, containers and an institutional system (e.g. custom office) in the PIC also has to precede this.

Above all, diplomatic cooperation for the NSR by international organizations to discuss passing dues, shipping insurance, jurisdiction problems and so on must precede it.

CONCLUSION

As the possibility of the NSR has recently increased, the importance of the pan-East Sea economic region has been receiving new attention.

As with the shipping network on the Mediterranean Sea, which led the Renaissance in Europe, the pan-East Sea economic region’s meaning is hoped to be reinterpreted as the East Asia Mediterranean. This is because the possibility that the region could be a new center has also grown, since the feasibility of the NSR’s commercial use has increased.

One of the important recent trends in the transport and logistics field is the development of intermodalism. Consequently, a regional development strategy using the full scale of the NSR effect should be found from an intermodalism perspective.

From the intermodalism point of view, passive transport and logistics functions just connect each developed area, whereas active transport and logistics functions lead to the development of the new area.

The reason why intermodalism has to be quoted at this point is that passive transport and logistics functions are changing to active ones as time passes. If a stupendous revolution like the Suez Canal, Panama Canal, or the NSR happens, it will accelerate this transition.

This study proposed a strategy to maximize the NSR effect by the development of Port & Industrial Clusters, which could increase the added value of the port region.

Of course, the melting of icebergs is not good news for the residents of Earth. First we should try our best in various ways to prevent or to delay ice melting at the North Pole. However, it is not necessary to leave the new open passage if it occurs naturally. From that perspective, it is necessary to start to consider how to apply the naturally open new passage of the NSR and how to maximize the effect as a new opportunity from now on.

Notes

1. Intermodalism: a system whereby standard-sized cargo containers can be moved seamlessly between different "modes" of transport, typically specially adapted ships known as containerships, barges, trucks and trains.
2. A Distripark is a term now used to indicate an integrated center that offers numerous facilities and services to companies operating in the field of distribution.

References

Assen, M. F. 2000. "Agile Based Competence Management: the Relation between Agile Manufacturing and Time-based Competence Management." *International Journal of Agile Management Systems* 2(2): 145-155.

Bititci, U. S., Turner, T. J. and Ball, P. D. 1999. "The Viable Business Structure for Managing Agility." *International Journal of Agile Management Systems* 1(3): 190-199.

Brooks, Mary R. 2001. *Sea Change in Liner Shipping: Regulation and Managerial Decision-making in a Global Industry*. Amsterdam: Pergamon Press.

Cullinane, K., Song, D. and Gray, R. 2002. "A Stochastic Frontier Model of the Efficiency of Major Container Terminals in Asia: Assessing the Influence of Administrative and Ownership Structures." *Transport Research Part A* 36(8): 743-762.

De Langen, P. W. 2002. "Clustering and Performance: the Case of Maritime Clustering in Netherlands." *Maritime Policy and Management* 29(3): 209-221.

De Langen, P. W. 2004. *The Performance of Seaport Clusters: a Framework to Analyze Cluster Performance and an Application to the Seaport Clusters in Durban, Rotterdam and the Lower Mississippi*. Rotterdam, Netherlands: Erasmus University

Fujita, M. A. 1999. *The Spatial Economy*. Boston, MA: MIT Press.

Goss, R. O. 1990. "Economic Policies and Seaports: The Economic Functions of Seaports." *Maritime Policy and Management* 17(3): 207-219.

Haezendonck, E. 2001. *Essays on Strategy Analysis for Seaports*. Garant, Leuven: Belgium.

Hayuth, Y. 1982. "Intermodal Transportation and the Hinterland Concept." *Tijdschrift voor Economische en Social Geografie* Vol. 73: 13-21 in Haezemdonck, E. 2001. *Essays on Strategy Analysis for Seaports*. Garant, Leuven: Belgium.

IAPH. 1996. *The Future Role of Ports in Combined Transport and Distribution Centers*. Combined Transport and Distribution Committee. Tokyo.

Krugman, P. 1995. *Development, Geography and Economic Theory*. Cambridge, Massachusetts: MIT Press.

Moon S. H. and Lee, C. Y. 1983. "Analysis of port logistics systems." *Korean Navigation Research Association Journal* 7(1).

Lee, K. R. 2001. "Analysis on the Knowledge Clusters of Korea for Policy Design to Activate Regional Innovation." *Policy Study* 2001-08. Science & Technology Policy Institute (STEPI). Seoul, Korea.

McConville, J. 2001. *Economics of Maritime Transport: Theory and practice*. The Institute of Chartered Shipbrokers, Witherby & Co Ltd, London.

Notteboom, T. E., Winkelmans, W. 2001. "Structural Changes in Logistics: How Will Port Authorities Face the Challenge?" *Maritime Policy and Management* 28(1).

Park. H., Roh H. S., Kang S.G. 2007. "For the Cooperation System between Port of Incheon and Pyeongtaek." *Journal of Korean Management Consulting Review* 7(3): 27-36.

Park, C. H. 1997. "A Task to Encourage of Port Competitiveness." *Survey Research Report, Industrial Policy* 97-3. FKI (The Federation of the Korean Industries).

Rodrigue J. P. Comtois C. and Slack B. 2006. *The Geography of Transport Systems*. 2nd ed. London: Routledge.

Roh, H. S. 2000. *The Survey Report on Shipping and Port Logistics Companies in Busan*. Busan Metropolitan City Government. Busan, Korea.

Roh, H. S. et al. 2001. "Creating Added Value for the Shipping and Port Logistics Industry in Busan by the Establishment of e-Logistics Infrastructure." International Conference on Port and Maritime R & D and Technology. Singapore.

Roh, H. S. 2004. "A Conceptual Model of the Port Cluster and Related Assemblage." *2004 IAME Annual Conference Proceedings*. Izmir, Turkey.

Roh, H. S. 2007. *Port Cluster Systems Supporting Port Logistics Process*. Jongkum, Seoul: Korea.

Roh, H. S., C. S. Lalwani & M. M. Naim. 2007. "Modelling a Port Logistics Process Using the Structured Analysis and Design Technique (SADT)." *International Journal of Logistics: Research & Applications* 10(3): 283-302, September, London.

Roh, H. S. 2007a. "Modeling a Port Logistics Process using the Structured Analysis and Design Technique (SADT)." *International Journal of Logistics: Research & Applications* 10(3, September): 283-302.

Roh, H. S. 2007b. "New Logistics Networks around the East Sea for Passing the Crisis of Busan Port." Korea International Freight Forwarders Association International Logistics Forum in Korea Logistics Fair 2007. Busan, Korea

Roh H. S. 2010a. "A Regional Strategy for North East Asia, Preparing for the North Pole Route." The Symposium Celebrating The 20th Anniversary of Diplomatic Relations between the Republic of Korea and Russian Federation. Vladivostok, Russia.

Roh H. S. 2010b. "Intermodalism and Beyond - Toward Barrier-Free Transport & Logistics." The 3rd International Conference on Transportation and Logistics. T-LOG 2010.

Tenold, S. 2000. Changes in the Distribution of the World Fleet 1970-1987. *SNF Report 68/00*. NHH, Bergen.

Tongzon, J. L. 1995a. "Systematizing International Benchmarking for Ports." *Maritime Policy and Management* 22(2): 171-177.

Commentary

Bin Yang

COMMENTARY ON PAPERS IN PART II

Thanks to Dr. Lee and Dr. Roh for their hard work and wonderful speeches. In Dr. Lee's paper, "Benefits of the Northern Sea Route to the North Pacific," the possibility of opening the Northern Sea Route (NSR) and the shipping distance and time saved by the NSR are evaluated first, and then container traffic between related countries is forecasted. The author also compares costs between the NSR and Suez route of charter, fuel, ship operation, ice-breaking fees and the Suez Canal toll. In addition, by making a cost comparison of resources shipping between existing sea routes and the NSR, it is found that using the NSR will bring Korea great economic benefits and will promote international trade. Finally, further study and discussion is proposed.

In Dr. Roh's paper, "Strategy for Maximization of the Northern Sea Route Effects by Formulating Regional Port-Industry Clusters," effects of opening the NSR are predicted from another viewpoint. Firstly, use of the NSR for commercial purposes is believed to be possible within five to 10 years, and the feasibility of its commercial use is illustrated. It is believed that the NSR will become another strategic route after the Suez and Panama, and the regional shipping network of East Asia will change with the opening of the NSR and thus may contribute to redefining the layout of the pan-East Sea economic region. China, Russia, Korea and Japan will be stakeholders in this region. Meanwhile, the change of the shipping routes will lead to the emergence of new port and industry clusters, which will greatly change the regional economic layout. Likewise, the layout of the world economy and ocean transportation will be changed along with opening of the NSR, which will further enhance the strategic position of the Arctic area. The strategic importance of middle earth will be reduced, but that of the Arctic area will be strengthened, and thus the center of the world will shift to the north. Finally, some regional strategy for maximizing the effects of the NSR from a multimodal transport perspective is proposed.

Opening of the NSR will undoubtedly have an important impact on the world economy. I would like to introduce its effects on the economy of China and then discuss the possible strategies we may take.

OPENING THE NSR IS OF GREAT SIGNIFICANCE TO THE DEVELOPMENT OF THE CHINESE ECONOMY

The NSR connects East Asia, North America and Western Europe. It is reported that the NSR may shorten the distance from north Europe to Northeast Asia or the northwest zones of North America by about 40% compared to the Panama and Suez canals, if ships depart from any port north of 30 degrees north latitude. As we all know, most of the developed countries, which contribute 80% of the industrial products and 70% of international trade to the world, are in just this area.

Since China is an important part of the world trade, the opening of the NSR will significantly affect the development of the Chinese economy.

Changing the Layout of the Chinese Sea Route

At present, over 90% of China's international transportation is via eight main sea routes: China-Red Sea, China-East Africa, China-West Africa, China-Mediterranean Sea, China-West Europe, China-North Europe and Baltic Sea, China-North America and China-Middle & South Africa. Among these routes, China-North America and China-West Europe, the two most important ones, go through the Panama Canal and the Suez Canal, respectively. The opening of the NSR gives a new choice to China.

Developing New Resource Sources and Optimizing Resource Shipping Routes

China's oil imports are mainly from the Middle East, Africa, Russia and South America. The Arctic is known as "the second Middle East" for its rich oil and gas resources, and is much closer to China compared to the Middle East, Africa and South America. Therefore, the opening of the NSR will change China's resource import routes and reduce its over dependence on the Malacca Strait and the Suez and Panama canals.

Creating New Value for the Shipping Industry

The NSR may bring great value to China's international trade by reducing the east-west shipping cost. At present, the shipping cost is influenced by such factors as fuel, human resources, insurance, ship depreciation, compensation, ship operation and additional fees depending on specific routes. It is reported that the cost of the NSR is 11.6% to 27.7% lower than that of traditional ocean routes. Generally, shipping fees account for about 10% of the total international trade in China, and it is predicted that the total shipping fees of traditional routes will be USD 460 billion in 2020. With the opening of the NSR, China may save USD 53.3 billion to USD 127.4 billion.

Affecting the Layout of China's Coastal Economy

The opening of the NSR will definitely promote the development of the economy. New cities, new ports and port-centered industrial clusters such as shipping, shipbuilding, port construction, warehousing & transport service, marine information service and other related industries may emerge along the route. The NSR will significantly affect the layout of China's coastal economy, including large-scale manufacturing industries, especially for the northern cities.

CHINA'S STRATEGIES FOR USING THE NSR

The NSR is not only a great opportunity but also a great challenge for China. China is beginning to study strategies for using the NSR.

1) Strengthening research of hydrology, meteorology, and sea ice of the NSR. China has begun to establish long-term meteorological and oceanographic observation stations in important straits and areas along the NSR and to take advantage of real-time remote sensing photos for comparative analysis. The study of sea ice change on the NSR may provide technical support to shipping vessels in the future.
2) Increasing investment in building special ice-breaking vessels and anti-ice cargo ships. To solve the issue of sea ice in the NSR, China is increasing investment to build ice-breaking vessels.
3) Encouraging shipping experiments with anti-ice cargo ships. China is taking actions to encourage shipping enterprises to dispatch anti-ice cargo ships to navigate in the NSR in the summer.
4) Taking the effects of the NSR into consideration when establishing

a coastal economic plan. China relates the NSR incentive with long-term shipping, ports and logistics strategies, and also regards the NSR as a positive factor for the northeast industrial base.

5) Promoting cooperation with relevant nations and international organizations. China is enhancing cooperation with the IMO and relevant countries in aspects of infrastructure construction, and so on.
6) Strengthening strategic research on an Arctic shipping center and improving China's layout of shipping centers.

POSSIBLE ISSUES

There still exist many problems that should be addressed and studied for the NSR.

Lack of Comprehensive Shipping Management System

The NSR is a difficult but emerging sea route with a marine environment that is challenging to predict, extreme weather and complex sea ice conditions. A shipping management system with functions of weather and sea information collection, waterway status report, port construction cooperation, land-based support, environmental protection, etc., is needed to support the shipping operation.

Lack of Proper Ships

Due to the low temperatures, complex sea ice conditions, and storms in the Arctic area, general cargo ships are not suitable for navigation in the NSR. So we need to develop proper ships.

Lack of Unified Politics, Policies and Laws

The NSR goes through many countries, including Canada, Russia and others. Because of the environmental protection threshold set by corresponding countries, use of the NSR needs multilateral and diplomatic cooperation among many countries. An international cooperation framework is needed.

Lack of a Reasonable, Scientific System to Evaluate the Economic Benefits of the NSR

When evaluating the economic benefits of the NSR, not only should the distance and time saved be considered, but also some other costs, such as channel tolls, ship maintenance, rent of ice-breaking vessels, insurance for environmental pollution and so on. A scientific and reasonable evaluation system should be established for shipping companies' reference.

Lack of Comprehensive Information Database for the NSR

The NSR is related to the world's warming climate. Although many countries have investigated the NSR, information is limited. If an international cooperation framework is set up, a comprehensive information database on the NSR will be possible, and will benefit Arctic and non-Arctic countries with interests in the region.

Lack of Understanding of Environmental Pollution of the NSR

The northern polar region has potential wealth for the whole world. When the NSR is opened, this area has the potential of being polluted by maritime operations. Scientific and reasonable evaluation of the pollution will be helpful for us to make corresponding laws and regulations.

CONCLUDING REMARKS

As a representative of the Logistics Research Center, Shanghai Maritime University, it's my honor to make comments on Dr. Lee's and Dr. Roh's speeches at this conference. I am very grateful to the organizers: EWC, KMI and KOTI. Through this conference platform, representatives from different countries may exchange ideas and have a better understanding of the NSR from economic, trade, and political standpoints.

The Logistics Research Center of Shanghai Maritime University specializes in shipping and logistics research, postgraduate and doctoral student education and cooperation with industries, government, universities and research institutes. Our team consists of about 150 researchers, doctoral and postgraduate students. Our Logistics Research Center emphasizes international cooperation. We would like to be your Chinese partner in international research projects.

References

Jiansong Zhang. The Arctic: Attracting International Attention. *Sinopec Report*. May 21, 2009.

Jing Li. Good News for Chinese Energy: The Arctic Golden Waterway Open to China. http://news.xinhuanet.com/mil/2010-09/14/content_14175308.htm

Xia Zhang. Estimation of Arctic Sea Routes and Its Strategic Significance for the Development of the Chinese Economy. *China Soft Science*. 2009:88-90

Chunlin Shi. Effects and Strategies of China on Opening of the NSR, *Exploration of Economic Problems* No. 8. 2010.

Commentary

Hiroyuki Goda

INTRODUCTION

We, Japanese shipping companies, have a strong interest in the Northern Sea Route (NSR) and the development of resources in the Arctic zone. For example:

1) Kawasaki Kisen Kaisha Ltd. (K Line) has already chartered out to two LNG carriers to Statoil for the Snohvit LNG project on the Barents Sea.
2) An ice-class handy bulker, the M/V "Sanko Odyssey" of Sanko Steamship, which is under time charter out to Nordic Bulk CarriersA/S,[1] a Danish charterer, will pass through the NSR this autumn.

N.Y.K. Line is also interested in the Arctic Ocean and the offshore development of resources. N.Y.K Subsidiaries has managed and operated one deep-sea drilling vessel and one oceanographic research vessel.[2] The drilling vessel is the "Chikyu," and the research vessel is the "Mirai." The Mirai was the former nuclear ship "Mutsu," whose reactor was removed in 1995. The Mirai has visited and done research in the Arctic Ocean several times.

I would like to comment on seven points for Dr. Sung-Woo Lee's report, and on point for Dr. Hong-Seung Roh's report. Each detail is described as follows.

LOGISTICS CONTROL

At present, cargo vessels can sail in the Arctic Ocean without the support of an icebreaker only during some parts of the summer and in some parts of the NSR. However, it is very difficult to predict with adequate confidence when (what month, what day of the month) summer starts in the Arctic. Therefore, Japanese shippers that might wish to use the NSR, for example auto manufacturers, will have a difficult time to predictably supply key parts to overseas assembly plants. It is not suitable to transport some types of cargo by way of the Arctic Ocean. These are the key components of their products, which are under complex logistics control, based on the long production plan of the manufacturer: for example, auto parts and tires, which have about a 5% share of the east-bound Asian-European container trade.

EXTREMELY LOW TEMPERATURES

It is not suitable to transport precision instruments and precision machinery via the NSR. Precision instruments have about a 5% share of the eastbound Asia–Europe container trade.

Some sophisticated precision instruments will break in the extremely low-temperature environment.[3] A certain Japanese shipper has also suffered cases of cargo damage during transition by the Trans-Siberian Railway. The Monohakobi Technology Institute (M.T.I.), which is a 100% subsidiary think-tank for logistics technology, confirmed the possibility of cargo damage in such a severe environment by research.

ASSUMPTION OF CALCULATIONS

Dr. Lee assumed heavy fuel (380 cst) would be used on the NSR, according to page 20 of his PowerPoint sheet. We think that shipping lines will be required to use marine gas oil in order to avoid exhaust sulfur emissions in the Arctic Ocean in the near future, because we think that the Arctic Ocean will become a Special Emissions Control Area (SECA) of the IMO treaty. That is to say, "Marpol 73/78 Annex IV" will be amended.

And we should pay attention to the coming new regulations for navigation on the seaways of the NSR that the Russian government has delayed in releasing. The fees for icebreaking service and for pilotage may be changed according to the new regulation. Anyway, we do not know the actual future operation costs.

SHALE GAS REVOLUTION

On the Barents Sea, some commercial gas production projects have already started.

At present, the shale gas revolution is on the move, above all, in the United States.[4] We expect exports of shale gas LNG from Australia, the Canadian Pacific Coast, and the U.S. Gulf rather than traditional exports of LNG from the Arctic zone. We also expect the price of shale LNG will be more competitive than the price of the traditional LNG. Therefore, we doubt whether we can expect an increase of LNG exports from the Arctic area.

COMPETITION BETWEEN ALL-WATER ROUTE AND INTERMODAL TRANSPORTATION

Intermodal transportation has been commercially established in both the Asia-U.S. East Coast container trade and the Asia-Europe container trade. Generally speaking, the lead times of intermodal transportation are shorter than those of all-water routes.

On one hand, shippers have already elected to use the transcontinental railway to reduce GHG emissions on the Asia-Europe route, because the Trans-Siberian Railway (TSR) has already been electrified. But international container transportation on the TSR is not given first priority. On the other hand, transcontinental railways in North America have not been electrified yet, although the container traffic volume is much larger than on the TSR.

I think we should keep in mind the possibility of electrifying transcontinental railways in North America and enhancing the capacity of the TSR.

OIL POLLUTION RISKS

Mega-containerships usually carry about 5,000 metric tons of heavy fuel oil. If a vessel's fuel oil tank should collide with an iceberg, fuel oil may spill into the sea. We think the risk of oil pollution liability in the Arctic Sea will be enormous.[5] We have little knowledge of how to skim spilled oil off an icy sea, and we do not understand the ecosystem in the Arctic area fully yet. The Arctic is one of the human heritages.

NUCLEAR CONTAINERSHIPS

If we can use nuclear ships that have an icebreaking capability, we would not need support from Russian icebreakers. Such a nuclear ship could navigate with adequate speed without CO_2 emissions. Although there was minor leakage of radiation from the Mutsuin September 1971 due to a small design error in its shield rings, the technology of nuclear ships has been established.[6]

According to a study by Professor Tetsuo Yuhara of the University of Tokyo, and research adviser Dr. Toshihisa Ishida of the Japan Atomic Energy Agency (JAEA), if the price of crude oil exceeds USD 100 per barrel, nuclear containerships may become more economical than conventional ones, even taking into consideration the disposal cost of nuclear waste.[7]

Although Japanese shipping lines are not likely to design and build such an Arctic-capable nuclear ship, as such is not societally acceptable in Japan,[8] Japanese shipping companies still have the opportunity to charter them from foreign shipping lines.

IDEAL JAPANESE GATEWAY PORT ON THE SEA OF JAPAN SIDE

Recently, most container ships that sail to North America from Asia do not call at Japanese ports because there is little cargo volume from Japan. Such containerships sail to North America via the "Sea of Japan."[9] Such operations are reasonable, taking into consideration the time value for Asian shippers. "Asian shippers" include Japanese affiliate companies in Asia.[10] Therefore, if Japan needs its own gateway port, I think there is good reason that such a port will be located on the Sea of Japan side in order to minimize total transit time from Asia to North America.[11]

On the one hand, cargo exported from Japan is the so-called key parts. They are produced at the Chukyo Industrial Zone, which is the largest industrial zone in Japan.[12] Its center is Nagoya.

Table C.1 Shipment of manufacturing industry in Japan 2010

Zone	Main City	Mill. Yen	Share
Keihin	Tokyo,Kawasaki,Yokohama	30,084,948	8.9%
Cyukyo	Nagoya	58,399,424	17.3%
Hanshin	Osaka,Kobe	34,997,948	10.4%
Kita-Kyushu	Kita-Kyushu,Fukuoka	8,651,422	2.6%
Keiyo	Chiba	15,508,036	4.6%
Tokai	Shizuoka,Hamamatsu	19,302,258	5.7%
Setouchi	Hiroshima,Okayama	26,286,195	7.8%
Reference			
Iwate, Miyagi, Fukushima (total)		12,115,060	3.6%
Above 3 prefectures suffered from Earthquake			
Japan Grand Total		337,863,997	100.0%

Sourse: METI, 2011, March, 1st. "Wagakuni no Kougyo" (in Japanese).
http://www.meti.go.jp/ststistics/tyo/kougyo/wagakuni/2011.html

On the other hand, the final destinations of most of the cargo imported by Japan are to three major metropolitan areas: Tokyo, Osaka, and Nagoya. Therefore, the ideal Japanese gateway port should be able to cover major metropolitan areas and major industrial zones, at least Nagoya.

Table C.2 Japanese population (2011, estimate)

Zone	Thousand	Share	Major Cities
Shutoken (Captial)	41,322	32.4%	Tokyo, Yokohama
Chukyo	11,380	8.9%	Nagoya
Kinki (Kansai)	18,405	14.4%	Osaka, Kobe, Kyoto
Japan Grand Total	127,510	100.0%	
Reference			
Iwate, Miyagi, Fukushima	5,716	4.5%	Sendai

Source: Statistic Bureau, Ministry for internal affairs and Communication.

Dr. Hong-Seung Roh explains that Niigata, Toyama, and Kanazawa are linked to Busan, which is a North-East Asian regional hub, in his paper. This is right at present, but we think Tsuruga (Fukui Prefecture) has the potential to become the gateway of Japan, and is located on the Sea of Japan side, even if the Arctic sea ice does not melt. It takes only two hours to go from Tsuruga to Nagoya and Osaka via expressway,[13] and Tsuruga is the nearest Japanese port to North Korea.

It is reasonable to develop the gateway port for Japan on the Sea of Japan side even if the NSR does not open in the near future.

CONCLUSION

Indeed, the NSR may open in the near future, but we do not think this route is more economical or useful at the present, because there are important environmental factors that we believe must be addressed, for example, the oil pollution risk and sulfur emissions reduction, both of which will increase operation costs.

We do not yet know the levels and details of new Russian navigation regulations regarding the use of seaways along the NSR. So, we cannot now estimate real future operational costs.

If we do introduce nuclear cargo vessels with ice-breaking capacity that can use the NSR, we see many hurdles to address.

It is reasonable to construct a gateway port for Japan on the Sea of Japan side even if the NSR does not open in the near future.

Notes

1. http://www.nordicbulkcarriers.com/images/Media/Filer/nsr2011_presslease.pdf
2. Of course, N.Y.K. has interest in offshore business not only on the Arctic Sea, but also in other waters (for example, off Brazil).
3. "Open water through the Pole – shipping across the top of the world," Fairplay, 2002. Jan. 24, p.19. Franklyn Griffiths,"New Illusions of a North Passage," (edited by Myron H. Nordquist et al. in "International Energy Policy, The Arctic and the Law of the Sea" (MartiusNijhoff Publishers (Leiden) 2005)).
4. Michiko Ichihara, "Shale Gas Revolution in North America," (presentation at JOGMEC briefing onApril16, 2009.) http://oilgas-info.jogmec.go.jp/pdf/2/2795/0904_b03_ichihara_shalegas.pdf in Japanese).
5. In general, the quantity of oil spills from normal ship operation in total is much larger than from accidents (for example, collisions with icebergs or another ship, going aground, etc.).
6. Some nations may think that the navigation of foreign nuclear ships in their territorial waters is not an innocent passage, but, at least, I think Russia and the U.S. will not think so, because they already operate nuclear ships and submarines.
7. Dr. Ishida e tal., "Feasibility of nuclear ships in anera whenthe oil price is USD 100 per Barrel" (in Japanese)- Proceedings of the annual meeting of the "Atomic Energy Society for Japan" 2008 (on Mar 26, 2008 at the University of Osaka). This feasibility study was carried out for Asia–North America container trade.

   The latest feasibility study for nuclear ships is by Shunichiro Namikawa (DNV) and Peter Nyegaard Hoffman (DNV): "Nuclear powered ships – Findings from Feasibility Study,"in the proceedings of the spring conference of the Japan Society of Naval Architects and Ocean Engineering, Organized Session 6, on May 19, 2011 in Fukuoka (http://www.dnv.jp/binaries/2011S-OS6-2_tcm164-460858.pdf).
8. http://www.toyokeizai.net/business/strategy/detail/AC/ec727a53d0969193e99a3859a78bf788/page/2/

   But if they construct nuclear ships with a Japanese flag in a Japanese shipyard, there are many hurdles to clear. For example, in the eyes of the law, Rinji Senpaku Kenzo Chosei Ho (Act on Temporary Adjustment Shipbuilding) Law No.149 of 1953, requests that the shipbuilder obtain permission to construct any ships in Japan from the minister of the MLIT. And Kaku Genryo Busshitsu, Kaku Nenryou Busshitsu, oyobi Genshiro no Kiseinikansuru Ho (The Nuclear Reactor Regulation Law) Law No.166 of 1957, requests that ship owners obtain permission to install a reactor after determination of the mother port. I think it will take a long time to obtain approval from local authorities, proposed for the mother port of nuclear ships.

But Japanese shipping companies have some options:

1. Charter nuclear ships (non-Japanese flag) constructed at anon-Japanese yard, from non-Japanese ship owners (including foreign subsidiaries of Japanese shipping lines.)

2. Install reactors made by foreign (for example Russian) engine manufacturers to ship hulls at yards outside Japan, and cascade cross trade.

9. Many Korean people call this sea the "East Sea." I think we should not think of this sea as Asian-Mediterranean, which Dr. Hong Seung Roh, of the Korea Transport Institute, has proposed.
10. Dr. Hiromichi Akimoto (anassociate professor at the University of Tokyo) made a presentation in the symposium "The tomorrow of East Asia Logistics" on July 8, 2011 at the University of Tokyo. (In Japanese)
11. Indeed, Kobe used to be a regional hub portinNorth-East Asia. Most Japanese believe the decline of Kobe was due to the earthquake in 1995. I disagree. I think the reason for the "dethroning" of Kobe was the transfer of Japanese manufacturers' plants to other Asian countries, that is to say, the shift of export cargo source. The year 1995 was the eve of the mainland Chinese take off. Although the Japanese central government and Kobe local authority tried to compete with Busan Port by way of fee reductions, all these attempts were in vain. It is not that ports invite vessels, but freights invite vessels.
12. Toyota Motor Corporation has 12 plants in the Chukyo Industrial Zone.
13. Tsuruga Port will be able to cover both Osaka and Nagoya. If Japan needs to have another gateway port for Tokyo on the side of the Sea of Japan, I think the candidate will be Niigata.

Commentary

Joshua Ho

A TAKE-OFF YEAR IN 2011?

The change in global climate patterns, hinting at a warming of global temperatures, is offering new opportunities for international transportation. The thawing of the ice in the Arctic region brings about a whole new aspect to commercial shipping. It is said that the use of these Arctic routes will shave a significant distance off the Far East to Europe trade route, by as much as 40 percent compared to transit via the Suez Canal. Some estimates have put the financial savings associated with using this shorter route at about USD 600,000 per vessel. In addition, these routes could provide a means to transport natural resources, such as oil and gas extracted from the Arctic.

There are three main Arctic routes, namely the Northern Sea Route (NSR), the Northwest Passage (NWP) and the Central Arctic Ocean Route. This commentary, however, will focus only on the NSR. The NSR is a shipping route between the Pacific and Atlantic oceans. It crosses the five Arctic seas: the Barents Sea, the Kara Sea, the Laptev Sea, the East Siberian Sea and the Chukuchi Sea, measuring a distance of 2,100 to 2,900 nautical miles along Russia's northern border from Murmansk to Profideniya. The NSR could be used as an alternative shipping route between the North Pacific, Northeast Asia and Northern Europe. The Central Arctic Ocean Route, also known as the transpolar route, is a shipping lane that cuts entirely across the North Pole from the Greenland Sea to the Chukuchi Sea.

The year 2009 was labeled as a test year for vessels sailing from Europe to Asia and vice versa via the NSR. The following year, 2010, was marked as a breakthrough year because so many different shipping interests were involved. Moreover, Russia and foreign shipping companies are coming to an agreement on using the NSR. As an example, during 2010, eight vessels of various specifications sailed through the NSR throughout the summer and autumn. Because of the increased activity in 2010, there is an expectation of an increase in voyages along the NSR in 2011. Rosatomflot (Главная–Атомфлот), the operator of Russia's nuclear-powered icebreakers, already has plans to escort up to 15 vessels of various types in 2011. Growing public interest in the NSR has paved the way for the northern sea ports to profile themselves as potential hubs for the future. Arrangements for Kirkenes in Norway, Murmansk in Russia and Petropavlovsk at Kamchatka in Russia's Far East to become hub ports for the NSR are already on the way. The growing interest has led some observers to regard 2011 as the take-off year for commercial shipping along the NSR.

If shipping along the NSR takes off, it may have an adverse impact on existing regional hub ports such as Singapore, which may no longer be a nexus of east-west shipping. Despite the threats that could be presented to a regional hub port such as Singapore, there are also opportunities that could be capitalized upon.

OPPORTUNITIES FOR NEW BUILDS

First, there are opportunities for new builds. With the opening of the Arctic routes and the Arctic in general for oil exploration, there would be an increasing need for new builds of offshore rigs, special-purpose offshore facilities and vessels that can withstand the cold and harsh Arctic environment. Shipbuilders that have already attained world-class standards are in a position to capitalize on this new market. Singapore shipbuilders such as Keppel Offshore and Marine Ltd (Keppel O&M) have already signed an agreement with LUKOIL to cooperate in new builds, and in 2009 delivered two ice breakers, two ice-class anchor handling tug supply vessels, two ice-class rescue vessels and an ice-class floating storage and offloading vessel that were built according to the standards and rules of the Russian Maritime Register of Shipping (RMRS). More shipbuilders can start to capitalize on this opportunity, as Russia has released plans to build a total of 40 ice-resistant oil platforms, 14 offshore gas terminals, 55 ice-resistant tankers and storage tankers and 20 gas carriers in the future.

OPPORTUNITIES FOR RESEARCH AND DEVELOPMENT IN SHIP TECHNOLOGY

Second, there are opportunities for research and development in ship technology. As the Arctic environment is relatively clean at the moment, it is very susceptible to marine pollution. In order to protect the marine environment, it is likely that stringent marine environmental regulations will be imposed on ships that transit the waterway. It is also possible that the Arctic Ocean will be designated a Special Emission Control Area (SECA) by the International Maritime Organization (IMO). The environmental regulations imposed will translate to the requirement for cleaner ships that have low carbon emissions and are more energy efficient. Some research and development that could be undertaken include improvements in hull design to reduce underwater resistance, special coatings to reduce fuel use, and the development of new ship engine technologies fueled by LNG and hydrogen. There is also a need for stronger and more powerful vessels to transit the Arctic as well as to extract natural resources that lie beneath the Arctic basin, which lends itself to further research and development. Examples of such ships would include double-acting ships where the vessel is able to use both her stern and bow interchangeably during navigation through different ice conditions. Another example would be the development of oblique icebreakers with azimuth propulsion that could rotate and break ice sideways.

OPPORTUNITIES FOR PORT DEVELOPMENT

Last, there are opportunities in port development. With the opening of the NSR there would be an increasing need for ports to service ships that ply the route. Currently, there are no well-furnished ports along the entire Siberian coast, as the current facilities are just berths for fishing vessels with no shore-based cranes, other infrastructure or anchorages. If Russia has plans to develop hub ports, then they would need to start planning now since the success of a container port depends on the supply and demand of the product, the number of calling ports along the way, port infrastructure, efficiency in handling containers and the logistics system in place. It might take another five to 10 years before a port can be operationalized. PSA International is one of the leading global port groups, with investments in 28 port projects in 16 countries across Asia, Europe and America. With its extensive experience in port development, PSA International is well placed to develop ports along the NSR in cooperation with a partner in Russia or to offer consultancy services in port development.

CAPITALIZING ON OPPORTUNITIES

The phenomenon of the opening up of the Arctic sea routes, in particular the NSR, could have an adverse impact on Singapore as a hub port. However, it also presents opportunities for new shipbuilding and research and development into ship technology, as well as opening up possible port development opportunities. Firms operating in these areas should quickly capitalize on the new opportunities that present themselves since the Arctic routes might open earlier than expected due to the current accelerated rates of warming.

Commentary

Adolf K.Y. Ng

INTRODUCTION

In recent decades, we have gradually witnessed a profound (perhaps also depressing) transformation in the Arctic region due to climate change, notably the accelerating melting of glaciers and sea ice, and technological innovation (such as nuclear-powered icebreakers), and thus its impacts on the global environment and indigenous population. Perhaps a silver lining for such transformation, however, is that it initiates the idea that some areas, such as the Arctic, which were initially covered by solid sea ice throughout the summer, would melt and, in turn, become realistically navigable. This would potentially trigger another wave of revolution in the general outlook of the global shipping industry due to the fact that major economic powerhouses (such as East Asia, Europe and North America) would become much more proximate to each other, at least in geographical terms, with ships navigating through the so-called Northern Sea Route (NSR), when compared to conventional transcontinental shipping routes, notably the Far East-Europe route via the Suez Canal and the trans-Pacific route (through inland connections via ports along the western coast) destined towards the eastern coast of North America.

Nevertheless, whether such an innovative idea is realistically feasible, or to what extent it is feasible under the current development trend, is still under intense debate and discussion. Simultaneously, one should not forget that the recent development of the Arctic would not only have economic, but also environmental, social and political impacts. So far, although some works on the topic have taken place, e.g. Xu et al. (2011), Lee (2011), Roh (2011), etc., they mainly focused on the economic cost-savings of using the NSR compared to existing global shipping networks, while other aspects related to the NSR are still rather scarce. The real potential of the NSR is still a mystery.

Recognizing such a deficiency, in August 2011, the *International Conference on Opening the NSR and Dynamic Changes in North Pacific Logistics and Resource Security* (hereafter called "the conference") organized by the East-West Center (EWC), Korean Maritime Institute (KMI) and the Korean Transport Institute (KOTI), took place in Honolulu in the United States. Its aim was to discuss and investigate the opportunities and challenges posed by recent developments in the Arctic region and the NSR, of which it focused on four themes: (i) the impact of climate change on Arctic ice melting, environmental fragility, Arctic marine shipping, and untapped natural resources; (ii) the North Pacific's economic benefits from opening the NSR and transformation of the regional port system; (iii) the strategic importance of Russian Arctic oil and gas to North Pacific energy security; and (iv) the promotion of North Pacific cooperation on the governance of Arctic maritime shipping and energy resource development (EWC, KMI and KOTI, 2011).

As an international scholar in transportation, logistics and supply chains, I was invited to this exciting conference as a lead discussant, and was thus offered the opportunity to share my personal views on this topic, especially theme (ii). Hence, based on the sessions and presentations of the conference, as well as my own research background and understanding on the topic,[1] the objective of this article is to provide some constructive views and comments on the opening of the NSR as an alternative to the conventional transcontinental shipping routes. In this article, I focus on the opportunities and challenges of the opening of the NSR and intensified shipping activities within the Arctic region. I will focus on three main aspects: (i) physical, economic and geopolitical restrictions; (ii) environmental concerns; and (iii) equality and regional development. In the concluding remarks, I also provide some constructive suggestions for this increasingly important issue, and call for the establishment of a "sustainable NSR" as the way forward for further development and research. I wish that my inputs can provide useful insight, and a decent platform, for further research on this important, but also exciting, topic that would pose a substantial impact on future well-being in this globalizing world.

PHYSICAL, ECONOMIC AND GEOPOLITICAL RESTRICTIONS

Although there are few doubts that substantial cost savings can be potentially achieved by using the NSR, as indicated in the two papers presented during Session II of the conference (cf. Lee, 2011; Roh, 2011), it seems that the opening of the NSR is likely to be a gradual process. In the foreseeable future, say, one to two decades, the NSR is still unlikely to be fully navigable 12 months per year. At the same time, it is likely to be a route with no shortage of chokepoints, e.g., the Bering Strait, Russia's northern coastline, etc., especially given that many of the navigable routes are located, at least in the short and medium terms, along the coastal areas rather than the open sea. Also, there are other risks (and thus extra costs) that can compromise the economic benefits of the NSR, for instance, icebergs leading to higher hazard levels (which may significantly boost marine insurance premiums), the need to reduce vessel speed, the inability of deploying mega-sized containerships, and the reduction in service frequency and reliability, to name but a few.

Of course, apart from physical constraints, we need to recognize the fact that substantial geopolitical issues within the Arctic region have yet to be fully resolved. Russia and Canada persistently have diversified opinions with other states that are interested in the Arctic region, notably the United States, on whether ships sailing across the NSR are crossing international or internal waters (so-called "innocent passages"), given that the most navigable channels are likely to be located along the coastal areas rather than the open sea, as stated earlier. Although such issues of sovereignty and legality are sometimes temporarily shelved by practical needs (and means), given the expected increasingly strategic importance of these channels in the foreseeable future, in my opinion, more efforts are required to resolve these potential conflicts more comprehensively. Indeed, before such geopolitical issues can be fully resolved, and together with the physical constraints as stated earlier, it seems certain that the economic potentials of the NSR as a realistic alternative will not be fully achieved at least until another two to three decades. With such an understanding, a step-by-step approach in the planning of the NSR seems necessary.

ENVIRONMENTAL CONCERNS

Apart from economic benefits, we should pay attention to the potential environmental impacts of the use of the NSR on the Arctic and surrounding region. As highlighted by Byers (2011) during the conference, intensified shipping activities can further accelerate the already rapid melting of ice within the region. In turn, this would disrupt the Arctic Ocean's maritime climate and affect the navigation condition of the NSR. His view is supported by the work of Ng and Song (2010), of which they note that most of the environmental impacts posed by shipping activities nowadays are not due to explicit accidents, which often led to substantial media exposure (like accidental, large-scale oil spills), but by routine shipping operations. This was especially true since the late 1990s, when higher navigation safety standards were imposed, thus leading to a vast reduction in the number of explicit, large-scale shipping-related accidents.

With such an understanding, it is not difficult to perceive that there will potentially be a lot of additional negative externalities posed to the surrounding regions due to intensified maritime activities. In this case, who should, and would, pay for the environmental costs? This would further intensify the issue related to international waters and innocent passage, as mentioned earlier. Also, are the current international and national legal frameworks (such as UNCLOS and MARPOL) adequate in addressing this new issue? So far, they seem inadequate, with only Article 234 of UNCLOS providing some guidance for the future development of large-scale, international maritime traffic in the Arctic Ocean. Needless to say, we also need to ask ourselves an ethical question about whether such activities should be encouraged, which would be a near certainty in accelerating the pace of melting of Arctic ice, and thus likely to pose further (negative) externalities not only to surrounding regions but also to other parts of the world (such as rising sea levels and endangered coastal cities and infrastructures).

EQUALITY AND REGIONAL DEVELOPMENT

The impacts of intensified shipping activities along the NSR on the traditional lifestyle of the indigenous population, especially Russian and Canadian, are beyond any doubt, and this has been discussed in detail in other articles within the conference proceedings. Nevertheless, I would like to mention a point here that often seems to be overlooked, i.e., regional development. First, provided that we admit that climate change, and thus the melting of the Arctic ice, is irreversible, this implies that the traditional lifestyle of the indigenous population will certainly undergo changes, whether voluntary or not. Recognizing such change, we must consider a critical question – to what extent can these people also share the benefits from such transformation, and not to be “edged out” or “marginalized” due to the evolution of global activities (and globalization)? No matter what, shipping via the NSR needs

Source: CentrePort Canada, 2013.

Figure C.1 A conceptual route map by CentrePort Canada connecting Canada with Russia, China and India via the NSR and Trans-Siberian Railway to be supported by coastal infrastructure such as ports, as well as efforts and knowledge in ensuring the well-being of these shipping routes (especially in view of the existence of chokepoints). As noted by Xu, et al. (2011), ports and other supportive coastal infrastructures along the NSR coastlines are extremely sparse and of poor quality, while professional knowledge in the construction, maintenance and operation of such facilities is also in serious shortage. This implies the urgent need for all Arctic states, and other interested parties, to collaborate and try to get the indigenous population involved. Indeed, in my opinion, intensified activities along the NSR imply that an initially "peripheral" region would become a more "core" region, and such a process should not result in further marginalization of the local population. In other words, how can we create more positive externalities posed by intensified shipping activities via the NSR? Indeed, it is a matter of how we should adapt to the impacts posed by climate change.[2]

There is also another aspect in regional development, namely transport, logistics and competition between transport modes. How, and in what ways, is the NSR going to affect the roles of ports, logistics and supply chains? Moreover, the use of the NSR implies sharing and competition between different shipping routes, and this is likely to have direct implications on inter-port competition. For instance, how will relationships be affected, especially among the major ports in East Asia and Europe? Indeed, do we need transshipment (and the deployment of mega-sized containerships) anymore, given that a substantial share of shipping demands might be diverted from the Suez Canal and trans-Pacific routes to the NSR, provided that the challenges stated earlier can be fully or largely resolved? In a nutshell, there is a critical question that has yet to be answered satisfactorily, i.e., what will be the relationship between the north (NSR) and south (Suez Canal/trans-Pacific) routes? Will they be competing, or will future demand grow to an extent that the "cake" will be so large that these shipping routes will be complementary with each other? This question is likely to be further complicated with the possible reintroduction of the "Eurasian Land Bridge," where a land connection between East Asia and Europe via rail (notably the Trans-Siberian Railway) might become realistically feasible in the foreseeable future (Hilletofth et al., 2007), provided that existing obstacles – physical, bureaucratic and economic – could be overcome. Indeed, such a development might not necessarily be negative, and optimistically, it might even encourage the evolution of a true "northern" transportation chain through the effective connection between the NSR and the Eurasian Land Bridge. Such an idea has been conceptualized by CentrePort Canada, one of the major inland terminals in Winnipeg, Manitoba and Canada (and possibly North America in the foreseeable future) connecting inland Canada with Russia and other parts of Asia (Figure C.1).

CONCLUDING REMARKS: THE ESTABLISHMENT OF A "SUSTAINABLE NSR"

In conclusion, I genuinely believe that the NSR has huge potentials, and indeed is a silver lining for the otherwise irreversible trend of climate change and accelerating melting ice within the Arctic region. However, there are still so many issues yet to be resolved, but this also leaves us many gaps for further research on this important, and exciting, topic. In my opinion, the dilemma is that while we should grab this opportunity with both hands and maximize the economic benefits provided by such transformation, we also need to ensure that such a process will not significantly worsen the environmental and social conditions of the Arctic and the surrounding region. In summary, how to establish a "sustainable NSR" will be the most critical point to be addressed. As an active participant of the conference, I genuinely hope that my views will provide useful insight, and a decent platform, for further development and research on this highly important, but also very exciting, topic that will pose substantial implications for the future well-being of this globalizing world.

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Notes

1. During the time between the conference and the publication of this article, I had taken up a new faculty position in the University of Manitoba in Canada. By doing so, I was given even more exposure to this issue, given that the Canadian and Manitoban government had generally strong interests in developing the NSR. Hence, some of the views of this article were based on my own first-hand observation and discussion with relevant scholars and practitioners since moving here.
2. For further theoretical discussions on climate change and adaptation, see Ng et al. (2013).

References

Beyer, M. 2011. "Promoting North Pacific Cooperation on the Governance of Arctic Marine Shipping and Energy Resource Development." Paper presented at the International Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security. Honolulu, U.S. August 8-10.

CentrePort Canada website: http://www.centreportcanada.ca, last accessed in October 2013.

Hilletofth, P., Lorentz, H., Savolainen, V.V. and Hilmola, O.P. 2007. "Using Eurasian Land bridge in Logistics Operations: Building Knowledge through Case Studies." *World Review of Intermodal Transportation Research* 1(2): 183-201.

Lee, S.W. 2011. "Benefits of the Northern Sea Route to the North Pacific." Paper presented at the International Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security. Honolulu, U.S. August 8-10.

EWC, KMI and KOTI. 2011. Program of the International Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security at the EWC website: www.eastwestcenter.org.

Ng, A.K.Y., Becker, A. and Fischer, M. 2013. "A Theoretical Discussion on Climate Change, Port Adaptation Strategies and Institutions." *Proceedings of the Canadian Transportation Research Forum* (CTRF). Halifax, NS, Canada. June 10-11.

Ng, A.K.Y. and Song, S. 2010. "The Environmental Impacts of Pollutants Generated by Routine Shipping Operations on Ports." *Ocean and Coastal Management* 53(5-6): 301-311.

Roh, H.S. 2011. "Effects of Opening NSR on the Emergence of Regional Port-industry Clusters." Paper presented at the International Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security. Honolulu, U.S. August 8-10.

Xu, H., Yin, Z., Jia, D., Jin, F. and Ouyang, H. 2011. "The Potential Seasonal Alternative of Asia-Europe Container Service via Northern Sea Route under the Arctic Sea Ice Retreat." *Maritime Policy and Management* 38(5): 541-560.

Commentary

Jerome Verny

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INTRODUCTION

The principal commercial maritime routes have changed very little since the beginning of the 20th century. Intercontinental exchanges, notably of maritime shipping containers, have intensified (Notteboom and Rodrigue, 2008a) along traditional, fixed routes long ago determined for geographical and commercial reasons. Maritime routes have changed little since the Suez and Panama canals were opened in 1869 and 1914, respectively. Four decades of uninterrupted growth in container traffic, however, has provoked questions as to the capacity of the international commercial network. Indeed, the theory of economic networks warns that the dimensionality of a network must be adapted to satisfy demand, excepting occasional periods of peak traffic (Quinet and Vickerman, 2004). This line of questioning is especially relevant for the "Royal Road" through the Suez Canal, which serves nearly all of the Asia-Europe market. The current mode of operation of the Suez Canal will have to adapt to a rise in traffic if congestion is to be avoided (Drewry, 2008). Globalization reflects an increase in the density and dynamism of merchandise flux, not just between continents but also between regions of the same continent. The trend toward further internationalization of trade and production has accelerated over the past two decades (Verny, 2007). In the two papers by Sung-Woo Lee and Hong-Seung Roh, the Northern Sea Route (NSR) is mainly mentioned, so we will focus on the Asia-Europe market, because the North-Western Sea Route (NWSR) gives more benefits to the Asia-North-East America market (with other scientific problems).

OBJECTIVES

This evolution of the world's commerce has relied heavily on the development of efficient transport networks, which reduce shipping costs to a negligible fraction of the product's factory price (Baykasoglu and Kaplanoglu, 2008). About 80% of the merchandise transported worldwide was carried on commercial shipping lines. In terms of value, the commercial exchange of merchandise has increased by a factor of 200 from 1948 to 2008 (WTO, 2008). This growth is mainly attributable to manufactured products. Since the 1980s, Asia has become the planet's principal industrial center and its consumer market is booming. Maritime routes linking Asia to the powerful consumer markets of Europe and North America have become the principal axes of container transport. In 2010, the Asia-Europe axis represented 30% of containerized freight transported on shipping lanes all over the globe (Global Insight, 2011). As we can see in Sung-Woo Lee's presentation, the Suez Canal is the most frequently used route between Asia and Europe, so we speak about the "Royal Route." United Nations economists have estimated that this market will grow at an annual rate of 5-6% between 2008 and 2015. Assuming that the three other principal corridors of maritime freight (transpacific, transatlantic, and intra-Asiatic) maintain their share of international commerce, we should apply a coefficient of 1.9 to the 2005 data to obtain an estimate of the volume transported in 2015 (United Nations, 2005). Over a longer term, from 2005 to 2030, certain studies anticipate that the volume of containerized traffic between Asia and Europe will increase by more than 600%. This figure corresponds to a mean annual growth rate of 24% over 25 years (HWWI, 2006). In order to accommodate this continuous growth in containerized trade, the transport network will have to provide adequate infrastructure and container ships. There are limits, however, to how much the network can evolve. Developing markets tend to have weak road and railway infrastructures, but it has been possible to serve them thanks to the evolution of their ports. Shipping companies are always trying to balance the gains obtained at sea by employing large vessels (economies of scale) against the additional port fees incurred by such a strategy: "the diseconomies of scale."

While the capacity of many ports can be improved, it is difficult to envisage applying the same strategy to a key component of growing Asia-Europe trade: the Suez Canal. It accommodates most of the containerized traffic between Asia and Europe: more than 20,000 ships and more than 800 million tons of freight in 2008. The canal is already beginning to feel the effects of increasing containerized traffic from Asia. At present, 46% of vessels transiting the canal are container ships. Despite construction intended to increase the maximum ship size (14,000-16,000 TEU) in 2011, the Suez Canal will soon reach its limits. In fact, granting access to larger and heavier ships will inevitably diminish the number of ships in each convoy. In consequence, the waiting time will increase and the canal will be able to offer its services less frequently. As shipping companies choose to pass through the Suez Canal mainly to save time, these extremely localized technical and financial problems (more days, more costs) could undermine the dynamism of the Asia-Europe economic environment. Can the limited capacity of the Suez Canal, tied as it is to an antiquated mode of operation, be overcome by increasing the size of container ships? To respond to the demands of Asian loaders, who want to efficiently evacuate consumer products (especially those destined for the European market), shipping companies are investing in ever larger, faster and less polluting vessels. Ships with capacities greater than 10,000 TEU are already in service on the Royal Road. It is thus possible that in the years to come the Royal Road will reach the limit of its capacity for container ships. In this scenario, alternative routes must be envisaged to smooth the circulation of containerized products between Asia and Europe.

The network of trade routes between Asia and Europe has several axes, the Royal Road seeing most use. Comprising land, sea, and air routes, the network provides a diverse supply of transport options. One alternative to the Royal Road is rail transport through Russia, a traditional interface between Northern Asian and Northwestern European markets. Russia

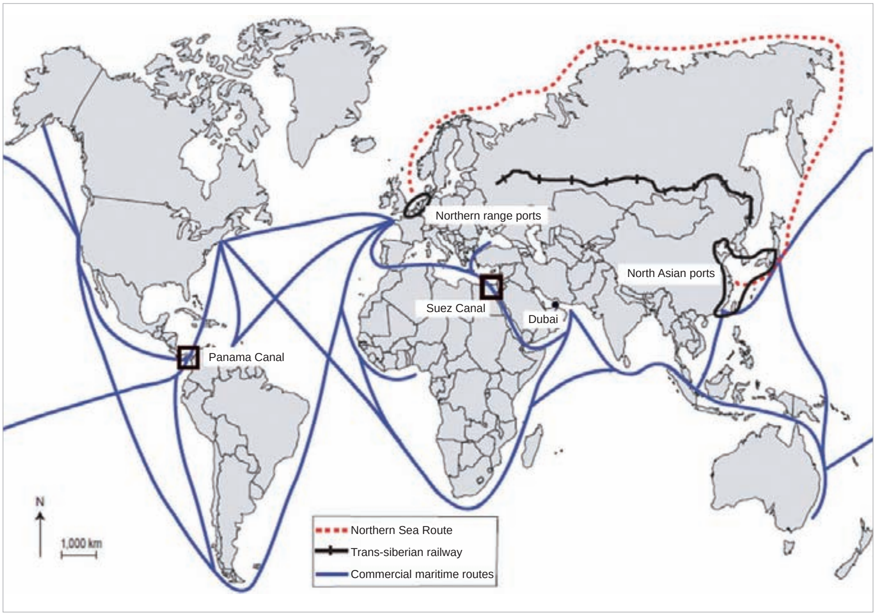


Figure C.2 Some international commercial maritime routes

is currently trying to present itself as an attractive territory for shipping, investing massively in its transcontinental train network (especially the Trans-Siberian and Trans-Aralian railways). In the aforementioned context, it could interest loaders attracted by the gain in time. By way of example, the transit time from Shanghai to Hamburg is 18 to 20 days by train compared to 28-30 days through the Suez Canal; less than 1% of the total container flux between Europe and Asia was convoyed by this infrastructure. If this axis is to become more attractive, Russia needs to further improve its infrastructure: doubling the number of tracks, improving the network's signals and electrical supply, etc. Russia must also optimize the network's organization by establishing regular lines (higher frequency), facilitating border crossings, increasing security, improving automated container tracking, creating a dedicated ticket office for freight, and adapting its rails to European standards (the separation is 1.52 m in Russia, compared to 1.435 m in most West European countries). We understand that rail transport between Asia and Europe has significant advantages but also obstacles limiting the possibilities for transferring a large volume of traffic. We are thus led to consider maritime transport once again, this time along a different route. The climate may change slowly with global warming. As the two papers prove, with global warming and the melting of polar ice, a new itinerary can be imagined permitting maritime transport on regular lines between the markets of Northern Asia and Northwestern Europe: the NSR, passing through the Arctic Ocean. The NSR has opened up as a possible avenue of trade in containerized products between Asia and Europe. In my research, I wish to determine whether the development of regular maritime transport along the NSR is feasible and pertinent, so the insightful contributions of Sung-Woo Lee and Hong-Seung Roh give to our scientific community a further approach.

Several factors justify renewed interest in liner shipping via the NSR. We have mainly discussed the goal of overcoming practical limitations on the Royal Road. The NSR presents other advantages linked to its geography, but also some logistical drawbacks. We wish now to discuss this route's advantages and drawbacks. The geopolitical climate has also grown more peaceful since 1991, when the dissolution of the USSR opened this ocean to international traffic, so this natural phenomenon is taking place in a context favorable to exploitation of the NSR. If the NSR begins seeing more traffic, however, it could awaken the avarice of coastal nations in this part of the world. If so, the route could rapidly become a key issue in international relations. The advantages of the NSR are closely tied to an international "geography of places." In Europe, the economic "center of gravity" is shifting from the West to the Northeast due to the ongoing development of Central and Eastern Europe. Among the 20 largest container ports in the world (2008), 13 are Asian and eight of these are Chinese (AAPA, American Association of Port Authorities). Asian mother ships are gradually abandoning Southeast Asia for northern China. On the basis of this new geography, it would seem worthwhile to transfer part of the containerized freight from the Royal Road to the NSR. Indeed, the NSR would reduce the length of voyages from North Asia (mainly ports in Japan, South Korea, and China) to Northwestern Europe (ports on the Northern Range, starting with Hamburg, Bremen and Rotterdam) by about 2,500 nautical miles. This translates into a gain of about 10 days, which is one-third of the time required for maritime transport by the Royal Road. By 2030, the NSR could be taken during the summer time without constraint to the shipping navigation.

The projection represents the three main roads of the Arctic. The future Central Arctic Shipping Route (CASR) could be one of the major axis of international trade by summer 2030. According to Russian authorities,

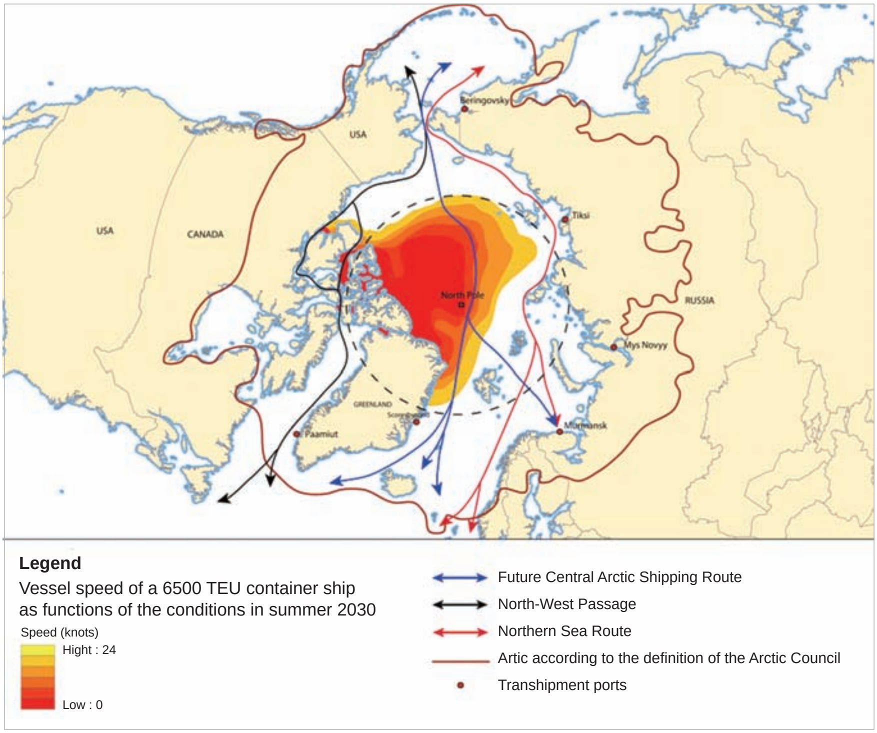


Figure C.3 *Vessel speed and future routes in the Arctic Ocean – projection to summer 2030*

5 million tons of goods passed through the NSR in 2011 (Ministry of Russian Transport, 2012). Russia evaluates that shipping traffic should multiply by 17 between 2012 and 2030, from 5 million tons to 85 million. The USSR saw 6.7 million tons of goods pass through the NSR in 1987. However, the advantages of the NSR run up against significant obstacles linked to the geographical characteristics of the territories traversed. About 2,500 nautical miles of Siberian coast between the Bering Strait and the port of Murmansk are nearly uninhabited, so no stopovers are possible. The most important consequence of this fact is that regular container lines on the NSR cannot be optimized following the model used in Royal Road transport, which relies on a network of developed communication lines in the hinterlands of port cities (river transport and high-quality rails for transshipment and feeding). A second consequence is that there can be little or no outside response to technical problems brought on by the hazards associated with extreme climatic conditions: floating ice sheets, icebergs,

fog, and violent winds. Maintaining the pace of a regular line requires certain guarantees: that ships can receive assistance with minimal delay, that replacement ships are available, the use of ice-breakers, and a suitable

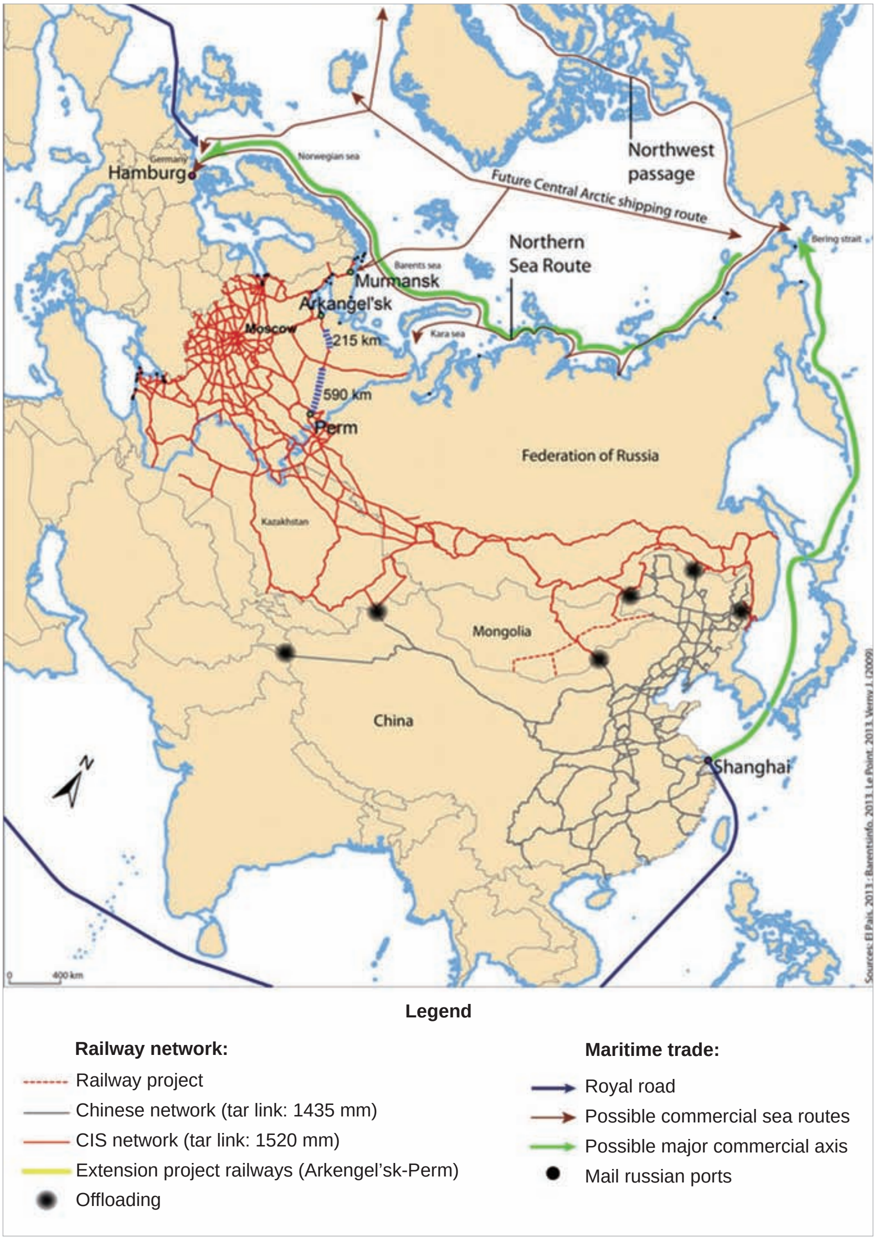


Figure C.4 *The new logistics project in the Arctic Ocean* means of transshipment. It seems evident that the liberalization of the Russian economy will spur demand for imported manufactured products, rendering the passage of container ships more attractive and profitable. The European project's FASE deals with another way, which is combining the railway and a part of the NSR.

The objective is to connect the NSR with the Russian railway network. The idea is to develop a link between Zhengzhou and Arkangelsk by railway and to use the NSR to Hamburg. The transport cost for a TEU (USD 2,400), is high for a carrier by railway to reach Arkangelsk. Furthermore, when we take into consideration the last part of the transit (Arkangelsk-Hamburg), the cost for one TEU is USD 2,715 (vs. a price range of USD 2,500 to USD 2,800/TEU for the NSR, MOBIS, 2013). Nonetheless, the physical distance (in time) is an advantage for this new multimodal network. In fact, this combined solution is about 2,000 nautical miles shorter and has four fewer days than the NSR. Indeed, the NSR represents about 20 days and 7,700 nautical miles (vs. 10,200 for the Royal Route, Verny, 2009) compared to 16 days and 5,655 nautical miles for the combined solution. Besides the great dependence on the climate, the difference lies in the variation between the lifting capacity of the railway (100 TEU) and the lifting capacity of the sea road (5,000 TEU, MOBIS, 2013). To conclude, this solution has to be developed by forwarders and shippers in order to sustain the combined rail/sea between Asia and Europe.

CUTTING EDGE OF THE NSR

Nowadays, some researchers often try to publish articles on the NSR in peer-reviewed journals. Here we mention some papers published in recent months. The book coordinated by Lasserre focuses more frequently on the northwestern passages. Schoyen and Brathen's paper in Journal of Transport Geography will interest Sung-Woo Lee in comparing his data for tramp shipping with theirs. Regarding Valsson and Ulfarsson's paper in Futures, the authors give us a global view on the impact of global warming on transport and settlement. Lastly, I mention here two papers that could be published in upcoming months in peer-reviewed journals. The first focuses on the North-Western Sea Route and the traffic study. For the second, the objective is to analyze the impact of the NSR on the international commercial maritime routes compared with the other future possibilities

(NWSR, different hypothetical future canals (Thailand, Nicaragua)).

- Lasserre, F. (dir), 2010. Arctic passages and seas - geopolitics, region analysis and transformation
- Schoyen, H., and Brathen, S., 2011. The Northern Sea Route versus the Suez Canal: cases from bulk shipping, *Journal of Transport Geography*, 19 (3), 977-983.
- Valsson, T. and Ulfarsson, G. F., 2011. Future changes in activity structures of the globe under a receding Arctic ice scenario, *Futures*, 43 (4), 450-459.

METHODS AND RESULTS

As we can see, the NSR is an increasingly important topic. The two papers complete this state of the art. And I would like to bring something to light: Sung-Woo Lee and Hong-Seung Roh have developed an original scientific approach, a crossroads between economic geography, network economics, management science and the new discipline of geographical economics. This is a very important contribution to this topic, so I can speak about two experimental studies that need to be carried out and developed in different research interests.

- North-East Asia regional development
- Maritime logistics
- Liner shipping organization
- Tramp shipping organization
- Dry ports and logistics development in emerging markets
- Maritime security
- Shipping and environmental issues

Each of these research interests will have to deal with the NSR in the next decade in order to conduct the decision-making of shippers and freight forwarders.

DISCUSSION AND FURTHER RESEARCH

We will develop two complementary parts during this discussion: organization and infrastructure. In the two papers, we have read that the creation of regular transport lines along the NSR is a real possibility in the near future. Several criteria confirm the pertinence and feasibility of liner shipping along this international route. Global warming is opening the door to regular lines on the Arctic Ocean, thanks to the progressive lifting of technical constraints on navigation (i.e., the ice sheets are melting). In addition, the ongoing changes in business location strategies are tending to increase the separation between production centers and consumer markets for certain families of products. This new geography of places and flows, reflecting changes on a planetary scale, could reinforce the advantages of the NSR. These conclusions are supported by a detailed economic analysis of a model liner shipping schedule plying the NSR (Verny, 2009). The estimated cost of exploiting a regular line on this axis could justify the transport of containerized products between Asia and Europe. While shipping through the Suez Canal is still by far the least-expensive option, the NSR appears to be a roughly equivalent second alternative if we develop port industry clusters, as we can read in the Park, Roh and Kang's paper published in 2007. We suggest that future research in a supply chain management and an Arctic context should be carried out simultaneously for this concept of port industry clusters. But it will be necessary to complete this approach with the intermodalism and the new supply chain organization, for example with the second emergence of the sea-air transport (the first emergence was in the 1970s before the amazing development of maritime transport). With the possibility of creation of regular transport lines in the Arctic Ocean in the next decades, is it relevant to invest in new infrastructure, so in new organizations, in order to have for example an airport close to a port, as in Dubai?

As we can see in the paper by Hong-Seung Roh, the NSR poses new accessibility challenges for North-East Asian countries, but also in Europe. Murmansk and Indiga will be the two ports where we could supply containers from the NSR to Eastern Europe (the new economic center of gravity of Europe). But these two ports must prepare for this evolution of a new geography of freight flows. Port authorities need to invest, in the near future, in new terminals, in new handling tools, etc. But they need to optimize their land accessibility thanks to new inland transport infrastructures. But to build transport infrastructures is not enough. It is necessary to develop a good organization. And I think about the dry port concept. In fact, there are

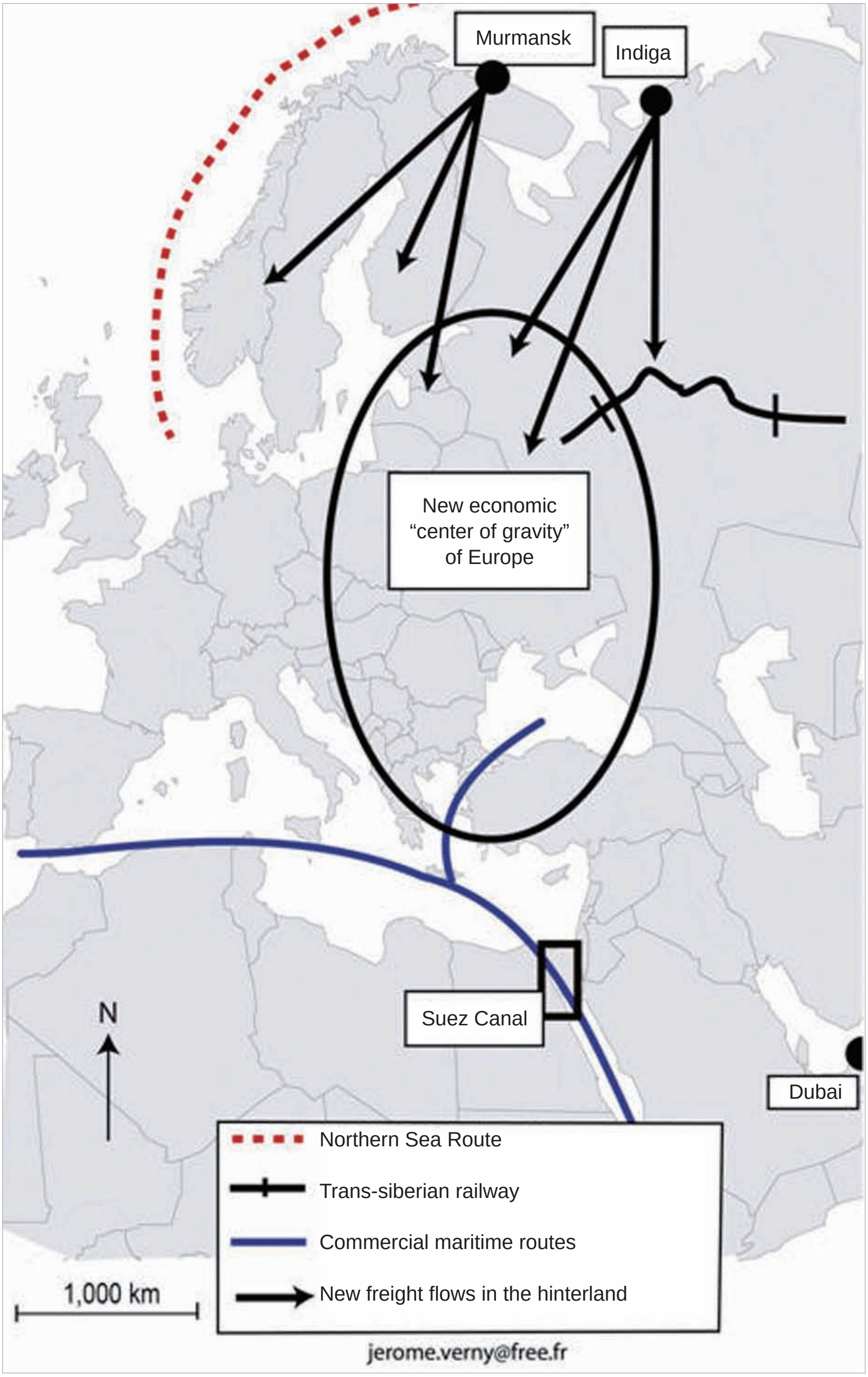


Figure C.5 The NSR and the opportunity for Northern and Eastern Europe good infrastructures, but the dry ports are developed only if we can integrate them in an optimized organization of freight flows, and this is possible if we understand the evolution of supply chain management. For example, we will find logistic platforms on dry ports where we will put added value on each product (postponement, in order to minimize the transshipment costs between rail and road, for example). And I think that the optimal location of dry ports will be strategic in the success to connect the NSR with Eastern Europe. Regarding this discussion about the NSR and opportunities for North-East Asian and European countries, the European Union and Russia need to develop cooperation as soon as possible (in order to promote good inland accessibility and to develop intermodalism).

The second part of the discussion deals with infrastructure. But before this, you can see that the first paragraph is more a recommendation, a proposal. In fact, I think this international conference is a good opportunity, after less than a decade of research on the NSR (in economics, geography and management science), to imagine together how we can create an Arctic-Pacific-Atlantic (APA) think-tank or forum. We need this think-tank in order to choose the best future way for our society and planet. We can imagine gathering international researchers, politicians, enterprises, and nongovernmental organizations in this forum.

After more than a century with no real variations in international commercial maritime routes, Sung-Woo Lee and Hong-Seung Roh prove to us that global warming could change dramatically the major commercial shipping routes. But other features have to be integrated into our work. I give you here some examples that should be analyzed in order to determine whether the development of regular maritime transport along the NSR is feasible and pertinent. I think about the future Panama Canal, the Suez Canal widening, the Thai Canal and the Nicaragua Canal. We can also speak about the project of a rail link though Colombia, which could be paid by Chinese investments. The Republic of China wishes to develop an alternative to the Panama Canal in Colombia thanks to a dry canal, with a sea-rail system. But this is amazing because Panama owns a sea-rail system, a single track between the Atlantic and Pacific with 2 million TEU traffic capacities in the near future. And this is all the more incredible because important investments have been done in the future Panama Canal. So, some of these projects could have an impact in some decades on international commercial maritime routes such as the NSR.

References

Baykasoglu A. and Kaplanoglu, V. 2008. "Application of Activity-based Costing to a Land Transportation Company: A Case Study." *International Journal of Production Economics* 116(2): 308-324.

Drewry. 2008. *Container Forecast*. London: Publications of Drewry Shipping Consultants Limited.

Global Insight. 2011. *Trends in the World Economy and Trade*. Waltham: Publications of Global Insight.

HWWI. 2006. *Maritime Trade and Transport Logistics*. Hamburg: HWWI Publications.

Notteboom, T. and Rodrigue, J-P. 2008. "Containerization, Box Logistics and Global Supply Chains: The Integration of Ports and Liner Shipping Networks." *Maritime Economics and Logistics* 10: 152-174.

Quinet, E. and Vickerman, R. 2004. *Principles of Transport Economics*. Cheltenham: Edward Elgar Publishing.

United Nations. 2005. *Regional Shipping and Port Development Strategies*. New York: Publications of the UN.

Verny, J. (coord.). 2013-2016. Asia-Europe Land Bridge Services (FASE). European Project.

Verny J., Itmi M., El Hami A., Cardon A., Couturier L., and Abdulrab H. 2012 (May). A Sustainable, Multidisciplinary Approach to Building Regional Competitiveness. In the Symposium on Security and Safety of Complex Systems, 2SCS'12. Agadir, Morocco. 9p.

Verny, J., Alix, Y. and Ng, A. 2012 (April). The New Logistic Links between Asia and Europe, Interregional Dynamics in Constructive Turmoil - Interregional Competition and Asia-Europe Relations in the 21st Century. 3rd International Political Science Conference. Le Havre. P. 17.

Verny, J. and Grigentin, C. 2009. "Container Shipping on the Northern Sea Route." *International Journal of Production Economics* 122(1): 107-117.

Verny, J. 2007. "The Importance of Decoupling between Freight Transport and Economic Growth: The role of Distances." *European Journal of Transport and Infrastructure Research* 7(2): 113-128.

World Trade Organization. 2008. *International Trade Statistics 2008*. Geneva: WTO Publications.

Commentary

Hak-So Kim

The Northern Sea Route (NSR) is a potential new artery linking Europe, North America and North Pacific region, dubbed here as the *East Asia region*. The topic of this session is very timely since it examines future throughput at the NSR and ensuing changes in the port and logistics environment.

The first thing I'd like to say is that authors of the two studies deserve credit for their hard work. Both works are very insightful. Firstly, I'll comment on the study "Benefits of the Northern Sea Route to the North Pacific." The author, Dr. Sung-Woo Lee, works for KMI, which I head. Regardless, I want to say that there is no "conflict of interest."

BENEFITS OF THE NORTHERN SEA ROUTE TO THE NORTH PACIFIC

It is interesting that the study presented a list of nations that can benefit from shorter routes using the NSR. So far, the most often cited examples are the Tokyo-Rotterdam route and Yokohama-Rotterdam route. Other ports in Asia and Europe have not yet been analyzed. Possible beneficiaries include Asian ports north of the Philippines or European ones in Spain and Portugal.

The study examined seaborne container throughput by analyzing their origins and destinations (O/D). It also calculated the distribution ratio between the Suez Canal Route (SCR) and the NSR with the Stated Preference (SP) survey, which I regard as a very rational approach.

However, when it comes to detailed assumptions and applications, the study shows room for improvement. First, it used the real GDP growth rate to predict container throughput. Although container throughput rise and real GDP growth largely correspond, they are not identical. Empirical studies showed that the elasticity of container throughput to GDP was higher than 1.3 to 1.5. This implies that the study didn't adequately calculate the throughput. Therefore, I think the elasticity of container throughput to GDP is a better option. Or predictions by other organizations or writers can be used as well. I suggest that the writer use more accurate information on O/D of container throughput, and the study needs to consider both occupied and empty containers.

Another hitch is that the SP survey was conducted solely on Korean forwarders. As the writer knowingly commented in the conclusion of the study, characteristics of forwarders can differ according to their nationality. The study should have conducted the SP survey on the global top 20 shipping companies that provide global service. I also believe that the study will be utilized to greater length if it includes information on Chinese forwarders, which handle the largest throughput.

The study presented only time and cost as determinants of choice between the SCR and the NSR. I suggest that relevant literature be analyzed and possible operation time is included as another factor.

As for the cost analysis on container transportation, the study sampled ships with 8,000 TEU capacity. According to the previous studies, however, ships bigger than 4,000 TEU cannot operate on the NSR. I understand that the writer wanted to compare costs under the same conditions. Nevertheless, the study needs to find ways to reflect such a reality.

For the calculation of fees for ice-breaking services by Russia, the study directly applied rates notified by the Russian authority. However, the rates used in the study are much higher than others. I think the actual rates can be confirmed by shipping companies that run pilot operation of the NSR or the Russian authority. It should be reminded that the goal of research is to apply study results to reality. Therefore, no efforts should be spared to rightly reflect actualities.

I'd like to add my last comment on resource transportation. The study limited its scope to Korea. It failed to reflect characteristics of the Arctic Sea, as it wrongly assumed that the same vessel types will be used for the NSR and the existing routes. The study would have produced more meaningful results if it reflected case studies on Japan and China, which handle much larger throughput.

STRATEGY FOR MAXIMIZATION OF THE NORTHERN SEA ROUTE EFFECTS BY FORMULATING REGIONAL PORT-INDUSTRY CLUSTERS

Next, I'll move on to "Strategy for Maximization of the Northern Sea

Route Effects by Formulating Regional Port-Industry Clusters." The writer, Dr. Hong-Seung Roh, well showed how the logistics system in Northeast Asia will evolve with the opening of the NSR. He emphasized ports, intermodalism and port cluster development in conjunction with other industries. I fully agree with this notion.

If commercialization of the NSR comes with the development of the port and logistics industry of Northeast Asia, the seas of Asia could bring about another renaissance to the region, just like the Mediterranean Sea did for Europe. This was mentioned in later parts of the study. Although the study presented such a direction forward, it left something to be desired.

First, one of its objectives was to reinterpret the Pan East-Sea economic region. The study actually mentioned the subject, but missed concrete analysis on economic aspects of the concerned nations and interrelations between logistics facilities and industries of concerned nations or regions.

Basically, changes in regional logistics systems should be explained according to the following order: shipping network changes, rivalry between regional ports, intermodalism of ports and cluster development. All of these should be conceptualized, analyzed and their interrelations explained.

I think more analyses are required on the interrelation between Asian ports' competition and multimodal logistics development. Due to this reason, the study fell short of presenting accurate impacts of NSR development on port competition in the region and logistics industrial changes.

Changes in the Asian shipping networks should be complemented with an explanation about the background, such as the Newly Industrialized Countries (NICs), namely Korea, Hong Kong, Singapore and Taiwan. In the same vein, further accounts on the emergence of China and Southeast Asia, shipping network changes and the growth of port/logistics industry of concerned regions are also necessary.

Dr. Roh argued that opening of the NSR will move the heart of the current transshipment system from Singapore to Northeast Asia. I largely agree with him. However, I think such a move will have limited effects since Northeast Asia has different conditions from Singapore and its neighboring countries. For example, they have good industrial conditions, such as low labor costs, favorable weather, social openness and cheap land price and bad port infrastructure. In comparison, Northeast Asia shows high labor costs, social closeness, discontinuity, bad weather, (especially for the northeast inland), a different industrial development level and fierce competition between many good ports.

Along with commercialization of the NSR, these factors will affect the logistics industry of Northeast Asia and determine which nation or port will emerge as the logistics hub like Singapore.

More analyses are needed on changes in regional port rivalry, connectivity between ports and hinterland and ways to facilitate intermodalism for that connectivity. Explanations and analyses should follow on the cluster development among ports in Northeast Asia, as they are poised for leadership in the world as well as regional logistics.

I'd like to add a few more comments. Dr. Roh's paper mentioned the relation between intermodalism and demand for logistics infrastructure if the supply induces the demand, which I could not fully understand.

Dr. Roh cleared the concept of the port industry and port clusters. I think he provided accurate explanations on ports at the present and in the future. However, I think that his arguments for port clusters should be adequately linked to the opening of the NSR. His review of the literature helped us understand the issue better, but his claims would have been much more persuasive if they were supplemented with examples and empirical analyses.

On balance, the study is meaningful, as it firstly presented relevant concepts and the direction for regional ports with the opening of the NSR. It examined how the logistics structure in Northeast Asia will change and brought up the need for active intermodalism and port cluster development.

I'd like to summarize my comments for these two studies. First of all, fundamental analyses of the global shipping market should come first. Today's cutthroat competition is driving global shipping companies to cut costs. Therefore, they will quickly respond to opportunities to cut time and costs.

Therefore, the opening of the NSR should be analyzed accurately and realistically. Most of all, O/D of the current containers and general cargoes should be precisely analyzed, and both occupied and vacant containers should be considered.

Nevertheless, what is clear is that more throughput from Asian nations, including Korea, China and Japan, is likely to use the NSR in the future. As a result, the current hub ports, such as Hong Kong, Singapore and Shanghai will witness aweakening status, while Busan, Kobe and other ports will emerge as new hub ports. This becomes more apparent given the fact that ships with less than 3,000 TEU capacity should transship their containers at logistics hubs if they sail from one of the 30 container ports in China and use the NSR. Accordingly, ports need new plans that reflect the importance of hinterland and inland logistics centers concentrated in port hinterlands. It is also noteworthy that integration of SCM and logistics and vertical industrial specialization are behind this phenomenon.

In a nutshell, these two studies are experimental in their prediction for throughput on the NSR and changes on other routes. This is why supplementary studies should be carried out. In this regard, I'd like to propose a few ideas for future studies.

First, an Asia-Pacific Arctic Forum should be in place. The largest users of the NSR, such as Korea, China and Japan, and Arctic coastal nations, such as the United States, Canada and Russia, need to lead this forum for constant studies, information sharing and technology development.

Second, more studies should be done on the changes of the port system in Asia and Northeast Asia. With the opening of the NSR, the established Hub & Spoke system centered on Singapore, Hong Kong and Shanghai is likely to change, which requires continuing research.

Third, the NSR governance system should be open to wide and uninhibited participation.

Fourth, an international research and analysis system is necessary for research on fisheries resources in the Arctic, protection of biodiversity and protection and use of natural resources.

PART III

NORTH PACIFIC ACCESS TO ARCTIC ENERGY RESOURCES

5. Strategic Importance of Arctic Oil and Gas to Energy Security in the North Pacific

Nodari A. Simoniya

INTRODUCTION

According to the latest estimations of the U.S. Geological Service (2008), some undiscovered reserves of hydrocarbons in the Arctic amount to 412 billion barrels in oil equivalent (around 25% of world reserves). At the end of May, 2009 the American magazine *Science* published the results of the first complex research and estimation of oil and gas reserves of the Arctic. According to this research, 13% of undiscovered world oil reserves and 30% of natural gas reserves are embedded in this region.[1] At the same time, major parts of these oil reserves are embedded close to Alaska's coast, while practically all the natural gas reserves are near Russia's shores.

In a paper presented in Houston at the first Offshore Technology Arctic Conference (Feb. 6-9, 2011), Mark Blaizot from Total SA listed the following data: within the Arctic areas, which represent around 20 million km^2, around 40 billion barrels of oil equivalent (boe) have already been discovered, 80% being gas. The main proved basins and mostly untapped reserves are located in Russia, the Barents Sea, the Kara Sea, and the Yamal Peninsula for gas, and in Alaska, the North Slope basin for oil. Other important basins are Timan-Pechora in Russia and the Mackenzie Delta and Sverdrup basin in Northern Canada. Several basins, mainly located in Eastern Russia, are totally virgin, devoid of any exploratory wells. They are mainly the offshore North Kara Sea, Laptev Sea, the East Siberia platform, and the North Church, which together represent more than five times the surface area of Texas.[2] Arctic resources play an especially important role in the Russian economy, not only because the Russian Federation possesses the largest part of the Arctic coast (up to 40%), but also because 1% of Russia's population inhabiting this region has a 22% share of Russia's exports and 20% of its GDP.

Recently (especially in 2008-2009) serious ágiotage flared up around the Arctic, and not only in the mass media. Many governments and international organizations made statements and even declarations, and sometimes the former had little to do with the Arctic (NATO, the European Commission, etc.). The main factor that has stimulated interest in the Arctic was the consequences of a changing climate – a fact that nowadays almost nobody denies, though there are still considerable differences in opinion regarding the reasons for this warming. One of the manifestations of this natural phenomenon lies in the considerable reduction in the total volume of the Arctic sea ice and the general reduction of the extent of the Arctic Ocean's ice cover. Such a development may seriously influence in perspective at least three spheres of human activity in the Arctic: firstly, considerably simplify access to the richest resources in the ocean (especially energy ones); secondly, create new opportunities for fishing; and thirdly, promote opening of new (shortened) routes for northern navigation.

Russia has not stood aside. In early 2009, the RF Security Council published a document signed by President Dmitry Medvedev entitled "Bases of the Russian Federation's State Policy in the Arctic for the Period up to 2020 and Further Perspective." It's quite a balanced document, with the ideas of peaceful settlement of disputable issues in the Arctic, international cooperation and provision of mutually beneficial cooperation on bilateral and multilateral basis with other states neighboring the Arctic on the basis of the existing international agreements and treaties running all through it.

The document envisages a stage-by-stage solution of all the tasks within the framework of the outlined state policy in the Arctic. In the first stage in 2008-2010, it was decided to concentrate mainly on geological and geophysical, hydrographic, cartographic and other work to prepare materials to substantiate the external border of the RF Arctic zone; expansion of international cooperation, including for effective development of natural resources; realization of investment projects within the framework of state-private partnership, etc. In the second stage, from 2011 to 2015, legal official registration of the external RF Arctic zone borders will be provided; solution of goals of structural reconstruction of the economy in the Arctic zone; development of infrastructure and management system for communications of the Northern Sea Route (NSR) to resolve the tasks of Eurasian transit provision, etc. In the third stage, from 2016 to 2020, the RF Arctic zone will be turned into the leading strategic resource base of Russia.

In reality, Russia will have to address a long-range strategy for restoration and rehabilitation of its Arctic territory, with enormous financial expenditures, and to overcome severe natural obstacles. But a difficult goal is facing the country's leadership role, where there is considerable lowering of double-dyed bureaucracy and overall corruption, which will take more than one decade and consistent political will. Nevertheless, in spite of a seemingly oppressive picture the main accent in this paper will be on new, reassuring tendencies in Russia's oil and gas sector, which began to form in recent years, and that in several years will lead to important shifts inside this sector and in interconnections and cooperation between Russia and the outside world. First of all, it's the beginning of the "washing out" of monopolism of some large state corporations (primarily such monolithic enterprises as Gazprom) and, secondly, the turn of the country's leadership and Russian oil and gas business to the Asia Pacific (AP), which has already begun, diversification of export oil and gas routes, etc.

There is absolutely no doubt that Russia, whose leadership has already realized the enormous importance of AP countries in world development, will in the coming decade make an increasing contribution to the provision of energy security for its neighbors within the framework of mutually beneficial and equal cooperation. At the same time, bearing in mind the really complicated and controversial situation in today's Russia, the present paper puts the main accent on disclosure of those historic difficulties and opposition of two tendencies – traditionalistic-inertial and modernizing-innovational – that today stand in the way of successful cooperation between Russia and the AP. The author of the paper has consciously avoided describing the multiple declarative "strategies" in the sphere of Russia's energy that are in abundance and are being produced by the Russian bureaucratic machine. Instead, the paper seeks to show the preference for specific analysis and contrast of two main oil and gas corporations operating in the Arctic that especially personify two opposing tendencies.

THE SHTOKMAN PROJECT'S ROUNDABOUT WAYS OF REALIZATION

Of course, developing hydrocarbon raw materials is difficult in such environmentally challenging areas as the Arctic and especially sub-Arctic waters, where operating floating production systems is a tremendously difficult task, largely due to sea ice and icebergs as well as the challenges of having people working offshore in such extreme environments. Nevertheless, two floating production, storage and offloading (FPSO) vessels have been operating successfully off Newfoundland, Canada (by Husky Energy), on the White Rose field, and Suncor Energy at Terra Nova, while an FPSO has worked off Sakhalin in past years by Shell. But Shtokman is a far bigger project than any of these. Besides, in the efforts aimed at development of this deposit, as if in a drop of water, one could see all the historic twists and turns the country and its economy have passed in the transitional period from the USSR via Yeltsin's epoch and up to the present day.

Opened more than 20 years ago, the Shtokman deposit[3] is unique not only due to the volume of its reserves (3.9 trillion cubic meters of gas and 50.3 million tons of condensate), but also due to the diversity of its participants and approaches to its development in the post-Soviet period. In the Time of Trouble of the early 1990s it was decided to pass the deposit to Rosshelf, created by a number of military-industrial complex (MIC) enterprises at the height of the conversion company. By the mid-90s, however, all the absurdity of this decision became obvious, and by Boris Yeltsin's order Gazprom was embedded in the project. Gazprom itself did not express special enthusiasm at having received such a present, as it was busy with more "serious" business, placing its assets into "reliable hands." Meanwhile, large foreign oil corporations were on the contrary very interested in that project, especially hoping to realize it within a "production sharing" scheme and expecting that gas exports would be performed by sea and not by pipes controlled by the Russian monopoly. In 1996, Rosshelf signed a protocol of intentions on Shtokman with Conoco, Fortum, TotalFinaElf and Norsk Hydro. But the undertaking was fruitless. And in 2002, during the first presidential term of Vladimir Putin, state oil and gas companies Gazprom and Rosneft created JV Sovmorneftegas, which besides everything else was given the license for the Shtokman development. However, in 2004, Rosneft was busy obtaining Yuganskneftegas and, needing the means to accomplish it, decided to sell its share in the JV to Gazprom (just as later it also decided to sell half of its 40% share in the Sakhalin-1 project to Indian company OGNC).

Then Gazprom began to consider conditions for future partnerships with Chevron, ConocoPhilips, Hydro, Statoil and Total independently. It marked North America as the priority market for its gas and its intention to urge for exchange of assets with future foreign partners during the conclusion of its deals. After long negotiations, Gazprom's leadership suddenly made an incongruous declaration about the intention to develop Shtokman independently. Foreign companies were given an opportunity to act as contractors. But very soon the monopoly's leaders changed their mind, and in 2006-2007 renewed negotiations with foreign companies. As a result, in the second half of 2007 a framework agreement was signed on cooperation in realization of the first phase of the Shtokman deposit with Total and StatoilHydro. Within the framework of that phase in 2016 delivery of 23.7 billion cubic meters/year of pipe gas and 240 thousand tons of condensate should begin. (Further on, following the completion of all three phases, it is planned to get 71 bcm of natural gas, produce 30 mln tons of LNG and 740 thousand tons of gas condensate yearly).[4] In 2008 the company-operator of the project, Shtokman Development AG, was created. The shares in the project were allotted as follows: 51% remained with Gazprom, 25% was received by Total, and 24% by StatoilHydro. But the general contractor was Sevmornefte gas (i.e. Gazprom), with the license remaining at its complete disposal.* Gazprom also controlled gas sales (then it proposed to sell all the gas on shore). The beginning of gas extraction and pipe deliveries was planned for 2013, with LNG production slated for 2014. In February 2010, however, the time was again postponed to 2016 and 2017, respectively. Gazprom also insisted on the fact that within the framework of the project's first phase there should be singled out a separate stage of launching complex construction to organize gas deliveries by a pipeline-submerged extortion subsystem, pipeline to the shore, gas processing unit. In this connection it assured that the final investment decision (FID) on pipe gas deliveries and on LNG would be made separately: in the first case in March 2011, and at the end of 2011. (Let me remind you that in the initial version the general FID was planned for the end of 2009- beginning of 2010).[5]

Gazprom explained the transfer of terms by an unfavorable situation for gas sales on world markets (global crisis and reduction of demand, growth of shale gas production in the U.S.), but in reality the problem was not only for those reasons. After all, according to the most optimistic

* Further on, Gazprom twice changed the name of its 100% "daughter" to Gazprom Neft Shelf and Gazprom Dobycha Shelf.

forecasts, LNG from Shtokman field would have come to world market in 2017. By that time the crisis would have remained in the past, while the new main LNG consumers (China, India, etc.) would have increased the demand for it. And all the large and not so large oil and gas corporations (IOCs) and national companies (NOCs) already urgently began from 2009-2010 to invest in LNG projects in Australia, Southeast Asia, etc. Probably understanding the above, Total's Chief Executive Christophe de Margerie repeatedly addressed Russia's leaders with advice not to protract Shtokman's development. In an interview with *Kommersant* in July 2010, he in particular said, "I just asked the prime minister to help us accomplish the project in due time and not to detain it. The same I asked of President Dmitry Medvedev."[6]

In the meantime, due to indecision, and most probably the insufficient experience of Gazprom's top management, Shtokman got bogged down for almost two years in internal contradictions between the project's participants. Contradictions appeared, in particular, during the endorsement of technical parameters, for example, on transportation of gas to the shore. The rift revolved around how gas and condensate should be pumped from the Shtokman production vessel over 600 kilometers to shore near the Russian village of Teriberka. Although as far back as 2008, the board meeting approved the concept of two-phase pumping of the mixture of gas and condensate to the shore, Gazprom Dobycha Shelf start insisting in 2010 that the operator, the Shtokman Development company, should amend the previous plan. The Russian company now argues the operator should add gas condensate separation facilities to the Shtokman production vessel to be able to take out the material from the well flows, and also look at alternative options for condensate export. However, Shtokman Development is refusing to consider the installation of gas condensate processing and storage facilities on the production platform because of safety and fire reasons. The argument led to replacement of Shtokman Development General Director Yuri Komarov, who backed the standing of Total and Statoil, and the appointment of Alexei Zagarovsky from Gazprom Dobycha Shelf instead, but at the end of 2010 foreign partners managed to insist on the variant of two-phase mixture of gas and condensate.[7] However, controversies regarding the question of transportation of condensate by shuttle-tankers to avoid construction of two pipelines remained.[8]

Meanwhile, serious competition began on the market around large contracts of the first phase of the Shtokman project. In particular, the bet was on a contract worth USD 15 billion to deliver a ship-shape floating production unit (FPU). Two consortiums opposed each other: Saipem, Samsung Heavy Industries and Sofec competed against rival group Aker Solutions, SBH Offshore, Technip and Daewoo Shipbuilding & Marine Engineering, to build the FPU. The planned FPU would be about 330 meters in overall length and about 65 meters wide. It will also have a “turret structure” for mooring, with emergency disconnection in less than three minutes as a “last resort” in the face of ice floes. The project team hopes to access Novaya Zemlya, east of the field. Most of the island is controlled by the Russian military, but the army has signaled its willingness to consider allowing the project to make use of the island, such as for helicopter flights to and from Shtokman. Parallel to this, competition by Russian contractors is also on: from one side, Russia’s Zvezdochka military shipyard has confirmed it will receive Western technologies and will begin a massive upgrade in anticipation of an Aker Solutions-SBM-Technip-Daewoo consortium winning a several billion dollars contract to build an FPU in the Barents Sea, and on the other side the second consortium of Saipem, Samsung Heavy Industries and Sofec are working closely with another Severodvinsk military yard, Sevmach, on a similar technology transfer and upgrades. New Shtokman Development Chief Executive Alexei Zagarovsky said on April 22, 2011 that the company is now planning to award all engineering, procurement and construction contracts for both onshore and offshore jobs by September. The Shtokman Development operator declared that preference would be given to that group of claimants whose claim would envisage a higher level of participation by Russian subcontractors, even if it would be connected with a certain rise in the contract’s price.[9]

In early June 2011, mass media published information (confirmed by Gazprom) quite favorable for the future of the Shtokman deposit, in particular, for the solution of one of its main problems – future LNG sales. On June 1, 2011, the main LNG importer in India, Petronet LNG Company, said that it was ready to buy 2.5 million tons of fuel a year from Gazprom over the course of 25 years. While on June 2 it was found that similar agreements were prepared with other Indian companies, GSPC and GAIL. All in all it will be up to 7.5 billion tons a year for the next 25 years, as the trading “daughter” of Gazprom GM&T said. For the moment, memorandums of understanding have been signed. According to Reuters, deliveries on future contracts are planned to commence in 2016-2018. (Gazprom has delivered small LNG consignments to India since 2007).[10]

But Gazprom would have stopped being "Gazprom" if lengthy arguments, negotiations and seemingly found compromises would not threaten the final decision on the project with another shift of timing. The adoption of an FID on the first project stage planned for March 2011 did not take place and was postponed to April. In April at a Shtokman Development Board of Directors meeting at the request of Gazprom the decision on an FID was again shifted to the end of 2011. Meanwhile, in the mass media there appeared an announcement by the head of the Rosnedra agency about Gazprom leadership's request to postpone launching of the project for one year (i.e. to 2017 and 2018, respectively). And the last information about it was voiced in the middle of June 2011 in the lobby of the Petersburg Economic Forum by the head of Rosnedra, Anatoly Ledovskikh. It is interesting that when a Moscow News reporter asked the second executive manager of Total Iv, Lui Darricarer, about the timing of his company's Russian projects, the latter diplomatically, shortly but firmly answered, "Total is invited to the project not to frustrate the determined timing."[11]

NOVATEK SAGA: GAZPROM'S MONOPOLY IS UNDERMINED

In recent years in the West, it has become fashionable to speak about the threat of a Russian energy monopoly for Europe that in the future might allegedly lead to political dependence. These statements are constantly disseminated by almost all Western mass media sources, with the latter naturally not taking any trouble to present in the least bit serious analysis of the real state of affairs. Especially popular is criticism of Gazprom due to its conflicts with transit countries (Ukraine and Belorussia), which are independent states, but who knows why persistently insisted on much more favorable terms and prices for Russian gas (compared to the world's usual ones). They procrastinated on signing contracts, provoking Gazprom to stop gas delivery, being sure of moral support (but not of material support for some reason) from the outside world.

It's quite enough, however, to address facts and statistical data to receive evidence that in the decades following the time when historical "gas in exchange for pipes" agreements with Austria and Germany were signed, in spite of an absolute physical increase of gas deliveries from the Soviet Union, its share in the total volume of European gas imports decreased more than twice. It happened naturally due to diversification of import sources (from Norway with Algeria as well as other North African countries, plus Qatar, Trinidad and Tobago, etc.). What monopoly are we talking about?

And, nevertheless, Gazprom is a monopolist, but only in its own country. The company has at its complete disposal all the main export gas pipelines thanks to which it "makes miserable" the life of all the independent gas producers in Russia, either by imposing crushing terms for gas purchases or forcing them to burn associated gas in flares, polluting the atmosphere. History, however, shows that any monopoly sooner or later comes to an end. And such a monopoly usually breaks at its weakest link. Until recently Gazprom's life was comfortable. It was sitting on a "Soviet inheritance" and kept to the comfortable tracks beaten in earlier times. But when it became necessary to develop new deposits Gazprom's "weak link" became apparent – the Arctic with its multiple challenges: severe climate, need for absolutely new innovative technology, its unknown offshore, etc. The monopoly's leadership was neither psychologically, nor professionally ready to meet these challenges quickly, dynamically or widely. This was clearly demonstrated by the story of the long and agonizing development of the largest Arctic project, the Shtokman gas condensate deposit. That's when the advantages of a small, risky and innovational business became clear, and that business was personified by independent Novatek. The short but extremely eventful history of this company includes everything: clashes with Gaszprom, struggles, temporary defeat, restoration and participation in the first actions that broke Gazprom's monopoly. That is why in order to clarify yesterday's events in the Russian gas industry, its present state and future prospects, it is necessary to dwell more at length on the Novatek phenomenon.

It should be mentioned that in Yeltsin's times of "bespredel"* and increasing corruption Gazprom's fate was unenviable. It can be characterized by a well-known expression "to cast away stones," i.e. taking away bit by bit the monopoly's assets or even dispensing its whole subdivisions and "daughters" among relatives and close acquaintances of former Gazprom

* Literally translated from Russian, bespredel means "no limits." However, in the particular Russian context of that period, the connotation of the word means unrestrained lawlessness, unscrupulousness and corruption. Bespredel was manifested in an unlimited usurpation, or takeover, of the most valuable state assets by a small group of "the elite."

leadership (Itera, Sibur, Stroitransgaz, etc.). As a result, by the time the leadership of the company changed early in this century, Gazprom, following intra-corporate price manipulations, looked like a semi-ruined, practically unprofitable enterprise. By the way, it quite "efficaciously" harmonized with persistent efforts of the IMF and some foreign governments, as they insisted on Gazprom's reform, i.e. upon its dismemberment, putting it forward as a condition for giving another tranche of the financial aid that finally led Russia to default in 1998.[12] When Putin came to power, he not only changed Gazprom's leadership but also clearly emphasized the main goal: "to gather stones" or melted-away assets.

Unfortunately, the new Gazprom leadership headed by Alexey Miller had only one quality convenient for Putin – implicit faithfulness and readiness to obey orders from the top, which, no doubt, was the decisive argument for Putin, a newcomer in the Kremlin surrounded by a not very friendly but quite implanted powerful bureaucracy. Nevertheless, Miller's incompetence was slowly but surely revealing itself. He was successful only in one thing: based on powerful administrative support, Gazprom purposefully expanded its sphere of influence even beyond the limits of its abilities to implement this influence positively. This becomes especially obvious after you read a letter by Miller and Sergei Bogdanchikov (then head of Rosneft) sent on February 17, 2003 to Putin regarding East Siberia. Its authors proposed to unite several East Siberian and Yakutiya fields into a complex with a single production and social infrastructure to ensure higher efficiency in the development of the region's resources. They also proposed to develop oil and gas resources simultaneously, giving priority to development of the gas industry to provide for the needs of the region and ensure deliveries to Asian countries.[13]

Behind the verbal demagogical "concern" about the region's development and natural gas deliveries to Asia we can see in this letter obvious evidence of Gazprom's intention to subjugate the vast new oil and gas Russian province together with Rosneft itself (the latter was mentioned by Miller as a settled matter). In reality, however, Gazprom had neither the strength nor means nor ability to deal with such a grand goal, and his behavior in that case was that of "a dog in the manger" – he just wanted to stake out a claim to all the oil and gas treasures of the region to be laid in store, for the future. It is proved by all his actions in East Siberia up to the present day. As for "gathering stones," Gazprom was so much engaged in this process that it started to lay its hands on assets that never belonged to this monopoly. Special attention was paid to independent and successful companies. That is where the "saga about Novatek" starts.

Novatek was created as an independent regional company (an open joint-stock company) in 1994 and began its activity in 1998. Initially the company was headed by Leonid Mikhelson (he is still at the head of it), Leonid Simanovsky (nowadays he is first deputy chairman of the State Duma's Energy Committee), and Iosif Levinzon. The latter was a theorist and strategist who made a valuable contribution to the expansion of the resource base of the company in the initial stage of Novatek's formation. He is a professional geologist. From 1978 to 1987 he worked for Urengoineftegasgeologia, then headed Purneftegasgeologia, which was carrying out geological prospecting in the region and later became Novatek's resource base, and in mid-90s joined the latter. In 1996, Levinzon became deputy governor of the Yamalo-Nenetski autonomous region (YNAR) and obviously promoted consolidation of regional independent gas companies, doing so also through the Yamal Development Fund established by the YNAR administration.

An important (but not very long-lived) role was played in this consolidation process by another person, former intelligence agent Nikolai Bogachev, who in the mid-90s staked a purchase of West Siberian prospecting enterprises. Among other things, he controlled the license on prospecting of the South Tambeiski deposit. In 2002, the joint-stock company Tambeineftegaz was created, where 74.9% of its shares belonged to Bogachev's joint-stock company Tambeigaz and 25.1% to the Regional Fund of Yamal's Development Fund. With the help of Levinzon, who became a member of Novatek's board of directors, this share was exchanged for 5.61% of the latter's shares. By 2005, Novatek's share in Tambeineftegaz reached 25.1%. The "reinforced" Tambeineftegaz had far-reaching goals that envisaged LNG plant construction and construction of a complex for transshipment of that gas to tankers, which had to provide for export channels independent from Gazprom. This project was developed with the participation of Halliburton and Bechtel and cooperation of Shell, Repsol and Petro Canada. The initial capacity of the plant had to amount to 7.5 million tons of LNG, while the project was to be completed in 2008-2009. In 2004 the project was directed to the profile ministry in Moscow for endorsement.[14]

No wonder that such an activity was not welcomed by Gazprom, and its leadership decided to act in both directions: against Novatek and against Tambeineftegaz. In 2003-2004 Gazprom tried to dispute Purneftegazgeologia's joining Novatek, but in vain. In 2005, probably by using its administrative resources, it managed to squeeze out Levinzon both from Novatek and the post of YNAR vice-governor. In 2006 Gazprom managed to outbid one of Novatek's "daughters" for USD 2.2 billion (19.4%). The monopoly's leadership used its affiliated structure Gazprom Bank Invest against Tambeineftegaz, having bought Novatek's share. Apprehending the worst, Bogachev reissued a license for the South Tambei deposit to his new company, Yamal-SPG, and while Gazprom undertook litigation, Bogachev sold his share (about 75%) to large businessman Alisher Usmanov, who headed the corporation Metallinvest. Usmanov is also director general of Gazprom Investholding, which specializes in buyback of assets.[15] It is quite obvious that Usmanov did not seriously intend to be engaged in the gas business, and we may suppose with a large share of certainty that, perhaps, he interfered in this case at the request of the government (maybe even at the request of Putin himself). The events that followed speak in favor of this supposition. In early 2008 he resold 75% of Yamal SPG to a well-known oil trader, Gennedy Timchenko, known for his closeness to Putin.[16] Then Timchenko had to find a reliable and active partner to use the bought assets properly. It wasn't a difficult task, as in 2008 he already possessed minority shareholding (5.07%) of Novatek, and his name was on the list of the company's board of directors. That was probably enough to realize the serious potential of the company and to stake on it. In May-June 2009 Timchenko and Novatek leader Leonid Mikhelson performed a complicated, ambiguous, but fruitful exchange: Timchenko let Novatek have 51% of Yamal-SPG's shares and an option for purchase of his remaining 23.9% of shares in the course of three years. In response, Timchenko received a possibility to increase his share in Novatek up to 18.2%.[17] According to that agreement Novatek instantly paid USD 250 million in cash, USD 300 million in securities with redemption in February 2010 (already accomplished) and USD 100 million after Novatek managed to sign a contract with Gazprom on the selling of future gas.[18] The final step aimed at complete possession of Yamal-SPG was the appearance of Timchenko's partner Petr Kolbin on the arena – the co-owner of St. Petersburg oil trader Surguteks (49%). Quite of a sudden Gazprombank agreed to give the latter its 25.1% of Yamal-SPG shares for only USD 78.5 million. In December 2009, Kolbin's claim was confirmed at a meeting of government committee on foreign investments headed by

Putin (Kolbin's company is registered offshore, just like Volga Resources, belonging to Timchenko).[*] Simultaneously at the same meeting Timchenko confirmed his claim for a future increase of his share in Novatek up to 23.49%, which will allow him to leave Gazprom with its 19.4% behind.[19]

Thus, it is clear that Timchenko intended to spread business activity to the natural gas sphere.[20] At the same time the activity of Timchenko and Novatek against the background of Gazprom's clumsiness and sluggishness in implementation of super-important tactical and sometimes strategic decisions is simply amazing due to its impetuosity, resoluteness and all-embracing complex. Here are only some recent examples that prove the above: firstly, already in the course of 2009 Novatek faced reshuffles among personnel and in its structure. Levinzon returned to Novatek as first deputy chairman. He was charged to create a department on innovations also headed by Timchenko and Burkhard Bergman, former chairman of the board of Germany's E. On Ruhrgas (both are members of Novatek's board of directors).[21] Further on, during another reelection of the board of directors in May 2011, Vladimir Dmitriev (the chairman of Vnesheconombank) was excluded. This probably happened because a certain uncomfortable situation occurred due to Levinzon's return to Novatek's leadership. The thing is that it was Vnesheconombank that willy-nilly participated in the process of Novatek's destruction; having bought the share of the Regional Fund of Yamal's Development in 2005 (let me remind you that it was established in 2001 and was supervised by Vice Governor Livenzon) and then in mid-2007 this share went to Gazprom.[22]

Secondly, Novatek began to aggressively entice former clients of Gazprom and Itera in the home market. Already in October-November 2009 there appeared information that former Gazprom clients with still-valid five-year contracts – OGK-1 and Inter RAO EC (the latter's board of directors up to the middle of 2011 was headed by Vice Premier Igor Sechin) decided to sign new contracts with Novatek in spite of threats from Gazprom to use penalties in accordance with the terms of contracts of "take or pay." New contracts envisaged deliveries of 56 billion cubic meters of gas in 2010-2015 for OGK-1 and 75 billion for Inter RAO EC. But from early 2011, Novatek increased its deliveries to Inter RAO's electric power

* It's interesting that in the same December, Rosnedra, without any unnecessary fuss, prolonged the validity period of the license for Yamal-SPG from 2020 to 2045 (*Vremya Novostei,* March 25, 2010).

stations up to 14-15 billion cubic meters from a total demand of 17 billion cubic meters. Novatek also enticed Itera's 11-year-old client UGMK (a Ural mining and smelting company) in the Sverdlovsk region (the volume of deliveries was 600-650 million cubic meters).[23]

Thirdly, Novatek started using the tool of M&A against Gazprom and Gazprombank. In December 2010 Gazprom had to reduce its share in Novatek two times – 9.4% of this share was bought by Gazprombank for 57.46 billion rubles, and in March 2011 an announcement appeared about selling this package to Mikhelson and Timchenko for 82 billion rubles (i.e. the "mediator's" profit amounted to around 24.5 billion rubles).[24] The market price of this package this year is about USD 4 billion, but in December 2010 Gazprombank bought it two times cheaper.[25]

At the end of 2010 – beginning of 2011 another set of deals with the participation of Novatek, Gazprom and Gazprombank took place. The first one dealt with Severenergia. Initially it was called Enineftegas and was created on the basis of assets that Italy's Eni and Enel bought at the auction of Yukos property in April of 2007. The lot, for which the winners paid 151.536 billion rubles (USD 4.84 billion at the going rate) included 20% of Gazprom Neft shares, 100% of Articgas shares, 100% of Urengoil Ink and another 19 small assets. In total, this company owned licenses for oil development at four deposits in YNAR. The total oil resources in the ABC1+C2 categories amounted to 568 million tons, while those of condensate were 155 million tons, and gas was 1.3 billion cubic meters, or 13.3 billion barrels of oil equivalent. Extraction at the first one – Samburgskii – was planned to start in 2011. But before the beginning of the auction Gazprom announced that it concluded a call option with Eni and Enel on purchase of these assets. As a result, in April 2009 Gazprom bought 20% of Gazprom Neft shares for USD 4.1 billion, and in August of 2009, 51% of Severenergia shares for USD 1.6 billion. It's the above-mentioned 51% that Novatek and Gazprom Neft intended to buy from Gazprom, having created in the summer of 2010 a JV called Yamal Razvitie. The deal of Severenergia was closed during the last day of October 2010. The remaining share, 49%, belongs to Arctic Russia B.V., the JV of Eni and Enel (60% and 40%, respectively). Naturally, Gazprom Neft was interested in oil extraction, while Novatek was interested in gas and condensate to be processed at the nearby Purovskii gas processing plant. Obtaining Severoenergia's deposits was even more profitable, as by November 2010 the government adopted the scheme of financing for the oil pipeline

Zapoliarie-Purpe, which will pass along three out of four deposits of this company. According to the scheme the state will guarantee credits for the sum of 60 billion rubles, which will allow starting the pipeline in 2015.[26]

The second deal had to do with the purchase on December 19, 2010 of 51% shares of Gazprom's "daughter" Sibneftegas for 26.88 billion rubles (USD 874 million at the current rate). The story of Sibneftegas is quite instructive as an example illustrating, on the one hand, Gazprombank's monopolist-blocking behavior, and on the other hand, Novatek's activity of breaking through this monopoly. Sibneftegas was controlled by Itera (which branched off Gazprom already under its former leadership). In 2003 Itera even intended to develop its largest deposit, the Beregovoe one. But in the course of three years Gazprom blocked access to the pipe, and at the end of 2006 Itera was forced to yield 51% of assets to Gazprombank for USD 131.5 million, and then extraction at the deposit started. Ever since Gazprombank repeatedly tried to resell its Sibneftegas asset to Gazprom, but the latter always refused, demanding changes in Sibneftegas' charter according to which the company was to be managed on parity terms with Itera (which had around 49%) and the extracted gas would be divided according to the partners' shares. Novatek, on the contrary, was flexible. Its leaders believed that as the shareholder possessing a controlling block of shares and majority in the board of directors it could completely manage operational activity of the enterprise, and to settle serious, key issues, demanding a qualified majority Novatek leadership that would "build partnership relations" with the minority.[27]

Generally speaking, against the background of Gazprom's sluggishness, lag effect and indecision there is an impression that there are no limits for stormy expansion of Novatek's leaders. Anyway, it spreads to all those spheres where Gazprom, for objective, but more often subjective reasons, applies the brakes. So, for example, in December 2010 Mikhelson's offshore company Miracle agreed with Gazprombank on the purchase of the largest petrochemical holding in Russia, SIBUR, for USD 5.5 billion. The deal was realized stage by stage: at first, a 25% share of this enterprise was bought, in February the next year the Federal Antimonopoly Service (FAS) approved a deal for the next 25%, and in April 2011 Mikhelson placed an application with Russia's Government Commission for Foreign Investments to increase its share in SIBUR to 100%, and the application was approved this summer. The paradoxical nature of this story is in the fact that at one time new Gazprom leadership applied a lot of effort to stop the "flowing away" of SIBUR's assets organized by old leaders through mediation of a certain Yakov Goldovsky, placed at the wheel of this holding. However after the arrest and expulsion of Goldovsky with the help of Gazprombank and Russia bank*, Gazprom's leadership hardly cared about consolidation and modernization of the holding, especially in the years of crisis. Nevertheless, the holding's management succeeded in making a partial breakthrough: at the Gubkinskii gas processing complex (Yamal) a low-temperature condensation facility was put into operation with the most modern technology, which allowed extraction of up to 99% of liquid fractions from associated oil gas. Mikhelson immediately assessed the situation and arranged for buying from Gazprombank a non-profile and burdensome SIBUR holding. At the same time the fate of the long-frozen Gazprom project on LNG production in the Leningradskaya region, Baltic LNG, was decided. Gazprom for several years had been discussing the project with a number of foreign partners, but in September 2007 assessed it as unprofitable. And now SIBUR buys from Gazprom Germania and Sovkomflot a site where it was planned to build an LNG plant and instead intends to create a methanol production unit with a capacity of 2 billion cubic meters a year. It will be the largest methanol-producing enterprise in Europe.[28]

It is quite possible that in the second half of 2011 some other M&A processes and purchase of new resources might take place. Anyway, the largest co-owners of Novatek, Mikhelson and Timchenko, plan by 2015-2017 to more than double capitalization of their company (up to USD 100 billion), bring natural gas extraction up to 60-80 billion cubic meters, and that of gas condensate up to 8 mln tons. (In 2010 Novotek's production was 37.2 billion cubic meters of gas and 26 million barrels of condensate. Its share in Russia's total gas production is 6%, and its share in deliveries to the Russian domestic market is 11%. Its proven/probable reserves are 1.84 trillion cubic meters of gas and 1.35 billion barrels of liquid. Its engaged employers are about 5,000 people.) In any case, information appeared in the press that Gazprom was discussing the possibility of selling 51% of Northgas** shares if Inter RAO, supervised by Igor Sechin (the deputy chairman of the RF government) bought the remaining 49% from Farkhad Akhmedov, who controlled this shareholding through Cypriote REDI

* The Russia bank is headed by Yuri Kovalchuk, who is closely connected with Putin.

Holdings. In mid-April 2011 Mikhelson just in case directed a letter to Miller asking to allow Novatek to carry out an independent assessment of the cost of 51% of Northgas' shares and present the necessary information. Miller agreed. However, for the moment everyone is waiting for the results of negotiations between Inter RAO and Akhmedov.

Fourthly, Novatek did not shelve negotiations with potential foreign partners. It tentatively created the JV Terneftegas with France's Total to develop the Termokarst deposit in the Yamal-Nenets autonomous region with proved gas reserves of 49 bln cm. Novatek's share in the JV is 51%, and that of Total is 49%. The latter will buy out additional emissions for USD 18 million, and took on itself 75% of expenditures up to the beginning of industrial gas extraction. Novatek itself will spend 25% on prospecting expenses in the next two years.[29]

However, after Gazprom and Novatek signed a special agreement in the spring of 2010 on export of Yamal LNG abroad (we'll dwell on it a bit later) Novatek received the chance to realize an option for Timchenko's 23.9% share in the Yamal LNG project. When Novatek paid Timchenko a bonus amounting to USD 100 million, it got a free hand to attract foreign partners to the project, and Novatek speeded up negotiations on development of its main field, Yuzhno-Tambeiskii, with Total, Shell, Mitsui, Statoil Hydro, ExxonMobil, ConocoPhillips and Qatar Petroleum. But the most intensive was its negotiations with Norwegian Statoil. This project envisages construction of natural gas liquefaction with a capacity of 15 million tons of LNG a year and 1 million tons of condensate, putting the first line into operation in 2016.

The breakthrough was made in early March of 2011 at Prime Minister Putin's country residence in Novo-Ogarevo. Total Chief Executive Christophe de Margarie and Novatek Chief Executive Leonid Mikhelson approved and signed two deals. In the first deal (which was closed in April) Total will buy a 12.1% stake in Novatek from its two chief shareholders, Mikhelson and Timchenko, for about USD 4 billion. Total has also committed to increase its stake to 18% during first year and to 19.4% during the next three years. In the second deal (planned to close by end of June 2011) the French

** Northgas resources amount to 295 billion cubic meters of gas, and 58 million tons of condensate and oil. In 2010 it extracted 3 bcm of gas with prospects to bring the extraction up to 8 bcm by 2015. Northgas started developing deep Neocomian reservoirs at the North Urengoi field in the Yamal-Nenets autonomous region in 2001 (Upstream, April 15, 2011, p.13; Vedomosti, April 28, 2011).

super-major will take control of a 20% stake in the Yamal LNG project (with this Total was set to become Novatek's strategic foreign partner in the Yamal liquefied natural gas development project). Total will provide technical expertise and financial booking to the development of the asset, which has estimated recoverable gas reserves of more than 1.3 trillion cubic meters.[30] Due to the fact that it obtained 12% shares of Novatek, Total had a claim on one place of the board of directors for the election of which an extraordinary meeting of the company's shareholders was held on June 27, 2011. The French have proposed their candidate, the head of its prospecting and extraction department Iv Lui Darrikarrer (the second-ranked person at Total). This would be the second important foreign expert in Novatek's leadership after American Chief Executive Mark Gyetvay, who is responsible for financial aspects of the business.[31]

In the meantime, Novatek's leadership started with confidence the realization of the LNG project's preparatory phase. In March 2011, Novatek subsidiary Yamal LNG awarded U.S.-based Chicago Bridge & Iron (CB&I) a front-end engineering and design (FEED) services contract for its planned liquefied natural gas plant on West Siberia's Yamal Peninsula. The scope covers FEED work for the whole 16.5 million tons per annum plant to enable development and exports from the South Tambey gas field, and the design of LNG storage and loading facilities. CB&I's FEED plan is based on using its international partners – Japan's Chiyoda and Italy's Saipem – as well as collaborating with Russia's NIPI Gazpererabotka design institute to address local design and authority approval requirements. The FEED will provide a basis for the detailed engineering procurement and construction phase, as well as project schedule and cost estimates to enable Yamal LNG to secure the final investment decision. This FEED work is due for completion in the first quarter of 2012.[32]

By the end of March 2011, reports suggested Norway's Statoil might also become a partner, though as of mid-June this was still not confirmed. Instead, in May 2011 the Indian paper *Hindustan Times* wrote that a consortium of Indian companies, ONGC Videsh, GAIL, and Petronet LNG, put in a claim for 15% of the Yamal LNG project. While Total and Statoil are important for Novatek primarily from a technological point of view, the Indians might secure another, not less important front, the one of marketing. Participation of the Indian consortium is the guarantee for the sale of about one third of the future Yamal LNG, and on full scale at that. Petronet LNG was created according to a decision by the

Indian government specially as an LNG importer (it already has one regasification terminal, while the second one will be launched in 2012), GAIL, which is controlled by the state and is the main gas seller in India, while ONGC Videsh is the operator of all foreign projects of the ONGC state corporation (it has a 20% share in the Sakhalin-1 project and 100% in Imperial Energy in Russia). A Novatek representative confirmed the fact of negotiations with the Indians, and pointed out that it was still early to speak about details.[33] It is interesting that approximately a year before that the Indian state company ONGC tried to establish business relations directly with Gazprom: on March 12, 2010 they signed with Gazprom a supplement to a memorandum of understanding in which they agreed about possible participation on Yamal.[34] However, just as it used to happen, no practical steps followed. And now, perhaps, ONGC received hope to find real mutual understanding with a more pragmatic Russian company.

Fifthly, during all this time Novatek's second co-owner Timchenko did not sit still. At the end of March 2010 the oil trader Gunvor, which Timchenko owns together with Swedish businessman Torbjorn Tornqvist, announced that from April 1 he would begin to work on the European gas market. The vice-president of the gas division of the company, Robert Ellen, told the press that on that very day traders would inject gas into storages on the territory of France, Germany and Slovakia into the preliminary reserved capacities. Gunvor has already concluded agreements with regasification terminals in Belgian Zeebrugge to deliver LNG to the northwest of Europe. The company plans this year to carry out up to five LNG deliveries (the standard capacity of a methane carrier is 130 thousand cubic meters or about 250 thousand tons of LNG), but the main deliveries of up to 20-30 gas carriers a year will be accomplished in two to three years when the LNG plant in Yamal will start working. Gunvor Company will at this stage cooperate with all the main international gas producers and will concentrate on Europe, but in the near future plans deliveries to India, Kuwait, and AP region countries.[35]

Facing the increasing attack of Timchenko's group alliance with Novatek, Gazprom had to step on the way of historic compromise. On March 23, 2010, the heads of the two companies, Miller and Mikhelson, had a meeting during which, according to the gas monopolist's press service announcement, they "came to an agreement on main principles of cooperation and realization of LNG, which would increase the attractiveness of the project."[36] Judging by everything, those were the first negotiation of partners enjoying equal rights between the monopolist and an independent gas company. But in this case it would have been wrong to ignore the important role of Deputy Premier Igor Sechin, the curator of the Russian fuel and energy complex and the man who personally lobbied in 2008-2011 for free access of independent gas distributors (including associated gas). Naturally, such actions and decisions could not take place unknown to (and maybe with the direct encouragement) of the prime minister himself. This way or another, but the result of the confrontation between Gazprom and Novatek was an "agency agreement," i.e., an agreement when one party (agent) commits itself to make for remuneration on a commission from another party (principal) legal, and other steps on its behalf, but at the expense of the principal. In the given case Gazprom acts exactly as a commercial agent who receives a commission for his service on organization of Novatek LNG exports. At the beginning of the negotiations the leadership insisted on maximal concessions to buy out all LNG from the client. But Novatek's leaders insisted on preservation of their gas ownership. Then Gazprom demanded a 2% commission, but finally had to agree to around a symbolic 1%. Another concession in the signed agreement was an acknowledgement of the South-Tambei deposit as "a start-up in creation of LNG capacity in Yamal."[37] As for condensate, it remains in full possession of Novatek (as it can be transported by railway or motor transport). It is interesting that for two years following the beginning of gas extraction will be injected back into the bed to increase condensate output. Besides, in the process of construction of the line for gas liquefaction Novatek might obtain an opportunity to use sea routes, bypassing Gazprom's transport gas net. It is not an idle supposition and is confirmed by the fact that Novatek practically acted as an initiator in reanimation of the NSR's efficient exploitation. Of course, it would be wrong to say that before the appearance of Novatek nothing happened beyond the Arctic Circle in the hydrocarbon cargo transportation sphere within the framework of the NSR, which was principally neglected during the Yeltsin era. Let's take, for example, Naryanmarneftegas, a JV of Russian oil company LUKOIL and ConocoPhillips, which is developing the oil condensate field Yuzhnoe Khylchuyu (150 km from Narian-Mar, the capital of the Nenets autonomous region) that is believed to be one of the largest beyond the Arctic Circle. In 2008, LUKOIL put into operation the Varandeiskii oil shipment terminal, whose important constituent is a stationary offshore ice-steadfast dock, located in the open seas 22 km from the coastline (for the moment, it is the only object of its kind in the world). Beside it, the terminal complex consists of an underwater oil pipeline and coastal reservoirs. Of this complex construction, 30% was financed by ConocoPhillips, and the remaining 70% was given by LUKOIL. In 2009, 18.5 million tons of oil with gas condensate was developed in the Nenets autonomous region, but only a bit more than 7.5 million tons were transported by sea. Bearing in mind that in 2011 it is planned to start development of the Prirazlomny field (located 60 km from the region's coast) and that raw materials from it will be transported by sea, the significance of the speedy development of the NSR is considerably increasing. It's not by chance that the issue was discussed on November 26, 2010 in Naryan-Mar, where assizes of the Council of Federation Committee for National Maritime Policy took place. The session topic was, "Actual issues of state regulation on the Northern Sea Route and its influence on development of the regions (based on the example of the Nenets autonomous region)." It was attended not only by Council of Federation members, but also by State Duma deputies, representatives of the Ministry of Transport, Ministry of Emergency Situations, and other federal executive power bodies.[38]

While discussions were on active leadership of Novatek, the NSR was practically opened through de facto navigation: on August 14, 2010, the tanker Baltika, with an experimental consignment of gas condensate (70,000 tons) freighted by Novatek from Sovcomflot (a state shipping company) left Murmansk in Russia's extreme northwest and went to the Asia-Pacific region across the NSR on September 6. This consignment, for China National Offshore Oil Company, arrived at the Chinese port of Ningbo. The consultancy Business Monitor International commented that Novatek could reduce its normal journey to Asia of around 20,400 km around the Suez Canal to around 12,500 km, allowing for significant reduction in transit time, fuel costs, and the risk of pirate attacks.[39] Having demonstrated the route's viability, Novatek aims to send six to eight condensate cargoes along the NSR in 2011. Mikhelson who was on board the icebreaker "Rossi" during the whole route, told a reporter from Vedomosty that delivery of condensate via the Suez Canal at that time would have cost Novatek USD 50 per ton, i.e. approximately USD 3.5 million for the whole consignment, while delivery along the NSR cost half a million dollars less. At the same time, Sovcomflot's General Director Sergei Frank, who was on his tanker the "Baltika" during the whole route, explained that time economy was 45%. He added that Novatek's plans for 2011 would be a serious help for Sovcomflot and Atomflot, as they fall on a low season for them. When the announcement about two accompanying icebreakers, the "Russia" and the "Atomflot," appeared, there also appeared suppositions that it was all done out of over-cautiousness. But soon the "secret" was opened: when the caravan reached the strait between the Novosibirsk Islands and the mainland, the second icebreaker separated from the caravan and doubled the islands from the north to explore a more northern route, where larger-capacity vessels could pass (the Suezmax with deadweight from 150 000 tons). As Mikhelson told reporters, in the near future Novatek plans to direct APR LNG on large-capacity gas tankers.[40]

On February 1, 2011, Novatek and Atomflot struck deal on the NSR. They signed a cooperation agreement that lays down both companies' intent to engage in the fields of safe shipping. The agreement includes:

a) shipping of equipment for the development of the South Tambey field on the Yamal Peninsula;
b) shipping of LNG from the same field;
c) and organization of steering by icebreakers during transportation of Novatek's gas condensate along NSR routes to Asia-Pacific countries in 2011.[41]

NOVATEK PHENOMENON – SINGLE SUCCESSFUL START-UP PROJECT OR REAL START FOR NEW STATE STRATEGY?

In special Russian publications and some mass media sources there was certain confusion or even complete incomprehension of the essence of the events that were taking place concerning successes of Novatek in 2008-2010 (and even in the first half of 2011). It's surprising, but was especially demonstrated by the monthly magazine *Neft I Kapital*, which claims to be reputable and knowledgeable. In one of its Summer 2010 issues (when it seems that the situation had almost been clarified) there appeared practically an editorial, strange in its lack of logic, that presented a scheme describing the alignment of forces and Gazprom leadership's behavior.[42] The article presents Gazprom as an omnipotent organization and Novatek as a toy in its hands. Meanwhile, the article completely ignores the role of the government (and especially that of Putin), while the very favorable regime created for Novatek is ascribed to Gazprom leaders as a super-resourceful Gazprom intrigue. It turns out that Gazprom allegedly planned it *to deceive foreign investors*, so that they would bite the bait and invest at full capacity, planning in reality to develop Yamal LNG not earlier than 2024-2027 (as was written by Gazprom's leaders in the first variant of "The General Scheme of Russia's Gas Industry Development," presented to the government for adoption, but not adopted. It is interesting that the "traces" of such an interpretation of the situation can be found in further publications not only of the given magazine, but of other mass media sources as well.

The main sin of such an interpretation was, however, in ignoring the fact that the government had long ago formulated the concept of state-private partnership (SPP), where the state's role was in the formulation of ideas and large national projects, in partial investment in the latter (especially in various infrastructure spheres), etc., while the role of business was that of operational initiatives, realization of information technologies and the role of main investor. In the past Gazprom has clearly demonstrated its inability, and even reluctance, to give up its comfortable existence and fit into this SPP concept, having balanced its purely corporate interests with national goals. Instead, Gazprom's leaders spared no money for self-advertisement, for example, broadcasting the slogan "Gazprom is a national heritage," which could be heard from Russian TV sets continually over the course of the last several years. All this could not pass by Putin's attention. Just as the fact that he practically had to display initiative himself in the actual realization of all the largest energy projects by applying the "manual management" method (as if Russia is Singapore). Discontent accumulated. We have already mentioned his tactics in stimulating Gazprom's activity (as well as that of other organizations and agencies) in the Far East, having appointed Vladivostok as the place for APEC summit in 2012. Now he again, probably, decided to apply "shock therapy" for Gazprom in the LNG projects sphere, having created for the latter an active competitor represented by Novatek.

Perhaps it is necessary to stress once again that all the steps made by the government and Putin personally are in no way aimed at destruction of Gazprom as a large corporation. It would have been extremely unreasonable and damaging for the whole economy. But they are efficiently aimed against the negative aspects of Gazprom's monopolism, which in recent years has turned into the main brake on almost all of Russia's large energy projects, and turned Gazprom itself into a hindering factor in its own development. For the above-mentioned suppositions not to seem a kind of wishful thinking, it is necessary perhaps to present in confirmation some real facts.

1. First, the real divergence of views on the situation in the gas industry between Gazprom's leaders and the government (Putin and Igor Sechin, his deputy on the fuel and energy complex) were more clearly outlined in 2009. The main lesson learned by Putin from the world crisis and the damage caused to Gazprom was that continuation of former conservative-inertial strategy of Gazprom's leaders would inevitably lead the gas industry into a blind alley. The conviction in necessity to find that key link with which it would be possible to pull the whole industry out of a "Gazprom bog" was strengthening. This link could be LNG. Having concentrated the government's efforts on the latter it would have been possible to resolve two principle tasks – to raise the gas industry to a new technological level, on the one hand, and to get natural gas exports out of a narrow regional framework to a global space, on the other. The first serious rift in relations with Gazprom appeared in the summer of 2009 during discussion of a "General Scheme of Russia's Gas Industry Development for the Period up to 2030," a document prepared by experts of applied research institutes under the aegis of Gazprom. It contained no breakthrough ideas, but only outlined general indications for a far-off future, with an excessively large lag between minimum and maximum indicators of future achievements. The government returned the document as requiring improvement. Among the main criticisms there was noticed a lack of concrete plans in the sphere of projects on natural gas liquefaction and data on its export.

2. In a new version of the "General Scheme" (preparation of which took more than a year) there appeared a section on LNG, where the Far Eastern and Shtokman projects were mentioned, and even the Yamal-LNG project. Regarding the latter, quite a detailed comment was given, the essence of which is as follows: yes, technically the project can be realized, but economically it does not seem reasonable. At the same time, negative aspects of the project (real and imaginary ones) were described in detail and the project itself was set off against another Yamal project, Kharasaveisk LNG, that several years before was rejected by Gazprom in favor of traditional transportation by pipe. As a result, Yamal-LNG wasn't even included in the new version of the "General Scheme" on the

list of new LNG capacities under way in Russia. This was equal to a direct challenge to Putin. Already in September 2009 he had held a meeting in Salekhard (the administrative center of YNAR) on energy problems and invited representatives of more than a dozen foreign corporations to it. There he persistently invited co-participation in LNG projects. His signal was obvious: the concept supported by Putin – the one of state-private partnership – as the major component includes not only Russian private capital but large foreign (both private and state) corporations as well. Let me remind you also that at the end of 2009, Putin, as chairman of the Committee on Foreign Investments, contributed in every way possible to the growth and organizational strengthening of Novatek already described above.[43] Finally, there is a really momentous fact: in June 2010 in Paris, before the beginning of the International Economic Forum, Putin met with De Margery, the executive manager of Total, and mainly discussed not the issue of the Shtokman project, but Total's participation in the Yamal-LNG project (De Margery expressed a wish to buy a 20-25% share). At the same time he passed a personal message to Putin from the Qatar government expressing hope for cooperation between Qatar Petroleum and Novatek.[44]

3. Though Gazprom's intrigues led to certain hindering of Mikhelson's negotiations with supposed foreign partners in the project (he decided to wait for the final clarification of the government's standing), Gazprom's triumph was not long-lasting. On October 10, 2010, Putin held another assizes in the very same YNAR, this time in Novii Urengoi. On the eve of the meeting the premier visited the main Novatek field Yurkharovskoye. While touring the gas field, which now has a capacity of 33 billion cubic meters of gas per year, Putin inspected a methanol production unit, the only one in Russia installed directly in a gas field. The prime minister also examined the work of the complex that prepares the gas before it is fed into the country's integrated gas distribution system. According to Novatek, which manages the Yurkharovskoye gas field, this project is unique because using the methanol production unit at the field helps rule out the environmental risks related to transporting this reactive substance. The head of Novatek, Mikhelson, informed Putin that capital investment in this field had amounted to about 118 billion rubles and that the field had enough capacity to provide about 10% of the gas consumed in Russia. Mikhelson also briefed the prime minister on the innovative technologies that are being used at the Yurkharovskoye gas field, including the disposal of drilling slurry and on-site methanol production units. In addition, Putin

was told about the recently launched gas condensate pipeline, which is powered only by solar and wind energy. In the morning he announced that he signed an order on the plan of development of liquefied natural gas on the Yamal Peninsular. In fact, at the moment this document has to do only with Novatek, and envisages vast privileges. For the first time within the general scheme framework the government supported only high-tech projects on gas extraction and not the whole extraction. "We have to think about tax benefits for those companies that deal with new gas projects. For example, we shall not manage without such benefits during work on the shelf or LNG," Putin said, adding that he had already "charged the Ministry of Finance and Ministry of Social Development with preparation of appropriate proposals. They have already formed a mechanism for granting benefits."[45]

The plan signed by Putin envisages preparation of an appropriate document package by departments, with final adoption of it by the government for submission to the State Duma in early 2011. Meanwhile, the Russian Parliament is expected to approve a series of tax cuts and incentives later this year to lighten the financial burden on Novatek and its partners in the Yamal LNG project. Under the package proposed by the Finance Ministry, gas produced on the Yamal Peninsula and converted into LNG will be exempt from production tax from January 1, 2012. The ministry also proposed an oil production tax exemption for condensate produced with the gas on the Yamal Peninsula. According to the proposal, the exemption will be valid for the first 250 billion cubic meters of gas produced under a single license, or 12 years from the start of commercial production, whichever occurs first.[46]

According to the complex plan of the Yamal LNG project approved in Putin's order, in 2012, land management works should be completed on the peninsula, and in 2012-2016 it is planned to build the first turn of the LNG plant and simultaneously to prepare documentation, while in the course of 2013-2017 it is planned to create the second turn, and the third one in 2014-2018. (Mikhelson specified that every turn is 5 million tons of LNG per year.) The plan also envisages measures to provide transport logistics, to create infrastructure, to provide labor resources and security of work in offshore strips of the Gulf of Ob and Kara Sea. The Ministry of Transport, Ministry of Industry and Trade together with Sovkomflot and Novatek must determine what is necessary to deliver equipment to Yamal and to transport LNG and condensate from it; to calculate need for an icebreaking fleet, to create an ice-class tanker fleet, to build an airport and to prepare a pass-through shipping canal and seaport. The Federal Security Service and Ministry of Defense were also given tasks. The former should simplify the regime of stay for company employees working on the Yamal-LNG project in this zone, while the military ought to realize steps to clear the territory of mines.[47]

4. In the course of the meeting in Novy Urengoi, all the statements and Miller's request to spread the benefits system to other gas projects (i.e., those of Gazprom) was met with vague remarks by Putin that "we shall probably think about it." In reality, it was decided to name the project Yamal-LNG pilot start-up project or special green field project, obviously to cut off Gazprom's traditional claims for a state budget. And in November 2010 the government adopted a regulation on standards of opening information to natural monopolies, which are rendering services on gas transportation by pipes. In fact it meant a radical change binding Gazprom" to provide transparency of monopolist services and relations with competing independent gas companies. It considerably reduced the possibility of an ungrounded refusal of access to the pipe. More than that, the government's criticism of Gazprom is becoming more and more open and directly threatening the monopolist status of this company. In early February, 2011, a month before the announcement about Novatek and the Total deal, Putin declared at a meeting in St. Petersburg in 2010 on the results of fuel and energy complex that the government of the Russian Federation may be ready for changes in legislation if Gazprom – a Russian monopolist in gas transportation via main pipelines – did not allow independent gas producers access to its transportation capacities. "Either you work more efficiently, or we shall be forced to change the existing rules, to change the legislation," the premier said at the meeting, having stressed that "the company puts its own interests above the interests of the industry's development."[48] We could even say "the country."

Promoting in every way possible the formation of a new grand LNG production center on the Yamal peninsula, Putin did not forget to provide it with an additional raw materials base. Soon after the meeting in Novy Urengoi, on December 1, 2010, the premier through his order supplemented the complex plan on LNG with new assignments: Rosnedra, the Ministry of Labor, Ministry of Energy, Ministry of Economic Development and "all the interested federal executive power bodies" must in 2011 grant the right to use the subsoil of the Severo-Obskii and Vostochno-Tambeiskii regions in the Gulf of Ob of the Kara Sea and two land fields on the Yamal Peninsula, Salmanovskoe (also called Utrennee) and Geophizicheskoe. The resources of the latter two amount to about 900 billion cubic meters (767 and 142 billion cubic meters, respectively), while the Severo-Obskii plot contains approximately 1.5 trillion of expected gas reserves. There is no data on the Vostochno-Tambeiskoe field, but there is a general estimation for the Severo-Obskoe and Vostochno-Tambeiskoe fields: almost 1.8 trillion cubic meters of gas and 521.4 million tons of oil and condensate. As all these deposits belong to the category of large strategic ones, while two of them are at the same time shelf deposits, during organization of a tender appears the problem of access of private companies. But Premier Putin at the end of 2010 ordered the government committee on gas and energy complex issues, reproduction of the mineral and raw materials base and increase of energy efficiency of the economy to "provide in established order realization of measures aimed at extension of the resource base of the forming center for LNG production on the Yamal Peninsula, including by way of licensing of undistributed funds of subsoil."[49] This way or another, claims for obtaining a license were made by Novatek (for all four fields) and Itera, with Yakutskaya Toplivno-Energeticheskaya Kompania (a member of Ziyavudin Magomedov's Summu Kapital), were interested only in the smallest Geophizicheskoye field. Though the tender for all four plots is planned for June 23, 2011, in early May it became known that only Novatek will be allowed to participate in it, while the other claims the Rosnedra committee regarded as "falling short of the requirements."[50]

It was absolutely clear from the majority of Prime Minister Putin's speeches that the question was not about one extraordinary case that became the object of his great attention, but that he regarded Novatek *as an example and a precedent* that would in the future be followed by many other similar projects within the framework of state-private partnership on creation of LNG production to raise the industry's level and diversify Russian gas exports. It's not by chance that among the orders directed to Minister of Energy Shmatko he charged him to render every possible assistance to such initiatives. And one such initiative really did not keep us waiting and was right in the Arctic region, near YNAR, the Arkhangelskaya region, to be more precise, in its Nenets autonomous region (NAR). Influenced by the precedent created by Novatek, the small and little-known company Alltech, which received licenses for the Kumzhinskoye and Korovinskoye fields in the Nenets autonomous region in 2010-2011, changed its initial, more modest intentions and decided to deal with the Pechora LNG project. Alltech is currently looking for a strategic partner outside of Russia to take up to a 49% stake in this LNG project, which calls for the development of two fields in the Nenets region and exports of LNG from the port of Indiga. The project has full backing of Governor Igor Fedorov, as he explained to South Korea's general consul in St. Petersburg, Lee Sok Bae, during his recent visit to Nenets' regional capital Naryan-Mar. An Alltech executive said that the company is in advanced talks with Vietnam's PetroVietnam, with China's CNOOC, and with South Korea's Kogas. Last year, France's Technip completed a feasibility study for the USD 4 billion LNG plant, which will have an initial annual capacity of 2.6 million tons of LNG and which may be doubled in the second phase. The first phase is set to be completed in 2015.

According to the Alltech executive, the company is now considering building the LNG plant on a platform that may be brought to an installation site near Indiga Port to avoid large-scale construction activities in environmentally sensitive onshore areas. Potentially, the caisson foundation of the platform may be ordered from the Sevmash military shipyard, which recently completed an oil production platform to be installed on Gazprom's Prirazlomnoye field (in the Pechora sea), he said. Alltech plans to announce the final investment decision on the Pechora LNG project in 2011. The company also signed an agreement for construction of four tanker-gas carriers (with deadweight not less than 177 thousand cubic meters) with the Far Eastern Shipbuilding and Ship Repair Center.[51]

TURN TO ASIA PACIFIC

The second large shift in the Russian oil and gas sector over the last two to three years was the beginning of a turn to the Asia Pacific. If the main essence of Putin's first presidential term was "collecting stones" (not only in the oil and gas sphere, but in consolidation of Russian statehood in general, which Yeltsin had put on the verge of collapse), starting from the second term of his presidency Putin for the very first time in Russian history (including that of the USSR) as the country's top leader began regular visits to Eastern Siberia and the Far East, as well as started to attend forums in the Asia Pacific. There came the understanding (a bit delayed though) of the necessity of a cardinal shift in the process of geographical balancing of the

Russian oil and gas sector, of the need to pull up energy business activity in Eastern Siberia and the Far East to eliminate the one-sided dependence of this sector on Europe.

By the way, ignoring the importance of Eastern Siberian and Far East development for the country was typical for large private and state oil and gas business representatives, who behaved as *timeservers* urging to "squeeze all the juices" from the structures they had obtained and ignoring complicated and expensive, highly cost-based greenfield projects. The first serious battle in this sphere took place in 2003, when the question about construction of an East Siberian and Pacific oil main pipeline (ESPO) was put on the government's agenda. The most active opponent of this oil pipeline to Nakhodka (today Kozmino Bay) was Mikhail Khodorkovsky, the president of the largest oil company, YUKOS. He personally agreed with the Chinese on a shortened version of the pipe to be closed up on China. He even yielded to China's insistence and gave up his initial plan of oil transit via Mongolia, with whose authorities he had also managed to conclude an agreement. Khodorkovsky did not spare money to lobby his plan in legislative and executive power structures and in mass media. Unfortunately he also managed to rely on the opinion of former leaders of the Siberian branch of the Russian Academy of Sciences, and certain researchers there stated in interviews that the resources of East Siberia were so scant that they obviously wouldn't be sufficient to fill the projected pipe capacity (80 million tons a year) and would barely be enough to realize the variant of pipe directly to China (30 million tons a year). However, better late than never, as the saying goes. Nowadays researchers of the Siberian branch are more realistic in their reasoning, as we can, for example, see from publications in the magazine *Neft Rossii* ("Oil of Russia") and in other sources. That's what a group of authors now state in a comparatively recent article.[52]

East Siberia and the Far East concentrate more than 54 trillion cubic meters, or about 21% of the initial total gas resources of Russia, explored reserves of 4.9 trillion cubic meters (10%). The extent of exploration of natural gas reserves in these two regions is 8.6% and 11.3%, respectively, which demonstrates promising perspectives of new discoveries. Total reserves of condensate in the given regions amount to 3.3 billion tons, while for explored reserves, 220 million tons, the extent of exploration is 6.3% and 7.9%, respectively. Here also are more than 15 billion tons of total reserves of oil (more than 18% of total country's reserves), while the share of unexplored reserves reaches 50%. According to the table presented by the authors, oil development in East Siberia and the Far East, which increased from 13.8 million tons in 2008 to 36.2 million tons in 2010, is forecasted to reach 75 million tons in 2015 and 95 million tons in 2020, while by 2030 it will reach 112 million tons.

I would like to point out another detail: as soon as Putin, reacting to the request of ecologists and advice of academic experts, moved the route of the ESPO oil pipeline 400 km to the North of Lake Baikal and much closer to the prospective oil and gas fields of East Siberia, representatives of Russian oil and gas companies instantly became active and started to obtain licenses for blocks of territories to invest in further prospecting and construction of oil-field facilities, and nowadays nobody doubts that the planned capacity of the main ESPO pipeline will be filled. The first half of the project (to Skovorodino and offset to China) has already been constructed, and in early 2011 was put into operation. The second stage of construction must be completed in 2012, but an oil terminal complex in Kozmino Bay is already working and receives oil transported along the railway from Skovorodino (where a transshipment complex has been constructed) to Kozmino.

ESPO - as far as its significance for Russia is concerned – may be placed in one historic line with Trans-Siberian main railway built before the October Revolution on the initiative of the outstanding Russian figure Sergey Vitte. Today, another important step in the development of Russian Far Eastern region and expansion of its cooperation with Asia Pacific countries is the decision to hold the annual APEC meeting in Vladivostok in 2012. Many in Russia believe that acceleration of energy projects in a new oil and gas province in East Siberia-Far East in 2009 is connected with the decision to hold the APEC summit in Vladivostok. On the surface it really looked like that, but the final decision on the location of this event was preceded by stormy discussion in governmental circles, in the course of which some representatives of inertial top bureaucracy of the country proposed to simplify the task and hold the summit either in Moscow or in St. Petersburg, where there already was infrastructure. However, the country's top leaders (and especially Putin) decided to use the APEC summit in Vladivostok as a breakthrough factor to accelerate the richest natural energy resources of the new province and establish closer economic cooperation with Asia Pacific countries.

The following scheme illustrates the main elements of this program aimed at development of a new energy province in the east of Russia:

Source: ERINA Report, vol. 91, January 2010, p. 25.

Figure 5.1 *The development of oil and gas complexes in the eastern regions of Russia*

We can notice unusual speed and decisive steps made by the countries' leadership in 2009. Putin personally attended the ceremony of welding the first link-up of a new Sakhalin-1–Khabarovsk–Vladivostok gas pipeline, which by 2012 will provide gas not only to Vladivostok, but also the whole Primorskii region. Gazprom, which in the spring of 2009 only started construction of the Bovanenkovo–Ukhta gas pipeline*, announced in the summer that putting the object into operation was postponed to the third quarter of 2012. Capital investments were reduced by 20% and means (including those of equipment and personnel) were moved to the Far Eastern project.[53] In October 2010, according to an announcement by a high-ranking executive manager of Gazprom, the beginning of natural gas extraction on Kirinskii field within the Sakhalin-3 project framework was shifted to 2011 or the very beginning of 2012, i.e., two to three years earlier than was planned, an unprecedented case. Development of this project is planned as the second stage of the new Far Eastern cluster development, which will be started by the above-mentioned Sakhalin-1–Khabarovsk-

* Bovanenkovo is the largest gas field on Yamal, with reserves estimated at almost 5 trillion cubic meters of gas, while the volume of extraction is planned at the level of 115 bln cm a year, and in the long-term perspective – 140 billion cubic meters a year.

Vladivostok gas pipeline, 1,300 km long with throughput capacity up to 7.5 billion cubic meters a year. In 2009 Gazprom allotted 50 billion rubles for this gas pipeline construction, which is two times more than had been planned for the year earlier.[54]

One shouldn't think, however, that "Gazprom" has itself given up its traditional habit of declining or postponing the realization of projects (especially "detested" ones). The acceleration of the Kirinski block development was necessary due to the persistence of the prime minister, and because for many years already Gazprom (even with Ministry of Energy's mediation) was unable to agree on a so-called "gas component" with the operator of the Sakhalin-1 project Exxon Neftegas, or with another participant in the project, Rosneft.* Besides oil, Exxon also extracts associated gas, part of which (1-1.5 billion cubic meters per year) is delivered to consumers in Khabarovsky krai, while the rest is injected back into the formation. The "gas component" is understood as the development, according to the project's plan, of the Chaivo field with a project level of extraction of 8 billion cubic meters per year. As the project is carried out within the framework of a production-sharing scheme, and the gas share prescribed for Exxon and Rosneft is their property, they want to realize it as they like, in particular, to export it to China. But Gazprom has reminded them about its monopolistic export rights and offered to buy this gas at low domestic prices from them. Shell proposes to process this gas within the Sakhalin-2 framework, having completed the construction of a third line and having increased the capacity of the existing enterprise by 50%. Lately, Exxon has not rejected this variant, but Gazprom is insisting. As a result the government demanded for a third time to accelerate putting into operation the Kirinskii block of the Sakhalin-3 project. Gazprom, which formerly declared that it intended to develop this project itself, had to reconsider this intention twice. The first time was in the autumn of 2010, following the second time the government instructed the work to be accelerated, then it was decided to get the Norwegian-American company FMC Kongsberg Subsea involved in the installation and erection of an offshore underwater extraction complex. This time, after the tragedy in Fukushima, Japan, it was decided to renew negotiations with the Sakhalin-2 participants (Shell,

* The consortium of the Sakhalin-1 project consists of Exxon (30%), Rosneft (20%), ONGC (20% which were sold to it once by Rosneft) and the Japanese group Sodeco (30%).

Mitsui and Mitsubishi) as well as with India's ONGC.[55]

In general, however, there is an impression that Gazprom's leadership hopes to overcome APEC 2012, which was such an unpleasant event for them, with minimal cost to its corporate interests. This is confirmed by Gazprom's attitude and actions on the completion of the formation of the third link of the above-mentioned Far Eastern cluster connecting the Chayandin deposit (Yakutia) to Khabarovsk in 2014: the Vladivostok gas pipeline (a major part of its 3,000-kilometer route should pass in one pack parallel to the constructed ESPO main oil pipeline, which will make construction considerably cheaper). No less important is the fact that the general project of the cluster also envisages construction of a whole number of modern enterprises for gas processing, construction of a new LNG line[*], gas-processing and oil-refining plants, etc.[56] There is, however, only one thing in this idyllic picture that raises doubt: how seriously can one rely on the words and promises of Gazprom's leadership? Its reputation has already been blemished, at least by recent steps regarding Chayanda. This field was included by the government on a list of strategic deposits and was put up for auction. But soon it became clear that Chayanda was received by Gazprom without any tender. Appropriate instruction was given to profile agencies by the then-candidate for the presidency, Vice-Premier Dmitry Medvedev. Then Gazprom confirmed at a high level to the Yakutia leadership that it was ready to start gas extraction in Chayanda in 2013. Reassured local subsoil users even created a new company, Suntarneftegas, and began to buy licenses for areas adjoining the future route of the Chayanda–Khabarovsk pipeline. However, "Gazprom, having obtained the license, began to specify the terms of putting into operation the Chayanda project and the main pipe, shifting them from 2013 to 2016.[57] Today, however, having received another insistent order from the prime minister, Gazprom's leadership, in the person of one of Miller's most conservative deputies, Alexandr Ananenkov, in June 2011 began to speak again about the possibility of attracting foreign partners to the development of the Chayandinskii and Koviktinskii fields, linking it to their participation in gas and chemical projects.[58] But there are no guarantees

* At the end of May 2011, Reuters reported that an agreement had been reached between Gazprom and Japan's Mitsui and Mitsubishi on the construction of an LNG plant in Vladivostok with a capacity of 10 million tons, at an approximate cost of 7 billion euros. It is to go into operation in 2017 and its main consumers are Japan and South Korea. See: Kommersant, May 27, 2011.

that after 2012 Gazprom will not return to its old tactics of procrastination and even renunciation of these promises. The thing is, quite recently all along the wide front of oil and gas projects in the course of 2009-2010, intensive negotiations were on with Shell, Exxon, and a number of Japanese corporations (especially participants in the already working Sakhalin-2 project). During his visit to Japan, Putin proposed in his meeting with Japanese businesses, in particular to Mitsui and Mitsubishi, that they join the Sakhalin-3 project, consider the possibility of participation in the Chayanda and Shtokman projects, in the development of the Yamal deposits, and so on.[59] Miller also participated in that trip, and at his press conference repeated all the premier's proposals, but after returning to Russia, no real actions followed.

CONCLUSIONS

Finally, I would like to briefly formulate the main conclusions made from the above:

1. The Russian Arctic zone is not only the key base for development of the oil and gas industry, but also a "weak link" in which important shifts in the very model of this sector have been building up in the last three to four years.
2. The most significant shifts are: a) breaking through some state oil and gas monopolies in the home market and the appearance of real competition and b) a real, and not just declared, turn of the country's top leadership and Russian business to the Asia Pacific, to the establishment of equal and mutually beneficial energy cooperation with the region's countries. Here we can clearly trace the outlines of a modernization strategy by the country's top leaders, and their reaction to the global crisis, accompanied by oil and gas shocks, against the background of the inertial and unprofessional reaction of the bureaucratic apparatus (including some state corporations), their urge to give the Russian oil and gas industry new impulses and to fit it into a wider international context.
3. It became obvious that fast and effective development of Russia's fuel and energy complex is simply impossible without the closest international cooperation both with state consumers of Russian

hydrocarbons, advanced oil and gas corporations and service world companies. Any pretension to originality or independent development of Arctic resources leads only to lengthy procrastination and a rise in the cost of large energy projects (this is clearly proved by Gazprom's 20-year history, during which its monopolism was the main factor hampering development of the oil and gas sector).

4. At the same time, the process of renewal of Russia's oil and gas industry will take several years, as the scale of the tasks it faces is enormous, while the obstacles necessary to overcome are too rooted in the general economic structure of Russian society (the principal ones are double-dyed bureaucracy, pervasive corruption and the method of "hand management" still inevitable due to management's low level of professionalism).

Notes

1. The U.S. Energy Information Agency states that the Arctic could hold about 22 percent of the world's undiscovered conventional oil and natural gas resources, and about 30 percent of the world's undiscovered natural gas resources, about 13 percent of the world's undiscovered oil resources, and about 20 percent of the world's NGL resources. Source: http://www.eia.gov/oiaf/analysispaper/arctic/
2. *Oil and Gas Journal*, May 2, 2011, p. 48.
3. Note: During editing of this paper subsequent to the 2011 NPAC Conference, Shtokman gas production was cancelled in late August of 2012 because of soaring costs, falling European demand and cheap shale gas in America.
4. *Neftegazovaya Vertikal*, No. 20, 2010, pp. 8-9.
5. *Vremya Novostei*, February 8, 2010; Kommersant, February 8, 2010.
6. *Kommersant*, February 18, 2011 and June 17, 2010.
7. *Upstream*, 28 May 2010; Vremya Novostei, November 26, 2010.
8. *Upstream*, 11 February 2011, p. 10.
9. *Upstream*, 4 February 2011, p. 20; 11 February 2011, p. 10; 22 April 2011, p. 20.
10. *Vedomosti*, June 3, 2011.
11. *Vedomosti*, March 11, 2011; Kommersant, February 18, 2011; Moskovskie Novosti, June 23, 2011.
12. I dwelt on the latter in my chapter "Global Finance and Civil Society Deficits in Russia" in the book *Civil Society and Global Finance*, UN University, Warwick

University (Ed. by J.A. Scholte and Albrecht Schnabel), Routledge, 2002, pp. 79-93.

13. N. Simonia, "Russian Energy Policy in East Siberia and the Far East." In *The Energy Dimension in Russian Global Strategy*, The J.A. Baker III Institute for Public Policy of Rice University, October 2004, p. 30.
14. *Neft i Kapital*, No.7-8, July-August 2010, p.30; Kommersant, December 7, 2009.
15. *Vedomosti*, May 23, 2011.
16. *Kommersant*, May 23, 2011.
17. *Vremya Novostei*, February 8, 2009; *Kommersant*, February 8, 2010.
18. *Vremya Novostei*, December 26, 2009; *Kommersant*, March 15, 2010.
19. *Kommersant*, December 16, 2009; *Vremya Novostei*, December 28, 2009.
20. Perhaps it's not by chance that by the beginning of 2008 he obtained control over the Stroitransgas service company (a leader in the gas service business). Timchenko's Volga Resources owned about 80% of ordinary ("voting") shares, while Gazprombank had only 19.99%, and in the course of 2009 Timchenko changed half of the company personnel for his people (Vremya Novostei, June 22, 2009; *Vedomosti*, March 26, 2010).
21. *Kommersant and Vedomosti*, December 7, 2009.
22. *Moskovskie Novosti*, June 6, 2011.
23. *Kommersant*, November 27, 2009 and February 3, 2010; *Vedomosti*, December 25, 2009; *Vremya Novostei*, October 29, and December 25, 2009.
24. *Vedomosti*, December 21, 2010 and March 9, 2011.
25. *Commersant*, May 3, 2011.
26. *Vremya Novostei*, November 1 and 8, 2010; *Kommersant*, December 1, 2010; *Vedomosti*, November 8 and December 30, 2010.
27. *Vedomosti*, November 9, December 20, 2010; *Kommersant*, February 24, 2011.
28. *Neft I Kapital*, No.12, December, 2010, pp. 54-56, No.12, January-February, 2011, p.7; *Vedomosti*, February 9 and 15, March 3, April 29, May 3 and 4, June 6 and 7, 2011; *Kommersant*, January 12, March 3, 2011.
29. *Kommersant*, February 5, 2010; *Vremya Novostei*, March 15, 2010.
30. *Upstream*, March 11, 2011; March 18, 2011, pp. 42-43; April 1 and 8, 2011; Kommersant, March 3 and 25, 2011; April 6, 2011; Vedomosti, March 3, 2011.
31. *Moskovskie Novosti*, June 6, 2011; *Vedomosti*, June 28, 2011.
32. *Upstream*, March 25, 2011, p. 21.
33. *Vedomosti*, May 30, 2011.

34. *Vremya Novostei*, March 15 and 25, 2010.
35. *Vremya Novostei* and Kommersant, April 1, 2010.
36. *Vremya Novostei*, March 25, 2010.
37. *Kommersant*, November 27, 2009, June 21, 2010, June 28, 2010; *Vremya Novostei*, October 29, 2009; *Vedomosti*, October 29, 2009, July 21, 2010, February 18, 2011.
38. *Neft Rossii*, No.1, 2011, pp. 84-87.
39. *Petroleum Economist*, October 2010, p. 14.
40. *Vedomosti* newspaper site, #ixzz1EfN2YsC7.
41. www.barentsofserver.com (2011-02-02); http://www.novatek.ru/rus/presscentre/releases/2011_680.html
42. *Neft I Kapital*, No.7-8, July-August, 2010, pp. 30-32.
43. In this connection it would be interesting to recall a critical saying of Sergei Donskoy, the deputy head of the Ministry on Natural Resources, at a meeting of the Naval Committee of Russian Federation. He said that while Gazprom had been dragging its feet and repeatedly postponed the time of launching of the Shtokman field, he lost the chance to consolidate a position on the American gas market. Well-known is the opinion voiced by his ministry that if shelf development goes on using only the strength of Gazprom and Rosneft permitted to do it, it will take no less than 165 years, according to the most optimistic scenario. (*Vremya Novostei*, March 31, 2010).
44. *Moscow Times*, June 21, 2010. We can suppose with confidence that in tête- à -tête conversation with Putin, De Margery could not absolutely avoid talking about the Shtokman project and Gazprom's "successes" in this sphere, and this "insider" information could only strengthen Putin in correctness of orientation at Novatek's Yamal-LNG project.
45. *Kommersant*, October 12, 2010; Vremya Novostei, October 12, 2010; *Interfax*, October 11, 2010 (Government of the Russian Federation).
46. *Upstream*, March 18, 2011, p. 42
47. *Vremya Novostei*, October 12 and 19, 2010.
48. *Kommersant*, April 6, 2011.
49. *Vremya Novostei*, December 8, 2010; Vedomosti, December 8, 2010 and April 18, 2011; Kommersant, April 18, 2011.
50. *Vedomosti*, May 4, 2011.
51. *Upstream*, February 25 and April 22, 2011, pp. 20 and 48; *Neft Rossii*, No.3, 2011, p.34; No. 5, 2011, pp. 74-75.
52. *Neft Rossii*, No. 2, 2010, pp. 60-64.

53. *Kommersant*, June 17, 2009; *Vremya Novostei*, June 19, 2009.
54. *Oil and Gas Journal*, October 26, 2009, pp. 27-28; *Vremya Novostei*, June 18, 2009.
55. Vremya Novostei, October 20, 2010; Vedomosti, June 28, 2010, March 31 and April 1, 2011; *Kommersant*, March 17 and April 6, 2011; *Moskovskie Novosti*, April 11, 2011.
56. *Vremya Novostei*, May 3, 2009.
57. *Neft I Kapital*, No. 7, July 2008, pp. 30-31.
58. *Vedomosti*, June 22, 2011.
59. *Vedomosti*, May 13, 2009.

Commentary: Chinese Perspective

ZhongXiang Zhang

GENERAL COMMENTS

Simoniya's paper emphasizes the internal dynamics within the Russian oil and gas sector and illustrates the difficulties Russia has faced and continues to face in the course of the restructuring of this sector under the established regime in which monopolistic corporations have an overwhelming domination, and how the obstacles to such a restructuring are rooted in the general economic structure of Russian society. His paper describes in great detail Prime Minister Vladimir Putin's efforts to modernize the oil and gas sector in Russia. This great leadership at the top level of the Russian government, combined with a venture entrepreneur of lasting enthusiasm and thorough knowledge at the top level of corporation management, leads to an encouraging sign of such a modernization, although a comprehensive change in the energy sector takes years, if not decades. The issues addressed in the paper are important. The author is to be congratulated for a clear explanation of these issues.

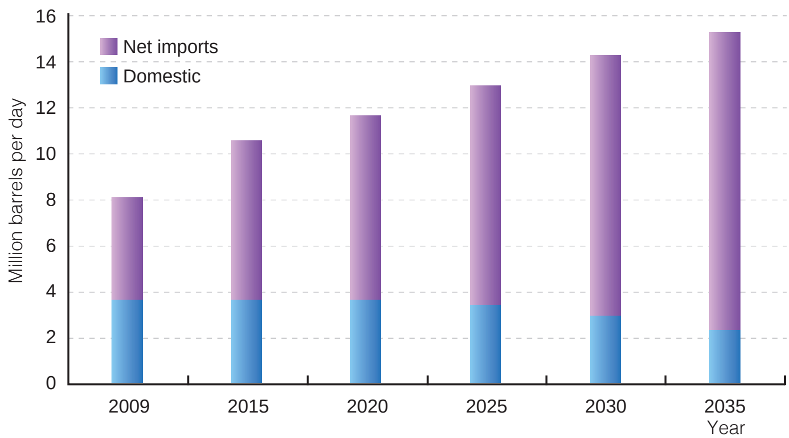
We, the planning committee for this conference, have defined the following terms of references (ToRs) for Simoniya's paper, which are given in the conference program dated May 13, 2011:

ToRs for Paper 4: Strategic Importance of Arctic Oil and Gas to Energy Security in the North Pacific

(i) Time profile of Arctic oil and gas exploration and their on-shore (inland) and off-shore availability
(ii) Impact of the new Arctic oil and gas supplies on the global market (supply/demand balance and prices) and the North Pacific market and energy security
(iii) International cooperation between Russia and the remaining North Pacific countries in accelerating Arctic oil and gas development

No matter how important these issues that his current paper has addressed are, I have to say that they are not the core issues that this paper is asked to address, according to our terms of references. The issues addressed in the current paper could serve as an important supplement, but they are not the key issues.

Given that the paper by Simoniya does not follow our terms of references, my comments are not on his paper. Instead, given that this session deals with energy security issues, my comments will mainly touch on China's concerns about and efforts towards energy security, in particular regarding the Malacca dilemma, and put Arctic oil and gas into that context. I agree with the author's conclusion regarding the real turn



Source: IEA (2010).

Figure C.6 *China's future oil supply: domestic versus imported (mb/d)* of Russia's top leader and the Russian oil and gas business to the Asia Pacific. As discussed in diversifying China's sources of oil supply, while such a turn is welcome by major Asian energy-consuming countries such as China, India and Japan, it is probably even more beneficial for Russia itself, because such a shift not only provides the Russian oil and gas companies with much-needed credit and investment, but also helps Russia to secure customers and reduce its dependence on Western Europe. On the downside, it provides some leeway for Russia to play politics to take advantage of competing rivals, such as China and Japan, and raises the issue of Russia's reliability as an energy supplier, an issue open to question (Zhao, 2007:41).

CHINA'S GROWING THIRST FOR OIL

China's appetite for oil is soaring. Its oil demand grew from 2.3 million barrels per day (mb/d) in 1990 to 4.4 mb/d in 2000 (IEA, 2000). By 2009, China's demand had jumped to 8.1 mb/d (IEA, 2010:105). The IEA estimates that by 2035, China's oil demand will reach 15.3 mb/d, overtaking the United States (14.9 mb/d) as the largest oil consumer in the world (IEA, 2010:105).

China was traditionally self-sufficient in oil, but since 1993 it has been a net oil importer. China's economic boom and its stagnating domestic production of oil have produced a growing hunger for foreign oil. As of 2003, China emerged second only behind the U.S. in terms of oil imports. In 2009, China imported 4.3 mb/d, or 51.3% of its demand (IEA, 2010). This was the first time China imported more than half of its oil consumption. According to China's National Development and Reform Commission, by the end of June 2011, China's oil dependence rate further increased to 54.8%. While this rate is still lower than 61% for the U.S., China's dependence on imported oil has been growing rapidly in recent years (Zhang and Zhang, 2011).[1] During the first five months of 2011, China's oil imports cost the country USD 78.9 billion, which accounts for 45.1% of its total expenditures for imported goods and services (Zhu and Zhang, 2011).

China is projected to maintain production close to the current level of 3.8 mb/d to 2015, followed by a steady decline as resource depletion sets in (IEA, 2010:130). As a result, its oil imports will continue to soar in the decades ahead (See Figure C.6). The IEA estimates that by 2035, China is

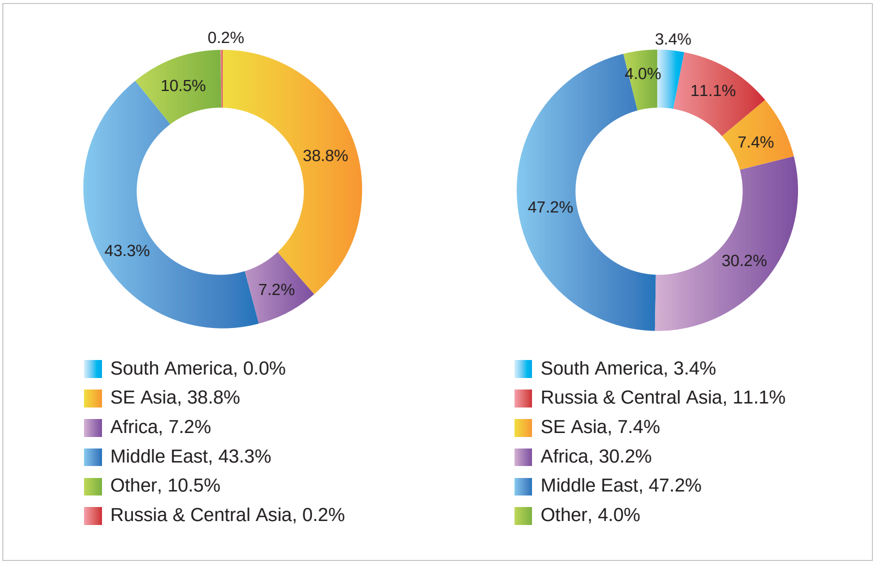


Figure C.7 *China's crude oil imports by region in 1995 (left) and 2005 (right) (Total imports of oil: 17.1 million tons in 1995 and 126.8 million tons in 2005)*

expected to import nearly 12.8 mb/d (IEA, 2010:135), more than the U.S. imports today, in order to meet its expected oil demand of 15.3 mb/d. This puts China's oil dependence rate at 84.3% in 2035 (IEA, 2010). China will thus be even more exposed to the risk of international supply disruptions than it is today. Energy security has risen to the height of importance in its foreign policy, and is becoming what has been called a "transforming" factor in relations between China and the Middle East, Russia, and energy-rich Central Asian, African and Latin American countries (Yi, 2005).

CHINA'S CONCERNS ABOUT THE STRAIT OF MALACCA

As shown in Figure C.7, in 1995, China relied mainly on the Middle East and Southeast Asia (mainly Indonesia, which alone accounted for nearly one-third of China's total imports) for 82% of its crude oil imports. China has relied on the Middle East for the majority of its oil imports. Thus, it will continue to consolidate its base there. In recent years, China has also turned its eyes to the emerging oil and gas fields in Africa. Top Chinese leaders frequently paid the visits to oil-producing countries in the region. This high-profile, goodwill-based energy diplomacy has helped China to make remarkable inroads in striking energy deals with oil-rich African countries in the Gulf of Guinea, Central African Republic, Chad, Congo, Libya, Niger, and Sudan. By 2005, China had significantly diversified its import mix. As shown in Figure C.7, Africa accounted for 30% of China's oil imports, while Russia supplied 10% of total imports (Downs, 2006:31).

However, China remained just as reliant on the Middle East in 2005 as it had been 10 years ago, with 47% of its imports coming from the Persian Gulf. In addition, because China was now heavily reliant on Africa as well as the Middle East, it now depends more on a single chokepoint - the Strait of Malacca - than it had before, with nearly 77% of its oil imports flowing through the Strait. This situation still remains: China still imported 77% of its crude from the Middle East and Africa as of 2010 (Kennedy, 2011).

Foreign trade has become one of the pillars underpinning China's phenomenal economic growth over the past three decades, and oil is intimately related to it. Given that most crude oil imports from the Middle East and Africa have to pass through the Strait of Malacca, the strait is of the strategic and economic importance to China's economic and energy security. As a chokepoint, this strait directly affects China's sea lane of communications (SLOCs), but China has little sway over it. Therefore, China has every reason to be concerned about the safe and smooth passage of its shipments. Beijing feels susceptible to this strategic weakness, considering that any unexpected event could disrupt its trade flows and particularly oil imports, which could further deal a blow to China's economic development, social stability and military operations (Chen, 2010; Zhao, 2007).

Over the past few years top Chinese leaders have come to view the Strait of Malacca as a strategic vulnerability (Blumenthal, 2008; Holmes, 2007). In November 2003, the Chinese President Hu Jintao declared that "certain major powers" were bent on controlling the strait, and called for the adoption of new strategies to mitigate the perceived vulnerability. Thereafter, the Chinese press devoted considerable attention to the country's "Malacca dilemma" (Lanteigne, 2008; Storey, 2006). *China Youth Daily*, one leading Chinese newspaper, declared: "It is no exaggeration to say that whoever controls the Strait of Malacca will also have a stranglehold on the energy route of China" (Shi, 2004).

CHINA'S RESPONSES TO COPE WITH THE MALACCA DILEMMA

Given the strategic importance of the Strait of Malacca and China's little sway over the waterway, China has taken great efforts to cope with the perceived "Malacca dilemma" and to enhance its energy security.

China's Demand-Side Efforts to Control the Growth of Oil Demand

On the demand side, China has taken considerable efforts to control the growth of its demand for energy and oil, and thus its demand for oil imports. China has incorporated for the first time in its five-year economic plan an input indicator as a constraint – requiring that energy use per unit of GDP be cut by 20% during the 11th five-year period running from 2006 to 2010. This is widely considered an important step towards building a "harmonious society" through "scientific development." Just prior to the Copenhagen climate summit, China further pledged to cut its carbon intensity by 40-45% by 2020 relative to its 2005 levels in order to help to reach an international climate change agreement at Copenhagen or beyond (see Zhang, 2010a and 2011a,b for further discussion). Meeting these energy and carbon intensity targets will not only help to limit the growth of China's carbon emissions, but will also reduce China's growing hunger for foreign oil, leave more oil on the market and thus help to stabilize oil prices.

China's Supply-Side Policies to Address Its Growing Dependence on Imported Oil

On the supply side, China has taken a variety of policies to address its growing dependence on imported oil. The country has made considerable efforts to maintain domestic production close to the current level. In the meantime, China has been making significant efforts to support the expansion of its own national oil companies (NOCs) (the so-called going-out policies for NOCs), to diversify both the sources and routes of its oil supply, to develop its own strategic petroleum reserves, and to strengthen its naval capabilities to protect supply lines (Chen, 2010; Kennedy, 2011; Zhang, 2010b).

Clearly, China resorts to these unilateral and bilateral measures to enhance its energy security and cope with the Malacca dilemma. As a result of the going-out policy, these NOCs now have equity production in 20 countries. By the first quarter of 2010, these NOCs' overseas equity shares had reached 1.36 mb/d, nearly one-third of China's net imports in 2009 (Jiang and Sinton, 2011:17, 39–40). While China continues to consolidate its base in the Middle East, it has been keen to invest in Central Asian and Russian oil and natural gas field development projects and in the construction of pipelines in order to bring oil and natural gas from these regions. In recent years, China has also turned its eyes to the emerging oil and gas fields in Africa. Its search for oil has recently taken it to Central and South America, America's backyard, which the U.S. perceives as its turf and within its traditional sphere of influence. In the midst of the global financial crisis, China further diversified its energy import mix via loan-for-oil deals. Chinese state-owned banks made loans worth USD 77 billion to nine different oil and gas-producing countries in 2009 and 2010, all of which are located outside the Middle East (Jiang and Sinton, 2011:41).

A noticeable deal is with Russia. China and Russia have been discussing a cross-border pipeline for crude oil since the early 1990s, but weren't able to finalize a deal. Leveraging its relative financial strength at a time when most other big economies are in recession, China eventually struck this largest, long-awaited loan-for-oil deal with Russia on February 17, 2009. Under this long-term deal, China lends USD 25 billion to Rosneft, Russia's biggest oil producer, and Transneft, its oil pipeline operator. In exchange, Russia will provide China with an additional 15 million tons of crude oil a year between 2011 and 2030, which represents about 300,000 barrels a day for 20 years, or nearly 7% of China's current volume of oil imports, through a new pipeline, which began making commercial deliveries on January 1, 2011. The deal not only provides the two Russian oil companies with much-needed credit, but also helps Russia secure customers and reduce its dependence on Western Europe.

Recognizing its limited potential to further diversify its oil imports away from the Middle East and Africa, China has sought to diversify the routes that its oil shipments take towards China from the Middle East and Africa (Blumenthal, 2008; Holmes, 2007; Kennedy, 2011). China is working with Myanmar to construct parallel oil and gas pipelines that would connect the Chinese province of Yunnan with the Indian Ocean. The 440,000 barrels per day capacity of the oil pipeline would allow a portion of China's crude shipments to bypass the Strait of Malacca on their way to China, while also saving 1,200 km of travel distance (Jiang and Sinton, 2011:34). China also appears to be involved in developing rail and road infrastructure that will connect the Arabian Sea port of Gwadar in Pakistan with western China and aims to create a new land route for China's oil imports from the Middle East, and for exports of Chinese consumer goods to Central and South Asia. Yet as far as transporting oil is concerned, it would be much more costly to transport oil in this manner, and thus this connection will be even more constrained than the pipeline through Myanmar (Erickson, 2010).

After several years of debate, on December 18, 2007, the National Development and Reform Commission announced that the China National Petroleum Reserve Center was established to strengthen the building of its strategic oil reserves and a sound management system of oil reserves. China decided to take 15 years, in three phases, to complete the construction of its petroleum reserve bases since 2007. Four sites were chosen for the first phase: Zhoushan and Zhenhai in Zhejiang Province, Dalian in Liaoning Province and Huangdao in Shandong Province. Together they provide a total storage capacity of 14 million tons (or 100 million barrels). If filled, this is equivalent to about 12 days of China's oil consumption in 2009. The construction of the first phase was completed by the end of 2008, and was completely filled in 2009 at an average price of USD 58 per barrel (Wang and Wu, 2011). The second phase, with eight sites, is under construction, and will add another storage capacity of 23 million tons. The third phase is in planning, and is expected to be completed by 2020. By then China will have a total storage capacity of 85 million tons. If filled, that would be equivalent to about 78 days of China's 2020 oil imports (8 mb/d) projected by the IEA (2020).

STRATEGIC IMPORTANCE OF ARCTIC OIL AND GAS TO ENERGY SECURITY

Given that China is already a large oil consumer and its oil use is set to rise rapidly, it needs to continue to invest in adding new capacity to its world oil supplies via loan-for-oil deals or acquisitions, as it has aggressively pursued during the current financial crisis (Zhang, 2010b). This should be seen as beneficial for other global consumers because Chinese investments in oil fields help to stabilize oil prices by pumping more oil out of the fields and enlarging the overall availability of oil on the world market.

Based on a comprehensive assessment of the Arctic's energy resources completed by the U.S. Geological Survey (2008), the Arctic is estimated to have 90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids. Given the huge Arctic oil and gas reserves, by the same token, China would see their exploration as having great potential for increasing the overall worldwide supply of oil and gas in the long term. Chinese companies, in particular those state-owned oil majors, clearly keep their eyes on the opportunity of investment in such an area. They see that such an involvement helps to achieve their ambition to grow and build global businesses, just like the NOCs have expanded their business overseas and have achieved a positive development for themselves with the support of the government-sponsored going-out policies. Chinese companies could consider working with their Russian counterparts under the loan-for-oil (or loan-for-gas) model in exploring and developing oil and gas resources in the Russian Arctic zones.

While China has to some extent succeeded in diversifying its source of oil supply since the 1990s, the country will have limited potential to further diversify its oil imports away from the Middle East and Africa and will thus continue to rely on these main suppliers of oil in the foreseeable future. If China cannot do much to change the source of its supply, changing routes is then the way to go. In this regard, opening the Northern Sea Route (NSR) would help to alleviate China's concerns about an overwhelming dependence on the Strait of Malacca for the majority of its oil supply in the long term. As the NSR is slowly becoming a reality as an international trade route, shipping chokepoints, such as the Strait of Malacca, would no longer dictate global shipping patterns.

However, in the short term, China would be reluctant or at least cautious to get involved in Arctic issues. This is partly because China itself is not an Arctic country. Presumably and more importantly, China is concerned about potential implications of its involvement for the territorial disputes in the East and South China Sea. China has faced territorial disputes with a few Association of Southeast Asian Nations (ASEAN) countries in the East and South China Sea, where no clear picture of ownership exists. China has claimed its sovereignty and has long considered the territorial disputes as a bilateral issue. China disapproves of referring bilateral disputes to multilateral forums and is strongly opposed to the intervention of an outside power in the South China Sea dispute. However, U.S. Secretary of State Hillary Clinton announced publicly at the ASEAN

Ministerial Meeting in 2010 that the South China Sea dispute was related to U.S. national interests. The dispute has since been heating up. At a time when certain countries attempt to promote the internationalization of the South China Sea issue to put pressure on China, China getting involved in Arctic issues may be used by others as an excuse for that endeavor. China clearly does not want that to happen.

I would like to point out that this should not be considered as an exception. In fact, China has been generally reluctant to participate in multilateral engagement on water (Mochizuki and Zhang, 2011). This stems from at least two factors. First, water scarcity is a pressing issue for China. Highly uneven water availability, rising demand and declining water quality all pose increasing water stress, particularly in Northern China. China's per capita water availability of 2,200 m^3/year is merely a quarter of the world's average (Liu et al., 2007), with Northern China supporting the water demands of as much as 45.2% of the country's population, despite possessing only 19.% of China's total water resources (Jiang, 2009). Water quality is also declining in many parts of the country. As such, the water issue is of increasing importance to China. Secondly, China's unique geography makes trans-boundary management of such a scarce resource particularly challenging. Currently, China shares 18 major international river basins with its neighboring countries, including Amur, Ganges-Brahmaputra-Meghna, Har Us Nur, Hsi/Bei Jiang, Indus, Irrawaddy, Mekong, Pu-Lun-To, Red/Song Hong, Salween, Sujfun, Tarim, Tumen and more than 40 tributaries (Wolf et al., 1999; Backer, 2007; Yan and Daming, 2009). In many cases, China is the upper-stream riparian state in these international river basins. The Chinese government fears, therefore, and quite reasonably so, that its handling of the Mekong River may expose it to similar demands by other downstream states, complicating already fragile water resource configurations (Backer, 2007). As such, Beijing has generally been reluctant to join multilateral discussion on this issue.

Notes

1. Using a different method of calculating oil dependence rate, China's Ministry of Industry and Information derives that by the end of May 2011, China's oil dependence rate reached 55.2%, even higher than 53.5% of the U.S., for the first time (Zhu and Zhang, 2011).

References

Backer, E. B. 2007. “The Mekong River Commission: Does It Work, and How Does the Mekong Basin’s Geography Influence Its Effectiveness?” *Journal of Current Southeast Asian Affairs* 26(4): 32–56.

Blumenthal, D. 2008. Concerns with Respect to China’s Energy Policy. in G.B. Collins, W.S. Murray (eds). *China’s Energy Strategy: The Impact of Beijing’s Maritime Policy*. Naval Institute Press, Anapolis. 418-436.

Chen, S. 2010. “China’s Self-Extrication from the “Malacca Dilemma” and Implications.” *International Journal of Chinese Studies* 1(1): 1-24.

Downs, E. 2006 (Dec.). *The Brookings Foreign Policy Studies Energy Security Series: China*. Brookings Institution. Washington, DC. Available at: http://www.brookings.edu/experts/downse.aspx.

Erickson, A. 2010. “Still a Pipe Dream: A Pakistan-to-China Rail Corridor is not a Substitute for Maritime Transport.” *China Signpost* No. 13. December 22, Available at: www.andrewerickson.com/2010/12/still-a-pipedream-a-pakistan-to-china-rail-corridor-is-not-a-substitute-formaritime-transport/

Holmes, J. 2007. China’s Energy Consumption and Opportunities for U.S.-China Cooperation to Address the Effects of China’s Energy Use, Testimony before the U.S.-China Economic and Security Review Commission. June 14, Available at: http://www.uscc.gov/hearings/2007hearings/transcripts/june_14_15/holmes_prepared_remarks.pdf

International Energy Agency (IEA). 2000. *World Energy Outlook 2000*. Paris.

International Energy Agency (IEA). 2010. *World Energy Outlook 2010*. Paris.

Jiang, Y. 2009. “China’s Water Scarcity.” *Journal of Environmental Management* 90(11): 3185-3196.

Jiang, J. and Sinton, J. 2011 (Feb.) “Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts.” Information Paper Prepared for the Standing Group for Global Energy Dialogue of the International Energy Agency, Paris, February.

Kennedy, A. 2011. China’s Petroleum Predicament: Challenges and Opportunities in Beijing’s Search for Energy Security, in J. Golley and L. Song (eds), *Rising China: Global Challenges and Opportunities*. Australian National University E-Press, Canberra. 121-135.

Lanteigne, M. 2008. “China’s Maritime Security and the ‘Malacca Dilemma.’” *Asian Survey* 4(2): 143-161.

Liu, J., Zehnder, A. J. B. and H. Yang. 2007. “Historical Trends in China’s Virtual Water Trade.” *Water International* 32(1): 78-90.

Mochizuki, J. and Z. X. Zhang. 2012. Environmental Security and Its Implications for China's Foreign Relations, in G. Wu (ed). *China's Challenges to Human Security: Foreign Relations and Global Implications*. Routledge, London, 105-134.

Shi, H. T. 2004. China's "Malacca Dilemma," *China Youth Daily*. June 15, Available at: http://zqb.cyol.com/content/2004-06/15/content_888233.htm

Storey, I. 2006. China's "Malacca Dilemma," *China Brief* 6(8). April 12, Available at: http://www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_news%5D=31575

U.S. Geological Survey. 2008. Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle. Available at: http://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf

Wang, X. and P. Wu. 2011. "China's Strategic Oil Reserves in 2020 will Increase to about 85 Million Tons." *China Economic Weekly*. 18 January, Available at: http://news.sina.com.cn/c/sd/2011-01-18/001821830415.shtml

Wolf, A.T., Natharius, J.A., Danielson, J.F., Ward, B.S. and J.K. Pender. 1999. "International River Basins of the World." *International Journal of Water Resources Development* 15(4): 387-427.

Yan, F. and H. Daming. 2009. "Trans-boundary Water Vulnerability and Its Drivers in China." *Journal of Geographical Sciences* 19(2): 189-199.

Yi, X. 2005. "Chinese Foreign Policy in Transition: Understanding China's 'Peaceful Development.'" *Journal of East Asian Affairs* 19(1): 74-112.

Zhang, Y. and L. Zhang. 2011. "National Development and Reform Commission Said China's Dependence on Foreign Oil Still Lower Than That of the U.S., Countering to the Ministry of Industry and Information's Data." *Sina Net*. August 16, Available at: http://finance.sina.com.cn/g/20110816/023510321332.shtml

Zhang, Z.X. 2010a. "China in the Transition to a Low-Carbon Economy." *Energy Policy* 38: 6638-6653.

Zhang, Z.X. 2010b. Energy Policy in China in the Transition to a Low-Carbon Economy, in F. Fesharaki, N.Y. Kim and Y.H. Kim (eds). *Fossil Fuels to Green Energy: Policy Schemes in Transition for the North Pacific*. Korean Energy Economics Institute Press, Seoul, 176-225.

Zhang, Z.X. 2011a. "Assessing China's Carbon Intensity Pledge for 2020: Stringency and Credibility Issues and Their Implications." *Environmental Economics and Policy Studies* 13(3): 219-235.

Zhang, Z.X. 2011b. *Energy and Environmental Policy in China: Towards a Low-carbon Economy*. New Horizons in Environmental Economics Series, Edward

Elgar, Cheltenham, UK and Northampton, USA.

Zhao, H. 2007. "Rethinking the Malacca Dilemma and China's Energy Security." *Contemporary International Relations* No. 6: 36–42.

Zhu, J. and Y. Zhang. 2011. "China's Dependence on Foreign Oil over the U.S. for the First Time." *Sina Net*. August 3, Available at: http://finance.sina.com.cn/chanjing/cyxw/20110803/013510250090.shtml.

Commentary: Japanese Perspective

Kenichi Matsui

ON THE CONCLUSIONS

I would like to start my comments with Professor Simoniya's paper and focus on his conclusions. Then, I will address several topics from his paper and make some brief comments on them.

In his conclusions 1 and 2, he says that the Russian Arctic zone is not only the key base for development of oil and gas industry but also a "weak link," and this weak link has been building up towards an important shift, namely a breakthrough by some state oil and gas monopolies and a real turn of the country's top leadership and Russian business community towards the Asia Pacific region.

This shift is welcome from the viewpoint of Japan since it resulted in a broader focus by Russian oil and gas industry to fit into a wider international context. This will contribute to a dramatic expansion and change to the future supply picture of oil and gas in the world.

Conclusion 3 emphasizes the importance of international cooperation. I agree. This point is specifically important for Russia considering its political situation. A fast and effective development of Russia's fuel and energy complex is beneficial to Japan, and Japan will continue to strengthen cooperation with Russia.

Conclusion 4 states that the process of restructuring of Russia's oil and gas industry will take time, suggesting it may take several years because the task is so enormous in order to overcome obstacles that are rooted in the general economic structure of Russian society. I can imagine how difficult this process is. I just wish it would go as smoothly as possible.

Thus the messages of Professor Simoniya's paper are clear and I share his views.

HUGE POTENTIAL OF RUSSIAN NATURAL GAS AND OIL

For the first topic, I want to focus on the huge potential of Russian oil and gas.

Professor Simoniya's paper clearly outlines the huge potential of natural gas and oil in East Siberia, Far East and the Arctic. As we know, part of this potential has already been materialized. For instance, oil exports from Russia after starting the operation of the East Siberian and Pacific Oil main pipeline (ESPO) has changed significantly the structure of oil supply in the Asia Pacific region.

In 2010, Japan's imports of Russian oil via Kozmino surpassed that of Kuwait, and Russia became the No. 4 exporter of oil to Japan and No.1 exporter, except for the Middle East. In the first half of 2011, the No.1 status of Japan as Russian crude oil importer through Kozmino was overtaken over by the United States, which is now 27% of Japan's crude oil imports. Japan shared 19% of Russian crude oil exported via Kozmino, followed by Korea with 13% and the Philippines with 11%. This trend will be more visible and seen throughout the world, and expectations for Russian oil will rise dramatically in the Asia Pacific region.

PUTIN'S EFFORTS TO MODERNIZE THE OIL AND GAS SECTOR

As the second topic, I pick up on Russian Prime Minister Vladimir Putin's modernization efforts. Professor Simoniya describes Putin's efforts to modernize the oil and gas sector in Russia in detail in the sections "The Shtokman Project's Roundabout Ways of Realization," "Novatek Saga: Gazprom's Monopoly is Underminded," and "Novatek Phenomenon."

I really enjoyed this part since it well illustrates the dynamism within the Russian energy circle, including the political leadership of the country. The success story of Novatek proved, I think, that a challenging project could be tackled only by a venture entrepreneur with top management expertise, combined with enthusiasm and knowledge. Just to command "Develop a new project! But don't waste money! Do it efficiently!" cannot achieve the goal of a challenging project.

I found Putin has done well with the modernization of the oil and gas sector in Russia, as he had to struggle with the established regime. However, as Professor Simoniya pointed out, the process of restructuring of Russia's oil and gas industry will take some time since it will have to overcome obstacles that are deeply rooted in general economic structure of Russian society. I understand the difficulty Putin faces, as it leads me to reflect on the difficulty Japan faced after the big earthquake, tsunami and the Fukushima nuclear power plant accident on March 11 this year.

BIG CHALLENGES FOR JAPAN

Here, I would like to say few words about the big challenges Japan now faces. The misfortune, the Fukushima nuclear power plant accident, is a natural disaster, but unfortunately it has been worsened by human errors. The measures taken by Japan to assist people who suffered from the earthquake, tsunami and Fukushima plant accident have been too slow and inefficient due to the lack of capacity and leadership of the government.

The nuclear plant accident would not be such a grave accident if Tokyo Electric Power Co. and the government had developed and introduced safety measures that were recommended by the IAEA and the serious lessons learned from the Three Mile Island nuclear power plant accident.

After World War II, Japan achieved an economic miracle under democracy. But the earthquake, tsunami and nuclear power plant accident revealed that democracy in Japan is a "pseudo-democracy." People claim just rights and forget duties. More than 60 years after the war, it became clear that the Japanese system does not work in the world of globalization.

In the general election in 2009, the Liberal Democratic Party, the long-time ruling party of Japan, lost and the Democratic Party, which appealed for change of this system, won. However, people were completely betrayed by this party's lack of governing capacity. People are waiting for a real political leader with vision, capacity and courage to emerge and restructure the old systems.

Using the words of Professor Simoniya, the process of renewal in Japan will take time, since it will have to overcome obstacles that are rooted in general economic and social structure of Japanese society.

We know that Putin's task for modernizing the oil and gas sector is a very challenging one, but the restructuring the bureaucrat system and state-business relationship that have long dominated Japan since World War II is not a less difficult one. Russia's situation looks even better than Japan since Russia has Putin, but Japan does not and has yet to find such a focused leadership role.

Here, I found that the difficulties in Russia and in Japan could be well visualized by looking at the aspect of state-private partnership in the two countries. This concept was introduced by Professor Simoniya as an important framework for modernization of the oil and gas sector in Russia.

STATE-PRIVATE PARTNERSHIP

According to Professor Simoniya, the role of the state in Russia is in the formulation of ideas and large national projects, and in partial investment, especially in various infrastructure spheres, while the role of business is that of operational initiatives, realization of information technologies and as the main investor.

In Japan, state-private partnership has also been very important for economic development after World War II. Here, the role of the state includes the formulation of ideas and large national projects and the partial investment like Russia, but one more role is added in Japan, namely to set up a business environment that makes it possible for companies in several industrial sectors to develop together with limited competition among them, through such measures as administrative guidance.

The role of the business sector also includes operational initiatives, realization of technologies and the role of main investor, as in Russia. And it additionally accepts ex-officials as company staff, returning the provision of a comfortable business environment by the government. This is called the "industrial convoy system" in Japan.

This system exists not only in the industrial sector but also in such sectors as mass communication (e.g., television and newspapers) and in the academic sector. Restructuring this bureaucrat-private system is one of the key elements for the renewal of Japan.

APEC SUMMIT IN VLADIVOSTOK IN 2012

For the next topic from the Professor Simoniya's paper, I pick up on the 2012 APEC Summit in Vladivostok.

Simoniya compares holding the APEC summit in Vladivostok to the construction of the Trans-Siberian railway before the October Revolution with the initiative of the outstanding Russian figure S.Y. Vitte and the East Siberia-Pacific Ocean oil pipeline.

I am confident that the Vladivostok APEC Summit will convey a strong message that there is a new wave of thinking within Russia to bring a geographical balancing of the Russian oil and gas sector, not only to the APEC economies but to the world as a whole. This summit will be a very exciting, "icebreaking," and could be one of the most memorable events in the long history of APEC.

I have been involved in APEC's Energy Working Group from the beginning, and so far the presence of Russia in APEC has been inconspicuous. But the Vladivostok summit will change the Russian presence completely and has the potential to revitalize APEC. I think this summit also might initiate an enhancement of intercultural communication in the west and eastern part of Russia and between Russia and North East Asian countries. Japan welcomes the Vladivostok APEC summit and wishes it great success as a critically important summit.

FUKUSHIMA NUCLEAR POWER PLANT ACCIDENT AND OIL AND GAS SUPPLY FROM RUSSIA

Next, I'd like to say few words on the short- and mid-term procurement of natural gas and oil after the Fukushima plant accident in Japan.

After the accident at the Fukushima plant on March 11, 2011, it was necessary for short-term procurements of LNG to replenish the loss of nuclear power from the plant and to increase electrical power from thermal power plants. We thank Prime Minister Putin, who expressed his intention to support Japan by providing extra oil and LNG immediately after the March earthquake and took due actions.

Japan started LNG imports in 1969 with an annual volume of about one million tons from Alaska, mainly to cope with the severe SOx emission standard. At that time, Japan was mocked by the oil and gas circles in the

Western world. They asked with contempt: Why do you buy high-priced gas, and why do you just burn the gas instead of premier uses like feedstock for chemicals? But LNG for electricity generation is booming in the West. Japan has steadily expanded the LNG trade since that time and is currently importing about 75 million tons per year. It is foreseen to increase by 10-15 million tons in the coming 10 to 20 years.

Japan started to import Russian gas in 2009 from the Sakhalin 2 project. Gas from Sakhalin 1, Sakhalin 3, Eastern Siberia and Arctic will be added in the future. Japan will continue to import gas from Australia, Qatar, Malaysia, Brunei, Indonesia, UAE, Oman and others. The physical availability of natural gas will not be a problem even if the demand for it expands significantly after the accident at the Fukushima plant.

However, I am concerned about the capacity of Japan to continue to import such large volumes of LNG, considering the falling international competitiveness of Japan's manufacturing industry due to uncertainties in the projections for electricity supply, possible high electricity tariffs, high corporate taxes, the high exchange rate of the yen and the unreliable, amateur government. It may cause very serious unemployment, social instability, and demonstrations that could lead to civil unrest or even riots. The possibility of coming under the control of the IMF is not to be excluded.

Given the situation, I think, Japan should pursue an energy mix less dependent on imported energy from a longer-term perspective and keep nuclear power plants while enhancing safety measures, including the construction of small modular reactors.

SUCCESS OF THE RUSSIAN LNG BUSINESS AND JAPAN

For my last comment, I will touch upon the success of the Russian LNG business from the perspective of Japan.

While the LNG demand in the northeast Asia is expected to grow, a number of conventional and unconventional LNG projects in Australia and Canada are being discussed, and some of them have already reached final investment decisions in recent years. The realization of an LNG project is never an easy task. It is key to find reliable long-term clients for the success of the LNG business. Japan has been a most reliable buyer and partner in the long-term LNG business and will try to keep that status.

The most important factor for reaching a long-term contract is price setting. Natural gas exporters should not repeat the failure of the price setting policy of OPEC. As you know, the share of oil in the total primary energy supply in the world has been falling continuously, from 47% in 1974 when OPEC took over the power of controlling the world oil market, to 34% in 2010. During that period the share of all other primary energy has increased. This change was brought on not due to the constraints of oil resources but due to the mismanagement of the international oil market by OPEC, and was especially due to its wrong pricing policy. I will not touch on this point in detail here, but OPEC will not be able to change its way of management, specifically its wrong pricing policy, for various reasons. Accordingly, the status of oil as the world largest primary energy will be replaced by natural gas shortly, say in around three years. The age of oil will be over and the age of natural gas will come. If natural gas exporters wish to extend the age of natural gas, they should be prudent enough to avoid the failures of OPEC.

Anyway, I believe that the 21st century will be dominated by nuclear energy and photovoltaic technology, which are based on the theories of relativity and quantum mechanics, and they will replace energy and technology based on the theory of Newtonian physics. The duration of the golden age of natural gas depends on the supply policy, especially the price policy of natural gas exporters. What is a reasonable gas price? It depends primarily on the decision of the gas exporters, but one thing is clear: this decision should be based on purely commercial considerations and should not be mingled with a money game and political considerations. A decision favoring the latter factors will not be supported by the market, will degrade the value and shorten the golden age of natural gas.

Commentary: Korean Perspective

Nam-Yll Kim

COMMENTS ON PROFESSOR SIMONIYA'S PAPER

First of all, Professor Simoniya provides complicated episodes surrounding the progress of projects in Shtokman and Yamal. He brought up some causes for the delay in the Shtokman project by mentioning that global market changes were unfavorable to gas sellers (for example, the global crisis and demand reduction, and shale gas production in the United States), and also pointed out such issues as Gazprom's insufficient professionalism, which lacks technological proficiency, and Russian bureaucracy. Overall, I agree with what Prof. Simoniya has presented.

While it was briefly mentioned in the paper, we need to pay more attention to the world supply outlook. Originally, the Shtokman project was intended to be developed entirely as an LNG export scheme, principally aimed at the U.S. market, but new global gas market conditions due to U.S. shale gas development caused this concept to be changed. The project is now intended to develop the field in two phases. In the first phase, which is planned to come about in 2016, gas exports will go via pipeline to Europe, and then an LNG export scheme will follow by 2017.

According to a report by the Baker Institute (July 2011), the projected North American shale gas production has the obvious implications that U.S. natural gas imports from the Middle East will be virtually nil throughout the next 20 years. Also, the report expects the share of Russian gas in the European market will continue to decrease from 20% currently to less than 13% in 2040. Based on this analysis, it is questionable that the Shtokman and Yamal projects of Russia will progress as planned. It seems that this paper needs a more detailed consideration of how the change in the world's gas supply will influence Russian Arctic projects.

Secondly, I will touch on some issues to be noted regarding Russian resources projects, focusing on the Arctic project. Prime Minister Vladimir Putin announced recently that Russia will promote cooperation with overseas countries in resource development in the Arctic continental shelf. Nonetheless, if we take a look at the actual operation structure of the Shtokman project, participation from overseas companies is quite limited. With Gazprom as the operating entity, Total and Statoil possess 25%

and 24% of the share, respectively. When the first stage of the project is completed (in 25 years), Total and Statoil must sell their stakes to Gazprom. Gazprom possesses full gas sales rights. Given the uncertainty in the Russian project, we believe that major enterprises prefer participating as operators rather than as mere shareholders. As we are all aware, operators have the authority to make decisions that are more beneficial for them.

Offshore gas field development projects, including the ones in the Arctic, require huge financing and advanced technology. Gazprom tends to monopolize most of the development and operation rights in gas projects. Therefore, some other projects are frequently delayed due to limits in manpower and funds. Consequently, countries waiting to purchase gas from these gas fields can suffer disturbances due to Gazprom's inconsistent behavior.

To enable Northeast Asian countries to trust the Russian gas supply, I believe, Russian gas development projects must open up for foreign businesses or non-state-owned domestic companies in the long run, including project operating rights. If not, large foreign investment is quite unlikely to be attracted.

Thirdly, as Prof. Simoniya mentioned above, corruption and a strong bureaucracy are the biggest obstacles to attracting foreign investors to Russia. Thus, these factors make it difficult for foreign investors to promote energy projects in Russia and also at times ignore the economic aspects. It seems that the government's role should be limited to making laws and developing policy, as well as supervising the companies involved. From this perspective, the recent decision by President Dmitry Medvedev to release high-ranking government officials from the boards of public companies is meaningful.

REGARDING THE KOREAN PERSPECTIVE ON ARCTIC OCEAN RESOURCE DEVELOPMENT

First, about energy import source diversification, Korea imports 97% of the energy it uses domestically. We are especially highly dependent on oil and gas from the Middle East. As we seek to diversify the sources of energy imports, development of the Arctic Ocean is highly desirable.

Nonetheless, natural gas from the Russian Arctic may lose its position in Korea's gas options if the development is delayed for the several reasons mentioned earlier. Korea needs to secure roughly 10 million tons of additional gas by 2014, because some long-term contracts will soon be terminated. If Korea reaches an agreement with Australia or other countries sooner or later, its involvement in Russian Arctic gas development will become difficult.

Moreover, when Korean gas experts (KOGAS, working-level government officials, the KEEI gas team) work on establishing the long-term basic gas plan, they do not seem to picture Russia as a potential gas provider in the near future, except for the Sakhalin II project, which is shipping LNG already. It seems that they seriously perceive high risk and uncertainty with Russian gas projects, as I mentioned earlier.

Second, KOGAS recently obtained a stake in a small gas field (the Umiak gas field) in the northern Canadian Arctic. This is Korea's first Arctic resources development project. From a Korean perspective, the Canadian Arctic area has two merits. In geographical terms, Canada is much closer to Korea than the Russian Arctic is. Moreover, negotiations and contracts with Canada are likely to be more transparent than with Russia. Also, we can benefit from focusing only on economic conditions in the contract process.

However, the Canadian Arctic development project seems to be faced with some changing circumstances recently. The recent announcement of Shell's sale of its entire stake in the Canadian Arctic brought about speculation that circumstances are leaning towards an LNG terminal on the west coast of Canada instead of the Mackenzie Delta pipeline. So far, the establishment of the Mackenzie Delta pipeline and the construction of an LNG plant in the Arctic have been pursued. For Korea, establishing pipelines and constructing an LNG terminal on the west coast of Canada is more favorable because it will reduce the transportation distance. Expansion of the North American market will bring huge benefits to Korea.

Thirdly, as mentioned in Prof. Simoniya's article, two consortiums were competing against each other for FPU contracts when the Shtokman project began. Two Korean companies, Samsung Heavy Industries and Daewoo Shipbuilding & Marine Engineering, were involved. Korea is widely recognized as having the world's best shipbuilding industry. We specialize in building high technology and high-value-added ships such as LNG ships, drill ships, FPSOs and so on. In particular, the LNG-FPSO is a special ship first developed by Samsung Heavy Industries in 2008. Winning a USD 3.036 billion order from Shell, Samsung Heavy Industries cooperated with

Technip to build the LNG-FPSO, which will be utilized at the Prelude gas field in Australia.

For your reference, I have heard from a KOGAS expert that the LNG-FPSO is difficult to use in the shallow Canadian Arctic waters. However, we hope Korea's superior shipbuilding technology will play a major role in Arctic development.

Fourthly, it is expected that resource development in the Arctic region can bring new progress in the Northeast Asian energy spot market. The ESPO oil pipeline's first-stage route (in 2009) and branch line to China were recently completed. Also, the price of ESPO Blend is listed in Platts. In addition, the amount of Russian crude oil imported through Kozmino Port has been increasing substantially. Currently in Korea, approximately 10% of total crude oil imports are from Russia.

Three countries in Northeast Asia, Korea, Japan, and China, are becoming the center for the world's oil consumption. OPEC and non-OPEC oil-producing countries are competing over the Northeast Asian oil market. Korean oil stockpiling facilities are leased to Saudi Arabia, UAE and Algeria from MENA and other non-OPEC countries such as Norway and Azerbaijan.

Furthermore, as mentioned above, the development of oil fields and construction of a pipeline in the Canadian Arctic or North Slope of Alaska can create an export port for oil and gas on the west coast of North America. We expect its establishment will increase the potential for a Northeast Asian oil hub.

Along these lines, there is a possibility that the Asian oil market will be divided into a Northeast Asian bloc and a Singapore bloc. Needless to say, we will continue to have high dependency on the Middle East. However, Korea, China and Japan will be able to relieve their dependency on the Middle East to some degree, and it will contribute to the improvement in energy security.

Commentary: North American Perspective

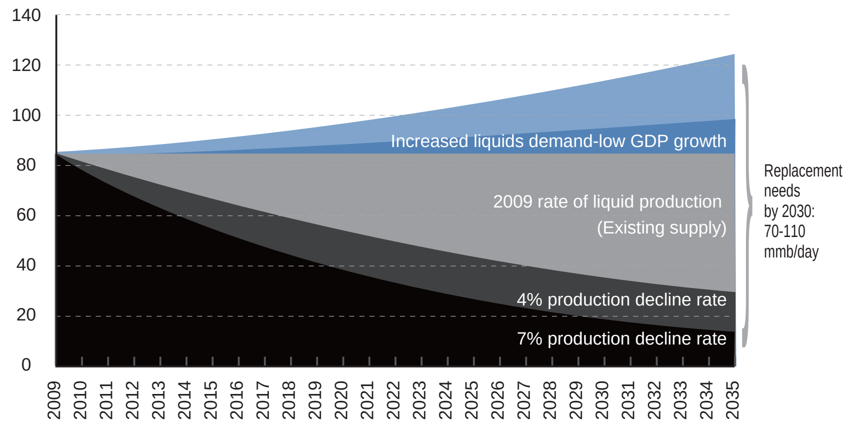
David Pumphrey

ENERGY SECURITY

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 the national vulnerability to a cutoff of energy supplies for geopolitical purposes has the potential to define a nation's foreign policy. Finally, energy's role in contributing to climate change-related security issues has begun to influence international norms, setting new standards for conscientious behavior on the international stage.

The United States has addressed energy security concerns through broad policy responses aimed at assuring reliability of energy supplies at a reasonable cost, while at the same time taking into account environmental concerns. For the most part, energy security in the U.S. has been dominated by concerns about oil, with natural gas fears driven more by resource base and price concerns. The politically stated objective of U.S. energy security policy has in the past been "energy independence;" recent policies, however, have progressively become more and more realistic, with diversity of international cooperation playing a key role in reaching the U.S.'s energy security goals of trying to assure adequate investment in global production capacity (Figure C8) as well as to reshape demand by transforming the way in which we use energy.

Development of the energy resources of the Arctic have 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 and include areas such as the Alaska North Slope that have been in production for a number of years, the financial, technical and environmental risks of operating in an Arctic environment create significant challenges to future production in the region. To make a significant contribution to global energy supplies in the



Source: EIA's International Energy Outlook 2010, CSIS.

Figure C.8 *Core energy security concern: need for investment in global production capacity*

future, governments will need to put in place clear sets of rules regarding investment, operating requirements and other issues to help reduce the uncertainties facing companies who will undertake exploration and development activities in the Arctic. Even with expansion of investment in Arctic development, however, the principal driver for global energy security will be the Middle East, which holds the largest share of recoverable petroleum resources.

COMMENTS ON PROFESSOR SIMONIYA'S PAPER

Professor Simoniya's paper provides valuable insights into the evolution of the structure of the Russian oil and gas industry, the importance of the Arctic to Russia's energy future and the emergence of the Asia Pacific region as a core market for future oil and gas exports.

The evolution of a more competitive industry that Professor Simoniya describes can have important implications for future development of the Russian Arctic. Allowing private Russian companies to compete with Gazprom will facilitate innovation and likely lead to faster development. In particular, the possibility of more open relationships with international oil companies that will come with a greater number of operating companies will facilitate access to the best technology and financial support. The process for making the industry more competitive, however, highlights a continuing concern about the Russian energy sector. As Professor Simoniya described the process, the role of senior government officials was extremely important. The importance of personal relationships between the leaders of the companies and the leaders of the government indicate that the new arrangements may not be institutionalized, but may be subject to changes in the personal objectives of leaders. This type of political uncertainty will be a concern to potential international partners and could limit the pace of development in the Arctic.

Professor Simoniya's paper describes the importance of Asia Pacific market for future growth in oil and gas exports from Russia. He describes the process of establishing pipeline connections to China and to the Pacific Ocean to allow better access for Eastern Siberian petroleum resources. He also mentions the decision to host the 2012 APEC Leaders meeting in Vladivostok as a signal of the importance of this market. Utilization of the Northern Sea Route (NSR) will potentially allow for LNG produced in Yamal and other areas of the Russian Arctic to better access these markets. In his description of the importance of these markets for future gas production in Russia, Professor Simoniya's analysis should incorporate the possibility that global natural gas markets will not support extensive and certainly not rapid development of Russian Arctic gas. Shale gas in the U.S. and possibly in China and other LNG projects will expand the availability of natural gas and constrain the size of market available to expensive Arctic projects.

ALASKAN ARCTIC OIL AND GAS AND U.S. ENERGY SECURITY

The expectation that the Arctic contains significant oil and gas resources has stimulated intense interest in the development of these resources as a way to address energy security concerns and provide commercial opportunities for the U.S. and other Arctic nations. The oil resources of the Alaska Arctic have for some time played a critical role in U.S. energy security. The Alaska North Slope has been a substantial source of oil since the 1970s; however, its current decline is problematic for U.S. energy resources and further infrastructure development in the region.

For natural gas, the North Slope is estimated to hold proved reserves of 35 trillion cubic feet. These large natural gas reserves have remained stranded, however, due to economic factors and political debates that have tied up further investment in a transportation scheme. The cost of infrastructure and environmental preservation has required special treatment in policy regulation and legislation, making arctic development more than just an issue of working in severe climates. As Arctic development becomes more problematic, the energy resources located there become more central to the continued success of nations with a stake in Arctic development.

The first significant Arctic discovery was made in the Prudhoe Bay field in 1968, which became the largest oil field in the U.S. The transportation infrastructure from the Prudhoe Bay field to the rest of the U.S. was an immediate concern and major obstacle, leading to the establishment of a pipeline corridor.

Complications, such as opposition to pipeline construction on native lands and environmental objections, led to a long series of litigation and new legislation. The 1973 Arab oil embargo added the final impetus to legislation that would remove legal barriers to the Trans-Alaska pipeline project, and today further infrastructure development is being considered. A BP oil spill in March 2006 temporarily shut down the field while cleanup was addressed, leading to a stricter examination of Arctic oil spill response.

It is believed that Prudhoe Bay has a total capacity of 25 billion barrels of oil, with total recoverable oil at 13 billion. Since first beginning production in 1977, Prudhoe Bay has produced 11 million barrels, with 2 billion barrels of oil remaining recoverable. Ownership of fields in the Prudhoe Bay is split up between ExxonMobil (36% ownership), ConocoPhillips Alaska Inc. (36% ownership), BP Exploration (26%; operator), and the remaining 2% is owned by others. In addition, other smaller fields in the area have been discovered and brought into production since Prudhoe came on line and the Alaska pipeline was built.

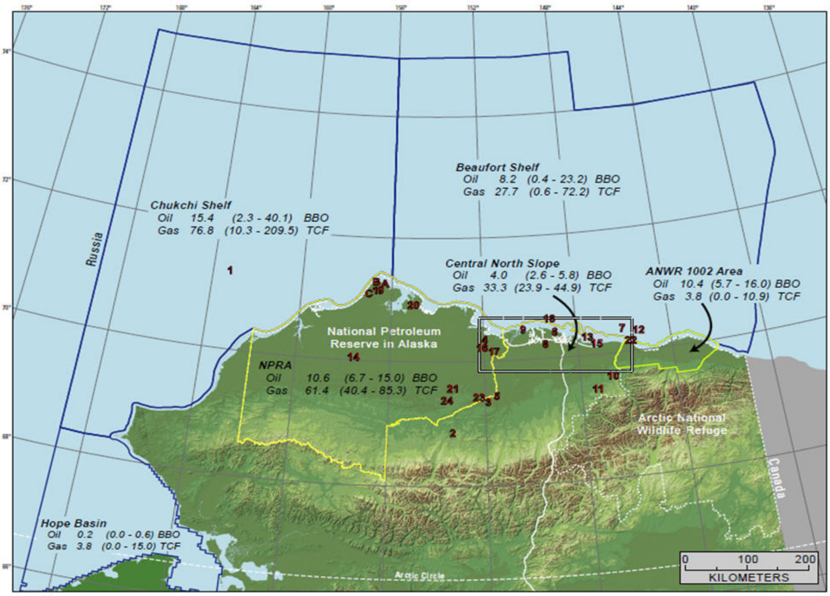
In 1988, North Slope oil production peaked at nearly 2 million barrels per day. At that point in time North Slope oil represented 24% of U.S. domestic crude oil production and 11% of total U.S. petroleum consumption. Since the 1988 peak oil production has declined significantly; in 2010 North Slope produced just 0.67 million barrels per day, falling to 13% of domestic production and 3% of total consumption. Additional oil field development could be supported by excess capacity in the pipeline, however, if the flow rate continues to decline the Alaska oil pipeline will start encounter a growing number of technical problems that would threaten its continued viability. The lower limit to flow rates for the pipeline is estimated to be in the 200-300 thousand barrel per day range.

The natural gas located in the Arctic has also been seen as a significant source of diversification of U.S. energy supplies. Similar to the oil resource, the key element for accessing this natural gas has been the development of transportation infrastructure. In 1977, Congress moved to expedite the construction of a gas pipeline with legislation, speeding up the selection and review process and putting in place special regulatory authorities. Price decontrol in the 1980s significantly altered the domestic supply and demand situation, resulting in prices that could no longer support the Alaska gas pipeline. Until the early 1990s, the pipeline project laid dormant, with the pre-build section in Canada providing a major avenue for increased Canadian exports. In 2001 the National Energy Plan called for the project to be further expedited, with natural gas prices pushing government incentive. Three years later, in 2004, Congress passed legislation to provide up to USD 18 billion in loan guarantees, and to once again consolidate the regulatory process. In 2007, the Alaskan government passed a bill to provide USD 500 million to a selected project. In the interim the estimated cost of the project has risen significantly, to the level of an estimated USD 40 billion total. The emergence of shale gas and other unconventional gas has again changed the U.S. gas market and driven prices to a level that will make completion of an Alaskan gas pipeline very challenging.

FUTURE POTENTIAL

The estimates of potentially recoverable quantities of oil and gas in the Alaskan Arctic are quite large. The 2008 USGS Circum-Arctic Resource Appraisal estimated that the Arctic Alaska region could contain about 30 billion barrels of recoverable, about one-third of the estimated total for the Arctic region. For natural gas the estimated mean value of recoverable gas is 221 Tcf about 13% of the total Arctic gas resources. The highest amounts of recoverable natural gas are believed to be in the Russian Arctic regions.

In the Alaskan Arctic there are four major areas to be explored for future oil and gas production. Perhaps the most controversial, the Arctic



Source: USGS, Oil and Gas Resources of the Arctic Alaska Petroleum Basin, 2005.

Figure C.9 *Arctic Alaska petroleum basin*

National Wildlife Refuge holds a mean value of 10.2 billion barrels of undiscovered, recoverable oil. Also, on shore the National Petroleum Reserve Area was in 2005 estimated to contain 10.6 billion barrels; however, after a review of drilling results the estimated recoverable reserves in this region have been downgraded to less than one billion barrels. Offshore, the Chukchi Sea, which has been estimated at 15.4 billion barrels, and the Beaufort Sea, estimated at 8.2 billion barrels, both remain the more likely areas to be developed.

KEY ISSUES IN DEVELOPMENT

A majority of the key issues that stand in the way of Arctic energy development in the United States center on environmental protection, in particular the Arctic National Wildlife Refuge (ANWR). Environmental values have clashed with development values for decades, in what has become a 30-year battle over whether to allow exploration and development in ANWR. The importance of ANWR for both sides of this debate is apparent—the refuge holds high oil resource potential in a relatively small area that is easily connected to an oil pipeline; it also boasts pristine wilderness, relatively untouched by man and one of the last undeveloped regions in the U.S., with a large migratory caribou area. First established as a reserve in 1980, a provision for oil exploration in the coastal plain was left open in case of approval by Congress. In 1996, legislation was passed to allow drilling, but was later vetoed. The battle has since continued, with the Bush Administration including drilling in the refuge as part of its National Energy Plan and the Obama Administration later opposing it.

Development of the Naval Petroleum Reserve also faces some difficulty. The administration and Congress have agreed that oil exploration and development can proceed in this area but so far only small to medium-sized discoveries have been made, and only a few of these appear to be economical to connect to the Alaska oil pipeline.

There are currently 87 leases covering 2.8 million acres issues in the Beaufort and Chukchi seas; applications for the first exploratory drilling are under review. However, concerns about the environmental impact—air quality, noise pollution, and potential damage to marine mammals—have dominated the discussions surrounding lease applications. Further, the Gulf oil spill heightened concerns about the ability to control wells in the difficult arctic environment, prompting discussion on the adequacy of spill response measures, Coast Guard capabilities, and knowledge of the impact of oil in Arctic waters.

Some criticism of development in the Alaskan Arctic has centered on the offshore leasing process in the Beaufort and Chukchi seas. Currently the U.S. Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) oversees the lease process, granting leases based on specific requests from the oil and gas industry during a designated time period. A complicated review process and environmental opposition have dramatically slowed approvals; however, a new, coordinated review process may allow drilling to begin as soon as 2012. Proponents of stricter lease practices point to the fragility of the Arctic environment and the lack of adequate capability to deal with any accident or oil spills as a reason to delay development; opponents point to the need for energy resources, the acres of available land, and the economic incentive that exploration provides. Provisions such as design and implementation of a "comprehensive, long-term scientific research and monitoring plan," conducting lease sales on a tract-by-tract basis as opposed to the current area-wide lease sales, and improved stakeholder participation in outer continental shelf (OCS) decision making; broad range reforms and more specific, industry and environment conscious changes are being fought for at both a national and state level, all with the Alaskan-Arctic interests driving the arguments. On August 4, BOEMRE issued the first conditional approval of a permit to allow Shell oil to begin exploratory drilling during the 2012 drilling season. This is the first of multiple steps Shell has to go through to receive final permission. Environmental opposition will certainly continue.

Another of the major issues that will confront Alaskan Arctic energy development is the issue of transport infrastructure. Currently the TAPS oil pipeline is nearing the lower limit on throughput. The pace of offshore development may be too slow to keep the flow of oil up (due in part to the slow lease approval process, as well as the long lead times for development). The State of Alaska, in response, is offering development incentives in the hopes of providing volumes in the interim. If the pipeline were to go out of service the cost of a replacement would be very high – perhaps in the range of a USD 30+ billion project. For natural gas the cost of a newly constructed pipeline to the lower 48 states is estimated at USD 30-USD 40 billion. The delivered cost of this gas may not be able to compete with shale gas in the lower 48 states. Long thought to be unrealistic, and still far from materializing, access of gas to international markets may be critical given differential regional pricing. LNG exports from southern Alaska have occurred since the 1960s. The cost of building the infrastructure to pipe Alaskan gas to the south for export has not been thoroughly evaluated, nor has the possibility of establishing liquefaction facilities in Alaskan Arctic region. Additionally, the State of Alaska will have demand for natural gas that will need to be met.

U.S. ENERGY SECURITY AND ARCTIC ALASKA ENERGY DEVELOPMENT

With abundant natural resources, a fragile ecosystem, and the fundamental role it plays in regulating the Earth's climate, the Arctic has become a strategic interest for United States energy policy, national energy companies, and environmental activists. Decisions regarding oil and gas activity in the region require a cautionary approach, but also fair consideration must be made for all interested parties. Government agencies must be willing to make accommodations based on the changing landscape, spill response, and responsible exploration; environmentalists must be willing to make accommodations based on the resources that are vital to a functioning, well-run nation.

Currently, the energy security debate is driven by higher oil prices; all sides of the argument can agree on creating a comprehensive energy policy with a mix of demand and supply options. For domestic resource development, particularly the Alaskan Arctic, one of the most fragile environments on Earth, the key question is the definition of responsible development. How energy security concerns and environmental concerns will balance remains uncertain; these questions and more will become larger and larger issues as the Alaskan Arctic becomes more important in coming years. Problems with infrastructure development, seasonal work, and funding will only last for so long, and then the very real importance of the Alaskan Arctic will be made clear.

The debate over how to approach U.S. energy security concerns that will ultimately drive U.S. actions in the Alaskan Arctic will hinge on the success of overall energy policies. As the U.S. works to increase efficiency and alternative fuels use, it has reduced projected growth in oil demand. The share of imported oil in the U.S. is expected to decline, from 57% in 2008 to 45% in 2035. The need to develop domestic resources is still a central piece on all sides of the debate, but a key difference comes in defining “responsible development.” Also, the development of unconventional natural gas resources elsewhere in the U.S. may lessen the perceived need to develop a natural gas transportation system in the Alaskan Arctic, as shale gas becomes an increasing focus for future energy needs. If the energy security landscape continues to transform, the “energy security argument” may no longer be an effective tool to drive Alaskan Arctic oil and gas development.

PART IV

PROMOTING NORTH PACIFIC COOPERATION ON THE GOVERNANCE OF ARCTIC MARINE SHIPPING AND ENERGY RESOURCE DEVELOPMENT

6. Arctic Straits: The Bering Strait, Northwest Passage, and Northern Sea Route[*]

Michael Byers

INTRODUCTION

For decades, shipping through the Northwest Passage and the Northern Sea Route (NSR) was restricted to heavy icebreakers by the year-round presence of thick, hard "multi-year" sea ice. But climate change, which is advancing more quickly in the Arctic than anywhere else on Earth, is rapidly causing the ice to thin and recede. 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 again in September 2012, when the area covered by Arctic sea ice plunged to just 3.41 million square kilometres, fully 49 percent below the 1979 to 2000 average.[1] Nor were 2007 and 2012 aberrations; the six lowest extents of Arctic sea ice on record all occurred in the six years from 2007 to 2012.[2]

It now seems possible that the Arctic could experience a complete, late season melt-out of sea ice within the next five to 10 years, and with it a permanent loss of multi-year ice. Indeed, imagery from the European Space Agency's new Cryosat satellite shows that the multi-year ice is already gone from much of the Arctic Ocean and thinning rapidly wherever it remains.[3] 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.

Already, we are seeing a sharp upturn in Arctic shipping. During the

* This paper's analysis has been further developed in Michael Byers, *International Law and the Arctic* (Cambridge University Press, 2013).

first century of navigation through the Northwest Passage, from 1906 to 2005, there were just 69 full voyages.[4] Yet it took just five more years, from 2006 to 2010, for the next 69 full voyages to occur, with 18 taking place in both 2009 and 2010. The increase has continued, with 22 transits in 2011 and 30 transits in 2012.[5]

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 United States, which claims the chokepoints along both waterways constitute so-called "international straits" through which vessels from all countries may pass freely.

According to the International Court of Justice in the 1949 *Corfu Channel Case*, "the decisive criterion" for an international strait is "its geographical situation as connecting two parts of the high seas and the fact of its being used for international navigation."[6] Foreign vessels sailing through an international strait necessarily pass within 12 nautical miles of one or more coastal states, but instead of the regular right of "innocent passage" through territorial waters, foreign vessels benefit from "transit passage." This entitles them to pass through the strait without coastal state permission, while also freeing them from other constraints. For instance, foreign submarines may sail submerged through an international strait, something they are not allowed to do in regular territorial waters.

In contrast, both Canada and Russia maintain that the straits along their northern coastlines constitute "internal waters." Internal waters are not territorial waters and there is no right whatsoever to access them without the permission of the coastal state. Internal waters arise in bays or along fragmented coastlines through the long-term acquiescence of other countries, and/or by the drawing of "straight baselines" between headlands in accordance with the judgment of the International Court of Justice in the 1951 *Anglo-Norwegian Fisheries Case*.[7]

The disputes over the Northwest Passage and the NSR mattered little when only powerful icebreakers could pass through. But due to the melting ice and increasing volumes of commercial shipping, they already matter a great deal more. This paper explains the legal and politic dimensions of the disputes. It also considers the interests of the different disputant states as well as major shipping countries such as China, South Korea and Japan, none of which have, as yet, taken a position on the legal issue. It concludes with a series of recommendations as to how the Northwest Passage and the NSR – and also the Bering Strait, through which all international shipping through these northern waterways will necessarily pass – could be transformed into safe, reliable and efficient shipping routes through cooperation between coastal and shipping states. Ideally, such cooperation would lead to treaties that recognize Russia and Canada's internal waters claims, in return for assured access and significant investments in services and infrastructure.

BERING STRAIT

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 Bering 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 the narrowest point, only 44 miles separate the mainland coasts of the two countries, with less than three miles separating two islands in the middle of the strait: Russia's Big Diomede and the U.S.'s Little Diomede.

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. According to a confidential U.S. diplomatic cable released by Wikileaks, the Russian Ministry of Foreign Affairs approached the U.S. Embassy in Moscow on April 17, 2009, "to request cooperation on a wide range of long-stalled Bering Strait initiatives, including nature protection, oil and gas exploration, and sea shipping and transport."[8]

In the same cable, the embassy discussed the often-contradictory public statements on Arctic policy made by different Russian officials, and provided the following advice to the State Department:

> *The statements of the MFA (Ministry of Foreign Affairs) and President Medvedev indicate that moderates have focused on the Arctic as a zone of cooperation. Our continued support of the Arctic Council and bilateral*

> *engagement on the Arctic (included in the proposed U.S.-Russia Action Plan), can help bolster the moderates and give incentives to the GOR (Government of Russia) to continue cooperation. Increased scientific cooperation, particularly on climate change, could increase trust and build confidence. Under the framework of either multilateral or bilateral cooperation, we can also offer to jointly develop navigation aids and port facilities, continue developing and sharing sea current and meteorological data, promote social development for indigenous peoples, and cooperate on emergency response and oil spill remediation – all tasks that Medvedev charged the GOR with in his September 17, 2008 remarks, but will be difficult to fulfil without outside expertise.*[9]

Exactly two years later, on the margins of a G8 meeting in Deauville, France, presidents Barack Obama and Dmitry Medvedev released a joint statement on cooperation in the Bering Strait region. The statement did not address shipping issues but instead focused on environmental cooperation, namely, "the expansion of interaction between the national agencies that are responsible for the specially protected natural territories/areas of both countries in the State of Alaska and the Chukotka Autonomous District."[10] However, given the record so far, additional cooperation in other areas may soon be forthcoming.

In 1990, the U.S. and the Soviet Union negotiated a 1,390 nautical mile single maritime boundary – one that delimits jurisdiction over both fish and seabed resources – in the Bering Strait, Bering Sea and Chuckhi Sea.[11] The U.S. was quick to ratify the treaty, with the Senate giving its advice and consent in September 1991. However, the treaty attracted a great deal of opposition within the Soviet Union (which was then disintegrating) and, in 1995, the Russian Foreign Ministry informed the U.S. that it would not be submitted to the Duma (i.e. Russian parliament) for approval. Yet both the U.S. and Russia have agreed, by way of an exchange of notes, to treat the agreement as binding as per Article 25 of the 1969 Vienna Convention on the Law of Treaties.[12]

Even if the boundary treaty were to unravel, the legal situation in the Bering Strait itself would remain unchanged. There is no disagreement as to the location of the boundary in the Bering Strait, where it passes through the narrow and shallow channel between Big Diomede and Little Diomede. As a result of those islands, and the fact that they are each less than 24 nautical miles from the coastline on their side, any foreign vessels wishing to make the transit must pass through the territorial waters of either Russia or the U.S. And again, they are entitled to do so because the waterway is accepted, including by both coastal states, to be an international strait on both sides of the two Diomedes.

The prospect of greatly increased shipping through the Bering Strait should prompt greater bilateral cooperation, including on improved search-and-rescue, navigation aids, ports of refuge, and oil spill response. Such negotiations could potentially include some of the major shipping states, notably South Korea, Japan and China, with a view to securing support for better and faster infrastructure development. Indeed, 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 surrounding waters.

Finally, Russia, the U.S., and ideally the major shipping countries should ask the International Maritime Organization (IMO) to endorse a mandatory ship registration scheme and mandatory shipping lanes in the Bering Strait. Such measures would protect the security and environmental interests of the coastal states while improving safety for foreign shipping. Similar IMO-endorsed measures exist in other international straits, including the Torres Strait between Australia and Papua New Guinea.[13]

NORTHERN SEA ROUTE

The NSR is defined in the Soviet Union's (now Russia's) 1990 regulations as:

> *The essential national transportational line of the USSR that is situated within its inland seas, territorial sea (territorial waters), or exclusive economic zone adjacent to the USSR Northern Coast and includes seaways suitable for leading ships in ice, the extreme points of which are limited in the west by the Western entrances to the Novaya Zemlya Straits and the meridian running north through Mys Zhelaniya, and in the east (in the Bering Strait) by the parallel 66° N and the meridian 168°58'37' W.*

The NSR offers a reduction in distance and sailing time from Northern Europe to Northeast Asia of up to 40 percent compared to the traditional routes through the Suez or Panama Canals.[14] It is also the first circumpolar shipping route to open as the result of climate change, with the thick, hard multiyear sea ice having disappeared from the Russian side of the Arctic Ocean already.[15] 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.[16]

In 1963, the U.S. Coast Guard icebreaker *Northwind* surveyed the Laptev Sea; the next summer, the USS *Burton Island* did likewise in the East Siberian Sea. These voyages prompted the Soviet government to send an *aide-memoire* to the U.S. Embassy in Moscow on July 21, 1964, clearly setting out the position that the straits joining these and other seas north of the Russian mainland are Russian internal waters:

> *The Northern seaway route is situated near the Arctic coast of the USSR. This route, quite distant from international seaways, has been used and is used only by ships belonging to the Soviet Union or chartered in the name of the Northern Seaways ... It should also be kept in mind that the northern seaway route at some points goes through Soviet territorial and internal waters. Specifically, this concerns all straits running west and east in the Karsky Sea. Inasmuch as they are overlapped twofold by Soviet territorial waters, as well as by the Dmitry, Laptev and Sannikov Straits, which unite the Laptev and Eastern Siberian Seas and belong historically to the Soviet Union. Not one of these stated straits, as is known, serves for international navigation. Thus over the waters of these straits the statute for the protection of the state borders of the USSR fully applies, in accordance with which foreign military ships will pass through territorial seas and enter internal waters of the USSR after advance permission of the Government of the USSR....*[17]

On June 22, 1965, the U.S. government responded with a diplomatic note that recast the Soviet internal waters claim in the language of "historic waters" and presented its own position – that the Russian straits are international straits – in a remarkably tautological manner:

> *So far as the Dmitry, Laptev and Sannikov Straits are concerned, the United*

> *States is not aware of any basis for a claim to these waters on historic grounds even assuming that the doctrine of historic waters in international law can be applied to international straits.... While the United States is sympathetic with efforts which have been made by the Soviet Union in developing the Northern Seaway Route and appreciates the importance of this waterway to Soviet interests, nevertheless, it cannot admit that these factors have the effect of changing the status of the waters of the route under international law. With respect to the straits of the Karsky Sea described as overlapped by the Soviet territorial waters it must be pointed out that there is a right of innocent passage of all ships through straits used for international navigation between two parts of the high seas and that this right cannot be suspended. In the case of straits comprising high seas as well as territorial waters there is of course unlimited right of navigation in the high seas areas ... For the reasons indicated the United States must reaffirm its reservations of its rights and those of its nationals in the waters in question whose status it regards as dependent on the principle of international law and not decrees of the coastal state.*[18]

By re-characterizing the Soviet claim as one of historic waters, and asserting that the waterways are international straits because they are international straits, the U.S. sought to sidestep the awkward fact that the waterways were not used for international shipping – one of the two criteria for international straits set out by the International Court of Justice in the 1949 *Corfu Channel Case*.[19]

VIL'KITSKII INCIDENTS

The Soviet-America dispute soon took on greater significance through what are sometimes referred to as the Vil'Kitskii Incidents. The Vil'Kitskii Straits are located between Bol'Shevik Island, located at the southern end of the Severnnaia Zemlia archipelago, and the Taimyr Peninsula, which is the northernmost portion of the Russian mainland. Their location at 78 degrees north latitude, just 740 nautical miles (1,370 km) from the North Pole, makes them the most important choke point on the NSR.

In the summer of 1965, the U.S. Coast Guard icebreaker *Northwind* approached the Vil'Kitskii Straits from the west. Strong diplomatic pressure was applied by the Soviet Union; pressure that, according to one

Department of State spokesman, extended to a threat to "go all the way" if the American ship proceeded into the strait.[20] The U.S. government responded by ordering the *Northwind* to turn around.[21]

In the summer of 1967, the U.S. Coast Guard icebreakers *Edisto* and *East Wind* were dispatched to circumnavigate the Arctic Ocean. The plan – as communicated to the Soviet government – was for the vessels to sail north of Novaya Zemlya and Severnaya Zemlya "entirely in international waters."[22] But heavy ice conditions forced the ships to change course towards the Vil'Kitskii Straits. A diplomatic note was sent to Moscow that was carefully worded so as not to constitute a request for permission: "This squadron will ... make a peaceful and innocent passage through the straits of Vil'kitskii, adhering to the centerline as closely as possible, and making no deviation or delay ..."[23]

The Soviet Union responded with an *aide-memoire* the very same day – followed by an oral *demarche* four days later – reiterating that the straits were Soviet waters and that foreign vessels had to submit requests to enter 30 days in advance.[24] The U.S. government aborted its plans of circumnavigation, while stating that it "strongly protests" the "unwarranted position that the proposed passage of the Edisto and *Eastwind* would be in violation by Soviet regulations, raising the possibility of action by the Soviet Government to detain the vessels or otherwise interfere with their movement."[25]

The Vil'Kitskii Incidents are important from a legal perspective because, again, of the criteria for international straits set out by the International Court of Justice in the 1949 *Corfu Channel Case*, namely that the strait must connect two areas of high seas and "be used for international navigation."[26] The latter functional criterion has clearly not been met in the straits north of Russia. Indeed, as Rothwell explains, since the incidents in the 1960s "there has been little further attempt by the United States or any other state actively to assert a right of freedom of navigation for its ships through the Russian Arctic straits."[27]

POST-SOVIET ERA

During a speech in Murmansk in October 1987, Russian President Mikhail Gorbachev said: "Across the Arctic runs the shortest sea route from Europe to the Far East, to the Pacific. I think that, depending on how the normalization of international relations goes, we could open the Northern Sea Route to foreign ships under our icebreaker escort."[28] Two years later, the USSR earned its first foreign currency from the NSR when the *Tiksi*, a Soviet vessel, was chartered to carry goods from Germany to Japan. In 1991, the French-flagged *Astrolabe* became the first non-Soviet vessel to traverse the NSR.[29]

During the 1990s, international interest in the NSR led to two major reports. The International Northern Sea Route Programme was a Norwegian, Japanese and Russian project that ran from 1993 to 1999 and focused on the viability of the waterway for international shipping. It concluded:

> *A substantial increase in international commercial shipping is feasible – in economic, technological and environmental terms. The largest and most obvious cargo potential is found in the huge oil and gas reserves in the Russian Arctic – both onshore and offshore – where marine export towards western markets is likely to start up early in the new Century. As for transit traffic, INSROP's survey of the main cargo-generating regions at the western and eastern ends of the NSR (NW Europe, NE Asia and the North American West Coast) identified a stable transit cargo potential, most notably for dry bulk.*[30]

The Arctic Operational Platform, funded and organized by the European Commission between 2002 and 2006, was designed to help make the NSR an environmentally and economically viable option for transporting oil and gas from the Russian Arctic. It concluded that: "*Oil and gas transportation by the Northern Sea Route is technologically possible and economically feasible*."[31]

In September 2009, two German container ships successfully navigated the NSR from east to west on a voyage that began in Ulsan, South Korea, and ended in Rotterdam.[32] In November 2010, Norilsk Nickel, Russia's largest mining company, reported that one of its vessels had completed a round trip from Dudinka, in northwestern Russia, to Shanghai, China. The 11,320-mile trip took 41 days, compared to the 24,100 miles and 84 days that it would have taken by way of the Suez Canal.[33] In June 2011, Bloomberg reported that Norilisk Nickel planned to invest USD 370 million in order to double Arctic shipments by 2016.[34] Other businesses such as Novatek, a natural gas company, and Lukoil, Russia's largest oil company, also expect to save time and money by using the NSR.[35]

RUSSIA'S LEGAL POSITION

As Rothwell observes, attempts to support the use of the NSR by foreigners have never meant that the USSR or Russia believed the straits should be opened to "unrestricted passage by international vessels."[36] Historical analyses of the Soviet/Russian legal position vary, with the most comprehensive one, by Erik Franckx, tracing an evolution from the "sector" theory to an "ice-is-land" theory to a claim based on historic title.[37] However, as the quotation from the Russian *aide-memoire* of 1964 makes clear above, for nearly half a century the core claim has, in fact, been one of internal waters.[38]

Following the establishment of straight baselines in the Pacific Ocean, the Sea of Okhotsk and the Bering Sea in 1984, the Soviet Union adopted similar lines along its northern coastline in 1985.[39] Crucially, the island groups of Novaia Zemlia, Severnaia Zemlia, and the New Siberian Islands were all connected to the mainland by straight baselines, effectively creating legal barriers to foreign vessels wanting to sail from the Barents Sea to the Kara Sea to the Laptev Sea to the East Siberia Sea, or in the opposite direction. The baselines themselves vary in length from 29 nautical miles in the Kara Strait to 42 and 60 nautical miles in the Vil'Kitskii Straits. Within these zones, through which vessels must sail while navigating the NSR, the permission of the Russian government is required – and with that, full compliance with Russian domestic law.[40]

The International Court of Justice upheld the legality of straight baselines along fragmented coastlines and fringing islands in the 1951 *Anglo-Norwegian Fisheries Case*.[41] Maritime areas within straight baselines constitute internal waters of the coastal state. It can, however, be questioned whether the islands joined by the Russian baselines fit the criterion of a "fragmented" coastline, since they protrude hundreds of miles northwards from the otherwise mostly east-west direction of the mainland coast.

Moreover, straight baselines do not terminate the right of transit passage where an international strait existed before they were drawn, and Franckx argues that this is the situation along the Russian coast – because the Soviet Union expressed the view that the straits were territorial seas when it opposed the proposed voyages of U.S. icebreakers in the 1960s.[42]

But again, the quotation from the 1964 *aide-memoire* above shows that this was, in fact, not the case.[43]

Although the U.S. protested Russia's Arctic straight baselines after they were adopted in 1985, it is unclear whether the basis for the protest was the length of the baselines, or the fact that they purported to close off the NSR.[44] Significantly, there is no evidence of protests from other countries.

The extensive rights involved in the internal waters claim have more recently been supplemented by the rights set out in Article 234 of the 1982 United Nations Convention on the Law of the Sea. Article 234 allows coastal states to exercise heightened regulatory powers over shipping in ice-covered areas for the prevention, reduction, and control of marine pollution – including in terms of vessel design, construction, and navigational practices – out to 200 nautical miles from shore.[45] As Brubaker explains: "Article 234 has been indicated by the Soviet Union and Russia to be the basis of its domestic Arctic legislation, including the Regulations for Navigation on the Seaways of the Northern Sea Route (1990 Rules) and supporting legislation, which are applicable to all vessels."[46] Most of the applicable documents, including supplementary rules adopted in 1996, are available on the official website of the Russian Ministry of Transport.[47]

These regulations require that permission for voyages be sought four months in advance, that the vessel and its master meet specific standards including having sufficient insurance coverage to cover possible pollution damage, that the vessel adhere to its assigned route, and that ships navigating the Vil'kitskii, Shokal'skii, Dmitrii Laptev, and Sannikov straits will be accompanied by "mandatory icebreaking pilotage." In addition, vessels must have double hulls and meet designated standards of ice strengthening. They may also be inspected en route to ensure compliance with regulations.[48]

Also in 1996, the Russian component of the International Sea Route Programme produced a *Guide to Navigating through the Northern Sea Route*.[49] Although the more than 300 page guide is now out of date, it still provides a useful overview of geographical, hydro-meteorological and navigational conditions, including a list of aids to navigation and information on ice navigation practice, search-and-rescue and salvage assistance.

U.S. LEGAL POSITION

The U.S. position remains that the right of free navigation exists along the NSR through the high seas, including the Russian exclusive economic zone, and that within 12 nautical miles from shore the regime of transit passage applies because Russia's Arctic straits are "international straits." The U.S. issued diplomatic statements indicating its view that the straits are subject to free or transit passage in the 1960s and again in 1992 and 1994.[50] The most recent of these statements came in January 2009, in a presidential directive issued by George W. Bush:

> *The Northwest Passage is a strait used for international navigation, and the Northern Sea Route includes straits used for international navigation; the regime of transit passage applies to passage through those straits. Preserving the rights and duties relating to navigation and over flight in the Arctic region supports our ability to exercise these rights throughout the world, including through strategic straits.*[51]

The Obama Administration, however, has been much more willing to cooperate with Russia, including in the Arctic. In these new circumstances Russia might wish to engage the U.S. in negotiations about the NSR. It could, for instance, provide assured access for responsible shipping companies and research vessels as part of an agreement that was explicitly "without legal prejudice" to the underlying dispute, in a manner similar to the 1988 Canada-U.S. Arctic Cooperation Treaty (as discussed below). Such an agreement could serve Russia's interests by reducing the risk of other countries, such as China, challenging its internal waters claim, while the U.S. would benefit from resolving or at least calming the one dispute where it argues that an international strait exists in the complete absence of any non-consensual voyages. Finally, negotiations on the NSR could conceivably include the major shipping states and Canada also, whereupon the issue of the Northwest Passage could be addressed as well.

THE NORTHWEST PASSAGE

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 over them in 1880, while the nearly impenetrable sea ice meant that the issue of ownership and control over the water was never even discussed. Only the acquisition of powerful icebreakers by the U.S., 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.[52] Provided the lines are of a reasonable length, 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.

During the negotiation of the 1993 Nunavut Land Claims Agreement, which created the Inuit governed territory of Nunavut, the Inuit explicitly sought to strengthen Canada's legal position vis-à-vis the Northwest Passage. It was the Inuit negotiators who insisted on the inclusion of a paragraph that reads: "Canada's sovereignty over the waters of the Arctic archipelago is supported by Inuit use and occupancy."[53] In the 1975 *Western Sahara Case*, the International Court of Justice affirmed that nomadic peoples are able to acquire and transfer sovereignty rights (albeit in a context involving land rather than ice-covered waters).[54]

The U.S. insists the Northwest Passage is an "international strait," which, again, is a waterway connecting two expanses of high seas and used for international navigation. The coastal state retains title to the waters but foreign vessels have a right of "transit passage," much like walkers on a footpath through a British country estate. The U.S. also points out, correctly, that straight baselines cannot be used to close off an existing international strait.[55] As a result, the crux of the dispute between Canada and the U.S. concerns the requirement that the strait be used for international navigation, including, especially, before the "critical date" of 1969 or – perhaps – 1985.[56]

In the past century, only two vessels have passed through the Northwest Passage overtly without asking Canada's permission: the SS *Manhattan*, an American owned-and-registered ice-strengthened supertanker, in 1969; and the USCGC *Polar Sea*, a Coast Guard icebreaker, in the summer of 1985. A number of Canadian authors argue that two transits are insufficient to fulfill the "used for international navigation" requirement set out by the

International Court of Justice in 1949, especially since the strait in question then – the Corfu Channel – was seeing thousands of foreign transits each year. American authors argue that the International Court of Justice did not specify a threshold, and also treated the functional criteria as subsidiary to the geographic one. Some authors in the employment of the U.S. Navy have gone so far as to argue that prospective use matters as much as actual use,[57] although this argument is generally dismissed by non-American experts, including a number of non-Canadians, since it finds no support in the *Corfu Channel Case*.[58]

The U.S. position has received some support from the European Commission, which in 1985 joined the State Department in protesting against Canada's drawing of straight baselines around the Arctic islands. However, the focus of the European objection was the unusual length of several of the lines, rather than the adoption of the baselines as such, or the internal waters claim specifically. Contrary to a widespread assumption, no country apart from the U.S. has ever explicitly and specifically objected to Canada's internal waters claim.

Nor has the dispute posed a problem for Canada and the U.S. in recent decades. In 1988, the two countries concluded a treaty in which the U.S. "pledges that all navigation by U.S. icebreakers within waters claimed by Canada to be internal will be undertaken with the consent of the Government of Canada." At the same time, the two countries agreed that "Nothing in this Agreement … nor any practice thereunder affects the respective positions of the Government of the United States and of Canada on the Law of the Sea in this or other maritime areas…"[59] In other words, they explicitly agreed to disagree.

The 1988 Arctic Cooperation Agreement would have resolved the matter of the Northwest Passage indefinitely, but for the recent and dramatic effects of climate change. Now, with the sea ice melting and the prospect of numerous foreign vessels sailing through, the environmental protection and security interests of both Canada and the U.S. point in the direction of further negotiations.

Since September 2001, Washington has become concerned about the possibility of terrorists using the Northwest Passage to sneak into North America, or of rogue states transporting weapons of mass destruction via the continent's longest, mostly unguarded coastline. Clearly, these challenges would best be addressed through a coastal state's domestic criminal, customs and immigration laws, rather than the much looser constraints of international law. It is difficult to see how it benefits the U.S. – or most other countries – to have foreign vessels shielded from reasonable regulations and scrutiny by maintaining that the passage is an international strait.

The U.S. Navy, however, is concerned that recognizing Canada's claim could create a precedent for other waterways where the legal status is contested, such as the Strait of Hormuz. Yet the presence of sea ice and paucity of non-consensual foreign transits make it possible to legally distinguish the Northwest Passage from all other potential or existing international straits – apart, that is, from the Russian Arctic straits that are part of the NSR.

Access to the waterway is not really at issue, since Canada would never deny entry to an ally or, indeed, any reputable shipping company. As then Prime Minister Pierre Trudeau declared in 1969, "to close off those waters and to deny passage to all foreign vessels in the name of Canadian sovereignty ... would be as senseless as placing barriers across the entrances of Halifax and Vancouver harbours."[60]

In 2005, then U.S. Ambassador Paul Cellucci asked the State Department to reexamine the U.S.'s legal position concerning the Northwest Passage. After his term in Ottawa was over, Cellucci made his personal views clear: "It is in the security interests of the United States that it [the Passage] be under the control of Canada."[61] In 2008, the former envoy participated in a model negotiation between two teams of non-government experts that produced nine recommendations for Canada-U.S. cooperation and confidence building with respect to northern shipping.[62]

Official policy, however, remains stuck in the pre-climate change, pre-9/11 era, when thick, hard sea ice could be relied upon to keep foreign vessels away, and concerns about a precedent that might negatively affect the U.S. Navy's navigation interests elsewhere weighed heavier than threats from non-state actors and WMD. In January 2009, just before he left office, U.S. President George W. Bush signed a presidential directive that included a reaffirmation of Washington's long-standing position that the Northwest Passage constitutes an international strait.[63]

Now, every summer brings a heightened risk of a challenge to Canada's position: most likely by a rogue cargo ship flying a flag of convenience and seeking to take a 4,000 mile short-cut without consideration for Canada's claim or the changing interests of the U.S.[64] In the circumstances, Ottawa and Washington should pursue every opportunity for cooperation and confidence building, including updating and extending the 1998 treaty on U.S. Coast Guard icebreakers to address the security threats posed by commercial ships and other non-state actors – with the ultimate goal being U.S. acceptance of Canada's internal waters claim, in return for a clear Canadian commitment to providing a safe and reliable route for international shipping. As with the 1988 treaty, any new agreement could state that it was "without legal prejudice" to the underlying legal dispute over the status of the Northwest Passage. Finally, such negotiations could conceivably include the major shipping states as well as Russia, in which case they could address the issue of the NSR as well.

ASSESSMENT OF LEGAL POSITIONS

The Vil'kitskii, Shokal'skii, Dmitrii Laptev, and Sannikov straits are almost certainly Russian internal waters, given the absence of any overt non-consensual voyages by foreign vessels and the fact that only one country has expressly opposed the Russian position. Brubaker agrees with this assessment, even though he presumes (but does not substantiate) the existence of at least some non-consensual voyages as well as protests of the Russian position by countries other than the U.S.[65] Rothwell writes: "Given the relative infrequency of foreign-flagged vessels passing through these straits, which seems even less frequent when compared to similar voyages through the Northwest Passage, it would seem difficult to classify any of the major straits in the Northeast Passage as 'international straits'."[66] For their part, Churchill and Lowe write:

> *A part from some of the individual straits making up the [Northeast] Passage being enclosed by straight baselines drawn in 1985, there are doubts as to whether the straits can be said to be "used for international navigation," and thus attract a right of transit passage, in the light of the handful of sailings through the (often ice-bound) straits that have actually taken place.*[67]

Cementing the Russian claim is the fact that the dispute's "critical date" – the point when the differing positions became clear and subsequent attempts to bolster them became inconsequential to the legal analysis – was 1964 or 1965.[68]

The status of the Northwest Passage is less clear. There have been two surface voyages where permission was not requested, even if Canada did give unsolicited permission in each case. At the same time, only the U.S. has expressly and specifically opposed Canada's claim. And notwithstanding the unusual length of several of the Canadian baselines, the drawing of baselines around a coastal archipelago of 19,000 closely-knit islands is consistent with the purpose of such lines as articulated in the *Anglo-Norwegian Fisheries Case*.

The Northwest Passage dispute likely achieved its "critical date" in 1969 when the SS *Manhattan* sailed through, making that the only non-consensual voyage on the ledger of state practice for-and-against Canada's claim. And one can question just how non-consensual the *Manhattan* voyage actually was, given that Canada gave its permission in advance and sent an icebreaker to help that, on 10 different occasions, freed the *Manhattan* from sea ice in which it would otherwise have remained stuck. Disregarding publications written by Canadian or U.S. officials, and discounting those written by Canadian or U.S. nationals, the picture arising from the literature is one of uncertainty. After engaging in a careful analysis of the "used for international navigation" requirement, Rothwell concludes that, "without further judicial guidance on the question of international straits it is extremely difficult to determine conclusively whether the Passage is or is not an international strait."[69]

POSSIBILITIES FOR COOPERATION

Canada considers the Northwest Passage to be internal waters and Russia takes the same view of its Arctic straits. The 1990 and 1996 Russian regulations are very similar to the provisions of the 1970 Canadian Arctic Waters Pollution Prevention Act and Canada's now-mandatory ship registration scheme (NORDGREG), which reflects their common connection to Article 234 of UN Convention on the Law of the Sea.

Both countries also recognize that the thinning and melting of the sea ice poses environmental and security risks *at the same time* that it creates economic opportunities in the form of increased shipping and access to natural resources. Both take the view that their domestic laws provide the best bases for protecting and developing their northern coastlines. And both face a single, common source of opposition to their claims, namely the U.S. All of which raises the question: Why have Russia and Canada not bolstered their respective positions by recognizing each other's legal positions?

Well, they have, on at least one occasion. In August 1985, as the U.S. Coast Guard icebreaker *Polar Sea* was sailing through the Northwest Passage, the press attaché at the Soviet Embassy in Ottawa expressed support for Canada's claim: "Whether it is the Northwest Passage or the Northeast Passage doesn't matter," Evgeni Pozdnyakov said. "Our position is based on provisions of international law. The waters around islands belonging to a country are the internal waters of that country."[70] But that was as far as it went. There is no evidence of any subsequent statements of mutual support on the issue of Arctic straits as between Canada and Russia. The reason for the lack of sustained, explicit, mutual recognition probably lies in the fact that Canada and the USSR were on different sides of the Cold War. The U.S. position has always based on security concerns, namely a felt need for maximum navigation rights worldwide for the U.S. Navy. With Canadian and U.S. security linked through the North American Aerospace Defense Command (NORAD) and North Atlantic Treaty Organization (NATO), it was difficult enough for Canada to take an independent stance on the Northwest Passage issue without provoking Washington by taking the Soviet Union's side in the NSR dispute.

But why did the Soviet Union not express support for Canada's claim, and at a higher level than an embassy press attaché? One possible explanation is that Moscow decided not to disrupt the delicate balance that allowed Canada and the U.S. to "agree-to-disagree" on the legal status of the Northwest Passage. Had Moscow come out publicly in favor of the Canadian position, Washington might have decided that the Canadian stance could no longer be tolerated. Another explanation, however, is that Moscow was not concerned that any foreign country would physically challenge its claim by overtly sailing through the NSR. The risk of sparking off a nuclear conflict would be too high, and the only U.S. vessels capable of a surface voyage were lightly armed Coast Guard icebreakers that would be no match for the Northern Fleet. They would, in addition, be a very considerable distance from any friendly port or NATO search-and-rescue assets, in the event that a non-military problem of some kind ensued.

Today, the Cold War has been over for more than two decades and relations between Russia and the U.S. have markedly improved, including quite recently. The changed geopolitical climate has been noticed in Ottawa, notwithstanding the occasional domestically motivated fear mongering about Russian bombers in international airspace. In November 2007, Canadian Prime Minister Stephen Harper and Russian then-prime minister Prime Minister Viktor Zubkov issued a Joint Statement on Canada-Russia Economic Cooperation.[71] In January 2010, according to a U.S. cable released by Wikileaks, Stephen Harper told NATO Secretary General Anders Fogh Rasmussen that the alliance had no role to play in the Arctic because "there is no likelihood of Arctic states going to war."[72] Harper also commented: "Canada has a good working relationship with Russia with respect to the Arctic, and a NATO presence could backfire by exacerbating tensions."

In February 2009, Alan Kessel, the senior lawyer in Canada's Department of Foreign Affairs, met with his Russian counterpart, Roman Kolodkin, in Moscow. According to a Russian summary of the meeting:

> *Both sides stated a high degree of similarity in their position on the issue of international shipping in the Northwest Passage (Canada) and the Northern Sea Route (Russia) – the existing limitations that are being applied to those areas are necessary to preserve the fragile maritime environment and are in sync with the rights that UNCLOS concedes to coastal states in ice-covered areas. Both sides agreed to have more detailed consultations on this topic, including the issue of rights to historical waters in the context of the existing disputes over their status with the U.S.*[73]

Now is the time to pursue this possibility, before the ice melts completely and one or another third state explicitly opposes Canada and/or Russia's claim. The European Union came close to doing so in December 2009, with the Council of Ministers issuing a statement that referred to the right of transit passage in the Arctic.[74] However, since the reference could have been included with just the Bering Strait in mind, it cannot be read as necessarily entailing opposition to either Canada or Russia's internal waters claim.

Finally, it would greatly facilitate all of these negotiations if the International Maritime Organization's "Guidelines on Arctic Shipping" were immediately made mandatory, as was originally intended.[75] This would eliminate most of the distance between the relatively strict rules applied by Canada and Russia in the Northwest Passage and the NSR, and the still relatively loose standards of international law. It would also make it easier for third countries to recognize Canada and Russia's claims.

RECOMMENDATIONS

1. 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. Such negotiations could usefully include major shipping states with a view to securing support for better and faster infrastructure development.
2. 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.
3. Russia and Canada should initiate negotiations with a view to publicly endorsing each other's respective legal positions on the Northwest Passage and the NSR.
4. Canada should initiate negotiations with the U.S. with a view to securing recognition of its internal waters claim, in return for assured accessed and investments in infrastructure, search-and-rescue, policing, etc. The result of such negotiations could be a new "without legal prejudice" agreement that is similar to, and builds upon, the 1988 Canada-U.S. Arctic Cooperation Agreement.
5. 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. The result of such negotiations could be a "without legal prejudice" agreement similar to the 1988 Canada-U.S. Arctic Cooperation Agreement.
6. Such negotiations could also take place trilaterally, between Canada, Russia and the U.S., or even multilaterally by including major shipping states. And again, one possible outcome could be a "without legal prejudice" agreement.
7. 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.

8. 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. If necessary, such endorsements could be made explicitly "without prejudice" to different legal positions concerning the status of the waterways.
9. The IMO's "Guidelines on Arctic Shipping" should immediately be made mandatory, as was originally intended.

Notes

1. See: U.S. National Snow and Ice Data Center, "Arctic Sea Ice News and Analysis," at: http://nsidc.org/arcticseaicenews/
2. Ibid.
3. BBC News, "Cryosat mission delivers first sea-ice map," June 21, 2011, at: http://www.bbc.co.uk/news/science-environment-13829785
4. Donat Pharand, "The Arctic Waters and the Northwest Passage: A Final Revisit,"(2007) 38 *Ocean Development and International Law* 3 at 38.
5. E-mails from John North, Marine Communications and Traffic Services, Canadian Coast Guard, Dec. 15, 2011 and Nov. 29, 2012 (on file with author). The post-2005 numbers do not include vessels under 300 tons, which are not required to register with Transport Canada before entering Arctic waters. Already, dozens of smaller vessels, mostly private yachts, sail the Northwest Passage each summer.
6. Corfu Channel (U.K. v. Albania), 1949 *I.C.J. Reports* 4 at 28.
7. Fisheries Case (U.K. vs. Norway), 1951 *I.C.J. Reports* 116 at 128-9.
8. State Department reference # VZCZCXRO2637. Sent May 26, 2009, available at: http://wikileaks.ch/cable/2009/05/09MOSCOW1346.html
9. State Department reference # VZCZCXRO2637. Sent May 26, 2009, available at: http://wikileaks.ch/cable/2009/05/09MOSCOW1346.html
10. May 26, 2011. See: http://iipdigital.usembassy.gov/st/english/texttrans/2011/05/20110526082231su0.7241262.html#axzz1SOGSoeUE
11. Agreement between the United States of America and the Union of Soviet Socialist Republics on the Maritime Boundary (signed June 1, 1990, entered into force June 15, 1990) (1990) 29 International Legal Materials 941, available at:

http://www.state.gov/documents/organization/125431.pdf

12. Art. 25 reads, in part: “A Treaty or a Part of a Treaty is Applied Provisionally Pending Its Entry Into Force If: the Treaty Itself So Provides; or the Negotiating States Have in Some Other Manner So Agreed.” Available at: http://untreaty.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf

13. See: “Stuart Kaye, “Regulation of Navigation in the Torres Strait: Law of the Sea Issues,” in Donald R. Rothwell and Sam Bateman (eds.), Navigation Rights and Freedoms and the New Law of the Sea (Kluwer Law International 2000) 119 at 127.

14. See: International Northern Sea Route Programme (June 1993 – March 1999), at: http://www.fni.no/insrop/. The reductions in distance vary significantly depending on the ports of origin and destination.

15. See: “Cryosat Mission Delivers First Sea-Ice Map,” BBC News, June 21, 2011, at: http://www.bbc.co.uk/news/science-environment-13829785

16. R. Douglas Brubaker, *Russian Arctic Straits* (Dordrecht: MartinusNijhoff, 2004) 187.

17. Reproduced in United States Responses to Excessive National Maritime Claims, (1992) 112 Limits in the Seas 71 (emphasis added).

18. Reproduced in United States Responses to Excessive National Maritime Claims, (1992) 112 Limits in the Seas 71-72 (emphasis added).

19. See discussion, supra, at note 6.

20. R. Petrow, Across the Top of Russia: The Cruise of the USCGC Northwind into the Polar Seas North of Siberia (London: Hodder and Stoughton, 1968) p. 352, cited in Erik Franckx, Maritime Claims in the Arctic: Canadian and Russian Perspectives(Dordrecht: Martinus Nijhoff, 1993) 148.

21. Erik Franckx, Maritime Claims in the Arctic: Canadian and Russian Perspectives (Dordrecht: MartinusNijhoff, 1993) 148. Curiously, the U.S. State Department account of the incident is limited to a single sentence suggesting, incorrectly, that the vessel stayed the course: “The Northwind conducted its transit from July to September of 1965.” United States Responses to Excessive National Maritime Claims, (1992) 112 Limits in the Seas 72.

22. United States Responses to Excessive National Maritime Claims, (1992) 112 Limits in the Seas 72.

23. R. Wells, “The Icy Nyet,” (1968) 94 (782) U.S. Naval Institute Proceedings 73 at 77.

24. United States Responses to Excessive National Maritime Claims, (1992) 112 Limits in the Seas 72.

25. United States Responses to Excessive National Maritime Claims, (1992) 112

Limits in the Seas 72.

26. See discussion, supra, at note 6.
27. Donald Rothwell, The Polar Regions and the Development of International Law (Cambridge: Cambridge University Press, 1996) 205.
28. Quoted in Donald Rothwell, The Polar Regions and the Development of International Law (Cambridge: Cambridge University Press, 1996) 206.
29. Erik Franckx, "The Legal Regime of Navigation in the Russian Arctic," (2009) 18 Journal of Transnational Law & Policy 327 at 329.
30. See: http://www.fni.no/insrop/ (emphasis in original).
31. See: http://www.transport-research.info/web/projects/project_details.cfm?id=38216
32. Tony Halpin "Cargo ships navigate Northeast Passage for the first time", The Times (London), September 14, 2009, pp. 1-2, available at: http://www.timesonline.co.uk/tol/news/world/europe/article6832885.ece
33. G. Gerenstein, "DJ Norilsk Nickel Vessel Completes First Northern Sea Route Trip," FWN Financial News, November 17, 2010, available at: http://wavesnewsletter.com/?p=1475
34. Ilya Khrennikov, "Russia's Norilsk Plans to Invest USD 370 Million to Double Arctic Shipments," Bloomberg, June 28, 2011, available at: http://www.bloomberg.com/news/2011-06-28/russia-s-norilsk-plans-to-invest-370-million-to-double-arctic-shipments.html
35. Ibid.
36. Donald Rothwell, The Polar Regions and the Development of International Law (Cambridge: Cambridge University Press, 1996) 206.
37. For an overview, see: Erik Franckx, Maritime Claims in the Arctic: Canadian and Russian Perspectives (Dordrecht: MartinusNijhoff, 1993) 152-155.
38. Soviet aide memoire of July 21, 1964, supra, note 17.
39. T. Scovazzi, "New Developments Concerning Soviet Straight Baselines," (1988) 3 International Journal of Estuarine and Coastal Law 37; V. Golitsyn, "The Arctic – On the Way to Regional Cooperation," (1989) 1 Marine Policy Rep. 91.
40. A. Kolodkin & M. Volosov, "The Legal Regime of the Soviet Arctic," (1990) 14 Marine Policy 158-160
41. Fisheries Case (U.K. vs. Norway), 1951 I.C.J. Reports 116 at 128-9.
42. E. Franckx, Maritime Claims in the Arctic: Canadian and Russian Perspectives (Dordrecht: MartinusNijhoff, 1993) 185-186.

43. Soviet aide-memoire of July 21, 1964, quoted at supra, note 17.

44. E. Franckx, Maritime Claims in the Arctic: Canadian and Russian Perspectives (Dordrecht: MartinusNijhoff, 1993) 224, fn. 471.

45. Art. 234 reads: "Coastal States have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of the ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance. Such laws and regulations shall have due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence." Available at: http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm

46. R. Douglas Brubaker, Russian Arctic Straits (Dordrecht: MartinusNijhoff Publishers 2004) 30.

47. Russian and English versions available at: http://www.morflot.ru/about/sevmorput/. See also: Donald Rothwell, The Polar Regions and the Development of International Law (Cambridge: Cambridge University Press, 1996) 201.

48. For a recent overview of the regulations, see: Erik Franckx, "The Legal Regime of Navigation in the Russian Arctic," (2009) 18 Journal of Transnational Law & Policy 327 at 330-339.

49. Guide to Navigating through the Northern Sea Route (St. Petersburg, Head Department of Navigation and Oceanography, Russian Ministry of Defense, 1996).

50. R. Douglas Brubaker, Russian Arctic Straits (Dordrecht: MartinusNijhoff, 2004) 41.

51. National Security Presidential Directive 66 / Homeland Security Presidential Directive 25, January 9, 2009, available at: http://www.fas.org/irp/offdocs/nspd/nspd-66.htm

52. See discussion, supra, at note 7.

53. 1993 Nunavut Land Claims Agreement, available at: http://www.tunngavik.com/category/publications/nunavut-land-claims-agreement/

54. Western Sahara, Advisory Opinion, 1975 I.C.J. Reports 12 at 79.

55. Art. 35(1), UN Convention on the Law of the Sea, available at: http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm

56. On the principle of "critical date," see infra. note 68.

57. See, e.g.: James Kraska, "The Law of the Sea Convention and the Northwest

Passage," (2007) 22 (2) International Journal of Marine and Coastal Law 257 at 274.

58. See: S.N. Nadan & D.H. Anderson, "Straits Used for International Navigation: A Commentary on Part III of the United Nations Convention on the Law of the Sea 1982," (1989) 60 British Yearbook of International Law 159 at 169; Tommy B. Koh, "The Territorial Sea, Contiguous Zones, Straits and Archipelagoes Under the 1982 Convention on the Law of the Sea," (1987) Malaya Law Review 163 at 178.
59. "Agreement between the Government of Canada and the Government of the United States of America on Arctic Cooperation," Canada Treaty Series 1988, no. 29; available at http://www.treaty-accord.gc.ca/text-texte.asp?id=101701.
60. Hansard, October 24, 1969, 39 (statement of Prime Minister Trudeau).
61. Daniel LeBlanc, "U.S. Reasserts Its Position on Northwest Passage,"Globe and Mail (Toronto), November 1, 2006.
62. For details of the model negotiation, see Michael Byers, Who Owns the Arctic?(Vancouver/Toronto/Berkeley: D&M Publishers, 2009), Appendix II, 143.
63. National Security Presidential Directive 66 & Homeland Security Presidential Directive 25, January 9, 2009, available at: http://www.fas.org/irp/offdocs/nspd/nspd-66.htm
64. For a detailed scenario, see: Byers, Who Owns the Arctic?, Appendix I.
65. R. Douglas Brubaker, Russian Arctic Straits (Dordrecht: MartinusNijhoff, 2004) 41 & 189.
66. Donald Rothwell, *The Polar Regions and the Development of International Law* (Cambridge: Cambridge University Press, 1996) 206.
67. Robin Churchill and Vaughan Lowe, *The Law of the Sea* (3rd edn) (Manchester: Manchester University Press, 1999) 106.
68. On critical dates, see: Minquiers and Ecrehos Case, *I.C.J. Rep*, 59-60 (1953); Sir Robert Jennings and Sir Arthur Watts, Oppenheim's International Law (9th ed. 1992) 711-712.
69. Donald Rothwell, *The Polar Regions and the Development of International Law* (Cambridge: Cambridge University Press, 1996) 200.
70. Matthew Fisher, "Soviets Back Canada's Claim to Northwest Passage Waters," *Globe and Mail*, August 7, 1985.
71. See: http://www.international.gc.ca/commerce/zubkov/joint_state-en.asp
72. U.S. State Department cable #VZCZCXR03302, January 20, 2010, available at: http://aptn.ca/pages/news/2011/05/11/while-harper-talked-tough-with-nato-

on-arctic-u-s-believed-pm-all-bark-no-bite/ Also available at: http://wikileaks.fi/cable/2010/01/10OTTAWA21.html

73. Russia-Canada consultations on the legal status of the Arctic, February 20, 2009, Moscow, available at: http://byers.typepad.com/arctic/russiacanada-consultations-on-the-legal-status-of-the-arctic.html (bolded text in original)

74. European Council Conclusions on Arctic Issues,December 8, 2009, available at: http://ec.europa.eu/maritimeaffairs/pdf/arctic_council_conclusions_09_en.pdf(Paragraph 16 reads: "With respect to the gradual opening, in the years to come, of trans-Arctic routes for shipping and navigation, the Council reiterates the rights and obligations for flag, port and coastal states provided for in international law, including UNCLOS, in relation to freedom of navigation, the right of innocent passage and transit passage, and will monitor their observance.")

75. Guidelines for Ships Operating in Arctic Ice-Covered Waters, December 23, 2002, available at: http://www5.imo.org/SharePoint/blastDataOnly.asp/data_id=6629/1056-MEPC-Circ399.pdf The Arctic Council has twice called for the IMO to make the guidelines mandatory. See: Tromso Declaration (2009) and Nuuk Declaration (2011), available at http://arctic-council.org/filearchive/Tromsoe%20Declaration-1..pdf and http://arctic-council.org/filearchive/nuuk_declaration_2011_signed_copy-1..pdf

Commentary: Russian Perspective

Alexander Vylegzhanin

The thematic Paper 6 by Professor Michael Byers of Canada is devoted to key political, legal and factual *aspects* of the governance of Arctic marine shipping, that is, to such large-scale objects of international law and policy as the Arctic Straits [the Bering Strait, Northwest Passage and Northern Sea Route (NSR)]. The paper is well documented and instructive; many international conventions, national legislation and other relevant sources of law are referenced. The paper as a whole represents a substantial intellectual contribution to teachings on Arctic law.

There are, however, several points in the paper that may be dwelled upon or specified, beginning with the legal meaning of the term "Arctic." It is also possible to add some relevant issues and facts from a Russian perspective, especially the contemporary legislation on the Arctic zone of the Russian Federation. There are also some scientific assessments of applicable law in the paper that are to be discussed and may be considered in different legal terms against the background of the customary international law, as will be suggested further.

LEGAL ISSUES AND POLITICAL PROBLEMS

According to prevailing definitions, the term "Arctic" means a part of the Earth around the North Pole, the southern boundary of which is the North Polar Circle (parallel 66° 33 min N). It may be a divine act of God that global environmental changes, including melting sea ice in the Arctic, occur in parallel with positive changes in the global political environment, with the end of Cold War and spreading of the principle of the rule of law (supremacy of law) in international relations. With new possibilities for marine shipping and other economic activity in the High North it is understandable that interests in the contemporary legal regime of the Arctic extend both from the Arctic states and non-Arctic states.[1]

The Arctic, as noted, may "turn out to be a laboratory for a new international legal regime."[2] The Ilulissat Declaration adopted by the Arctic coastal states on May 28, 2008, provides, however, that there is "no need to develop a new comprehensive international legal regime to govern the Arctic Ocean." Assessing the contemporary policy framework for the Arctic Ocean and relevant challenges for international law, different opinions are suggested by international lawyers. Even more complicated is the mosaic of political assessments of the potential growth of economic activities in the Arctic Ocean in the context of environmental security.[3]

The Ilulissat Declaration provides that "an extensive international legal framework applies to the Arctic Ocean." In fact, the declaration does not provide for any new rules, but reflects the current state of the applicable contemporary international law, referring to relevant rights and obligations of the Arctic coastal states.

Arctic marine shipping is certainly a fundamental common interest of the Arctic and non-Arctic states in the High North, along with such common interests as protection and conservation of the Arctic fragile marine environment, including that in ice-covered areas. There is a huge potential area for more developed international cooperation – namely the Arctic high seas, that is, an area of the sea water column that is not included in the exclusive economic zone (EEZ), in the territorial sea or in the internal waters of any Arctic coastal state.

The Arctic Straits, which are characterized in the paper from political and legal points of view, are not a part of the Arctic high seas. However, marine shipping via High North areas (and not through the NSR or the Northwest Passage, as shown by Russian geographers and economists, academician Granberg in particular) will be more attractive for ship owners when the central Arctic is free of ice and open to non-icebreaking vessels, even temporarily.[4] And there still exists potential legal and technical obstacles to free and safe marine shipping through these high North Sea routes.

In order to bridge the differences in the legal views on an international governance framework for shipping in the high seas in the central Arctic, it is advisable first to reach a sort of international consensus on the legal qualification of ice and water areas in the Arctic beyond 200 miles (from the baselines) as high seas. Such a consensus is important: a number of authors still consider such areas not to be high seas, and according to the UN Charter (art. 38 of the Statute of ICJ), "the teachings of the most highly qualified publicists of the various nations" are "subsidiary means for determination of rules of law."

Some contemporary Russian authors support the legal views of V. Lachtin, E. Korovin, Y. Dzhavad, A. Zhudro and some other Soviet authors, and such views are very rigid: "The Arctic Ocean is a hypothetic notion … combination of hypothetic waters … which are for the most part concealed by ice…there is no High Seas regime in the Arctic Ocean."[5] It is also noted that "Canada has occasionally expressed doubt as to the status of the Arctic Ocean as high seas, particularly the Beaufort Sea."[6]

A number of contemporary authors, including publicists from the Russian Federation,[7] however, are of the opinion that there is a high sea area in the central Arctic beyond the 200-mile EEZ zones of the Arctic coastal states, despite the fact that most part of this area is covered with ice. It may be predicted that with melting sea ice in the North Polar area there may be more chances to reach a consensus on this issue both on the theoretical and practical levels.

It's noted in the paper that according to International Northern Sea Programme the "largest and most obvious cargo potential is found in the huge oil and gas reserves in the Russian Arctic," and that according to the Arctic Operational Platform, "oil and gas transportation by the Northern

Sea Route is technologically possible and economically feasible." There are still different obstacles and challenges for oil and gas development in the Arctic subsoil. It is the general consensus that the Arctic coastal states are responsible under international law for rational management of marine subsoil in areas under their sovereignty (in internal waters and territorial seas) and jurisdiction (continental shelf). Again, there is a common interest for Arctic and non-arctic states and relevant fundamental purposes, that is, political and legal stability, which is a necessity for investors and for international economic cooperation in general. Because of the relative proximity between the Russian Arctic and North Pacific, for example, there are good reasons for cooperation in the field of exploitation of oil and gas resources between Russia and the North Pacific Rim countries, using the technological and investment capabilities of the latter. To achieve such a fundamental purpose, the legal regulation of economic activities in the central Arctic Ocean seems to be differentiated. Global regulation of shipping, including transportation of extracted oil and gas products, and protection of the environment in the Arctic high seas is already in demand. Of special significance for proper interstate governance of economic activity in the Arctic Ocean (taking into account relevant environmental changes) are such environmental protection treaties as the United Nations Framework Convention on Climate Change, 1992 (Climate Convention, 1992); the Kyoto Protocol of 1997 to the Climate Convention of 1992; the Convention on Biological Diversity, 1992; the Convention on Long-range Trans-boundary Air Pollution, 1979; the Vienna Convention for the Protection of the Ozone Layer, 1985; and the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987. Also, a number of international shipping law instruments are applicable to navigation in the Arctic Ocean.

So, it was probably too categorical but not very precise to state that "the Arctic Region is currently not governed by any multilateral norms."[8] In addition to the universal multilateral norms mentioned above there are a number of regional multilateral norms, starting from the Agreement on the Conservation of Polar Bears of 1973. So, there are a number of multilateral treaties applicable to the Arctic Region that provide for relevant norms. Some of these multilateral conventions have entered into force for all five Arctic coastal states. Such multilateral instruments are already used by countries of the Arctic region for environmental measures and regulation of shipping.

However, at the moment such global legal instruments are still physically impractical to apply in many Arctic areas. A regional, bilateral and national *lex special* is needed for the "transition period" of the melting ice cap in the central Arctic Ocean. A successful bilateral model of management of trans-boundary hydrocarbon resources in Arctic will be described further, as an example.

Another important regional Arctic agreement is the recent document from the eight Arctic states that are members of the Arctic Council, the Agreement on Cooperation and Maritime Search and Rescue in the Arctic of 2011. The objective of the agreement is "to strengthen aeronautical and maritime search and rescue cooperation and coordination in the Arctic" (art. 2). It provides for the delimitations of the aeronautical and maritime search and rescue regions. It provides that such delimitation "is not related to and shall not prejudice the delimitation of any boundary between States or their sovereignty, sovereign rights or jurisdiction" (art. 3). Aeronautical and maritime search and rescue operations within each of the areas are conducted on the basis of the International Convention on Maritime Search and Rescue, 1979; the Chicago International Civil Aviation Convention, 1974; and the Agreement of the Eight Arctic States, 2011.Such a combination of regional and global applicable rules is an optimal legal model for the Arctic's severe environmental peculiarities.

While there are delimited areas of responsibility for the parties under the agreement, it also provides for cooperation and coordination in the field of aeronautical and maritime search and rescue in the Arctic. For this purpose, the agreement provides for competent authorities of the parties and agencies formed according to national legislation that are responsible for aeronautical and maritime search and rescue. A list of relevant rescue coordination centers is also provided.

Another recent regional legal source, the Agreement on Cooperation on Marine Oil Pollution Preparedness and Responses in the Arctic of 2013, seems also to be an important legal instrument applicable to regulation of Arctic marine shipping.[9]

In sum, the regional level of regulation of economic activities in the Arctic Ocean is linked with bilateral and national regulation. Optimal adaptation of the applicable rules of universal conventions to peculiar Arctic realities also takes place, mainly at the regional level. Today it is "fed" by the law documents created by relevant regional institutional structures, such as the Arctic Council, the Barents Euro-Arctic Council and others.[10]

As correctly noted, one "useful approach in developing effective governance for a rapidly changing Arctic may be … to draw a clear distinction between the overlying water column and the sea floor. Ecologically and legally distinct from the sea floor, the overlying water column and the sea surface of the central Arctic can remain an undisputed international area."[11] For the Arctic high seas water column, the priority of global and regional regulation seems to be more appropriate. For the shallow Arctic sea floor, being legally the continental shelf of the five Arctic coastal states, the priority of regional, bilateral and national levels of regulation are more appropriate within contemporary legal and political environments.

EXISTING GOVERNANCE TO OVERCOME OBSTACLES

Bering Strait

It is correctly concluded in the paper that there are no major unresolved legal issues concerning the Bering Strait. The right of foreign vessels to transit the strait is accepted by both the coastal states, which are cooperating with each other to improve safety for their own and international shipping.

One remark, however, is obviously needed. It is noted in the paper that the agreement between the U.S. and the Union of Soviet Socialist Republics on the maritime boundary was signed on June 1, 1990. The agreement has not yet entered into force, neither on June 15, 1990 nor afterward as provided in Art. 7 (that is, upon ratifications by both parties). The State Duma (the Russian parliament) considered the issue of the agreement several times (in 1997 and 2002), and in each case the parliament's majority had a negative attitude toward ratification of the agreement.[12] However, long before such deliberations in the parliament both parties agreed by diplomatic notes to apply this agreement from June 15, 1990. So the legal basis of the contemporary binding nature of the agreement for the U.S. and Russia is not its ratification by both parties and not its entry into force (as provided in Art. 24 of the Vienna Convention on the Law of Treaties of 1969), but Art. 25 of this convention ("provisional application").

It should be noted, however, that the negative attitude of the Russian parliament to the 1990 agreement was caused by the delimitation line as provided in the agreement in the Bering Sea, and not in the Arctic Ocean, which was assessed as balanced and reasonable.

Northern Sea Route and Northwest Passage

The paper provides an excellent summary of the legal positions and relevant political actions of the two Arctic coastal states, Russia and Canada, on the one hand, and of disagreements with each of these states with the "persistent objector" to their arctic policy, the U.S.

The U.S. Presidential Directive of January 9, 2009 is correctly cited, where the Northwest Passage (along Canadian coasts) and "some straits" forming the NSR (along the coasts of Russia) are qualified as straits used for international navigation with a regime of transit passage. Neither Canada nor Russia provide for the legal status of waters along U.S. coasts in their national acts.

The recent "National Strategy for the Arctic Region" signed by the U.S. president on May 10, 2013, however, differs from the U.S. directive of 2009 in providing that "Existing international law provides a comprehensive set of rules governing the rights, freedoms, and uses of the world's oceans… including the Arctic. The law recognizes these rights, freedoms, and uses…Within this framework, we shall further develop Arctic waterways management regimes, including traffic separation schemes, vessel tracking, and ship routing, in collaboration with partners."

Additional legal information may be appropriate to show why it is of vital importance for Canada and Russia to preserve their respective national regulations through these seaways along their coasts, both from historical and legal points of view.

The NSR passes along the coast of Russia facing the Arctic Ocean. It is the shortest way between the northern Pacific and Atlantic. It is also the only route that connects all Arctic and sub-Arctic regions of Russia. The Russian Arctic lands have no main highways; instead, in winter, ice roads are built, many of which go out to NSR ports. The length of the NSR, depending on the itinerary chosen, is from 2,200 to 3,000 miles.[13] Ports located along the NSR include Igarka, Dudinka, Dickson, Tiksi, and Pevec.

The Federal Act on the internal maritime waters, territorial sea and contiguous zone of the Russian Federation, 1998, provides that "Navigation on the seaways of the Northern Sea Route, the historical developed national unified transport communication of the Russian Federation in the Arctic, including through the Vilkitski, Shokalshy, Dmitry Laptev, and Sannikov straits, shall be carried out in accordance with this Federal Act, other federal laws, international treaties to which the Russian Federation is a party and the regulations on navigation on the watercourses of the Northern Sea Route approved by the Government of the Russian Federation and published in the Notices to Mariners" (art. 14). A federal act (adopted by the Russian parliament and signed by the president of the RF) is of higher legal value in Russian legislation than a governmental act.

According to the governmental act "Regulations for navigation on the seaways of the Northern Sea Route" of September 14, 1990, which are a part of contemporary Russian national legislation (henceforth "the regulations"), the NSR is also defined as a national transportation route situated within the internal waters, territorial sea or exclusive economic zone adjoining the northern coast of the country. The extreme points of the NSR are, in the west, "the western entrances to the Novaya Zemlya Island straits and the meridian running northward from Cape Zhelaniye" (on Novaya Zemlya Island), and in the east, the point at latitude 66° North and the longitude 168°58′37″ West (in the Bering Strait).[14] The "functional" NSR areas extend even further away to the west and east: they include areas covered with ice in the southeast part of the Barents Sea and in the northern part of the Bering Sea (Gulf of Anadyr).[15]

During the soviet period (until 1991), the NSR served almost exclusively for national marine shipping under strict governmental control. Not surprisingly, Russia has a data bank of navigation through the NSR, including for carrying goods along the NSR during World War II. Now the situation is changing and more and more foreign vessels pass via the NSR.

According to the "Fundamentals of the State Policy of the Russian Federation in the Arctic for 2020 and further period" approved by the president of the RF in September 2008, the list of the "main national interests" of Russia in the Arctic includes "utilization of the Northern Sea Route as national integral transport communication of the Russian Federation in the Arctic" (para II, 4). The same legal qualification is supported in "The Strategy for Developing the Arctic Zone of the Russian Federation" approved by the president of the RF in February 2013.

The importance of the Northwest Passage for Canada is already shown in detail in the paper. The paper describes in detail the U.S.'s objections to Canada's and Russia's legal positions to qualifying as internal waters the Northwest Passage and the Russian Arctic Straits, which form part of the NSR. These Russian and Canadian straits are within straight baselines according to Russian and Canadian legislation. According to the decisions of the Cabinet of Ministers of the USSR of February 7, 1984 and of January 15, 1985 on baselines along the coasts of the USSR, a limited number of straight baselines were indicated along the Russian Arctic coast. Consequently, the status of Karskiy Strait, Yugorsky Shar, Matochkin Shar and the Vil´kitsky, Shokal´sky, Krasnaya Armiya, Sannikov, and Dmitry Laptev straits was confirmed – they are again qualified as internal sea waters of Russia. However, the Cabinet of Ministers' decisions were the first legal documents of the country that officially disavowed previous doctrinal Russian claims on the Kara, Laptev and East Siberian seas as "historic waters of the USSR."

The right of a coastal state to draw straight baselines is provided by general customary international law and by special conventions, including UNCLOS 1982 (art. 7). The paper indicates a case of drawing baselines that depart quite significantly from the general direction of the coast. Indeed, art. 7 of UNCLOS provides one of the situations where the method of straight baselines is applicable: "in localities where the coastline is deeply indented and cut into." But that is not the only situation where the drawing of straight baselines is possible, as noted by the International Court of Justice. The court also referred to historic title,[16] and to a case where the method of straight baselines "had been consolidated by a constant and sufficiently long practice, in the face of which the attitude of governments bear witness to the fact that they did not consider it to be contrary to international law,"[17] and to "certain economic interests peculiar to a region, the reality and importance of which are clearly evidenced by a long usage."[18] The court also noted that the straight baseline method was followed by several states "not only in the case of well-defined bays, but also in cases of minor curvatures of the coastline where it was solely a question of giving a simpler form to the belt of territorial waters."[19]

Moreover, independently of interpretation of the applicable international law and of the factual circumstances of how straight baselines along the Arctic coast are drawn and are provided in the national legislation of Canada and Russia, the key interest of the North Pacific Rim countries is of a different legal nature, that is, whether a coastal Arctic state is interested in international shipping along its coast and is cooperating to facilitate such safe shipping. And the answer is positive – both from Canada and contemporary Russia. In addition to what is noted in the paper about the political will of Russia to open the NSR for foreign shipping subject to pilot age for safety reasons (1987), another legal step was recently taken in Russia in this direction. According to the order of the Federal Rates Service (a governmental body) of June 7, 2011, maximum rates on ice-breaker fleet services along the NSR are determined; the order provides further that in practice, rates for such services "can be at the maximum rate or lower." This is the first flexible legal instrument of its kind in the history of the NSR, which means that the cost of the ice-breaker services for domestic and foreign ship owners might be much cheaper, since the state corporation Rosatom now has legal permission to provide ice-breaker services at low rates.

And last but not least, the important distinguishing feature of the NSR and Northwest Passage is that they are integral components of the respective legal positions of Russia and Canada as to the general issue of the status of the Arctic Ocean.

Status of the Arctic Ocean

International customary law applicable to the Arctic has been formed over the centuries at regional, bilateral and national levels. The continuous legal practice of Russia and Canada as Arctic states with the longest coastline in the Arctic region and the responses thereto (including tacit agreement or acquiescence) by other states (not only Arctic states, certainly) are the core of this customary law. In this context, important legal factors to be taken into account are: a) the legislative and treaty practice of Tsarist Russia, the USSR and the Russian Federation in the Arctic; b) the legislative and treaty practice of Canada in the Arctic; c) relevant legislative and treaty practice of other Arctic coastal states; and d) acquiescence or consent to such practices on behalf of the majority of states from the 15th to 20th centuries, and the absence of relevant "persistent objectors" during this period.[20] Such legal factors are usually noted in assessing international customary law.

According to the Convention between Great Britain and Russia of 1825, the king of the United Kingdom of Great Britain and Ireland and the emperor of Russia agreed upon "the line of demarcation between the possessions" of the parties in America. Of contemporary legal interest are the provisions of the convention on the northern part of this demarcation line, the "Meridian Line of the 141st Degree, in its prolongation as far as the Frozen Ocean" (art. III of the 1825 convention). This was the first "sector boundary line" (or "Meridian Line") in the Arctic ever established by a legal act. Years later another bilateral treaty used a sector line along a meridian in the direction of the North Pole. In accordance with the 1867 convention ceding Alaska of, the emperor of Russia agreed to cede to the U.S. "all the territory and dominion now possessed by his said Majesty on the continent of America and in the adjacent islands, the same being contained within the geographical limits herein set forth…" Again, the northern part of the line delimitating U.S. and Russian possessions in the Arctic is described in the convention as the meridian line (sector line): "the meridian which passes midway between the islands of Krusenstern … and the island of Ratmanoff … and proceeds due North, without limitation, into the same Frozen Ocean" (art. I). In spite of this rather brave terminology ("without limitations"), no state protested against the 1867 convention. These sector (meridian) lines are certainly not contemporary state boundaries of Canada, the U.S., or Russia. Nor are they per selines delimiting continental shelves of the three Arctic coastal states without the additional agreement of the relevant states, because in 1825 and 1867 there was no institute of continental shelf in international law. Still, the sector boundaries in the Arctic established by the 1825 UK-Russia Convention and by the 1867 USA-Russia Convention remain today in force as prima facie boundaries of national primary interests and responsibility of relevant states.[21]

As noted in academic writings and confirmed by documents, the Arctic legislation of Russia can be traced back to the Ukases (orders) of the Tsars of Russia of the 15th–16th centuries,[22] the decree of the Russian Senate of 1821,[23] and the Note issued by the Russian Ministry of Foreign Affairs in 1916,[24] to mention but a few sources.[25] The boundaries of the Russian Arctic sector were legally established in 1926 under national legislation,[26] thus confirming the eastern boundary defined in the convention on the cession of Alaska concluded between the U.S. and Russia in 1867.[27]

The political will of Canada as it relates to the Arctic sector can also be traced back to the 1825 convention, since Canada is legally a party to it today. It was confirmed in 1907, and the two sector boundaries were again provided for according to Canadian legislation in 1925.[28]

According to Canadian and Russian legislation,[29] an Arctic sector is formed by an Arctic state's coast (bordering the Arctic Ocean) and two meridians of longitude drawn from the easternmost and westernmost points of such a coast to the North Pole. Within such a triangular sector, an Arctic state may regard as its territory all "islands and lands." The term "islands" also includes rocks. The term "lands," according to some authors, includes submerged and ice-covered lands.[30] Other authors reject such a broad interpretation, saying that the word "lands" in Canadian and Russian legislation also means "islands."[31] It is asserted that within such an Arctic sector, the Arctic coastal state has jurisdiction with regard to the protection of the fragile Arctic environment.[32]A number of contemporary authors recognize that the limits of the Arctic sectors established by Canadian and Russian laws reflect, according to the customary legal order, the boundaries of primary interests of the Arctic coastal states for the rule of law in relevant areas of the Arctic Ocean through their national legislative approaches.[33] As was correctly noted, "While sector claims were asserted for administrative convenience, they were also symbolic and allowed for a comparatively uncontested territorial division of parts of the Arctic."[34]

Strange as it may seem, it is the U.S. (the persistent objector of any claims in the Arctic based on "sector boundaries"), that is the most uncontested beneficiary of the two sector boundaries established by the Great Britain – Russia Convention of 1825 and by the U.S. – Russia Convention of 1867. In practical terms, no state would claim rights to any area of the *prima facie* U.S. continental shelf situated within the U.S. Arctic sector established by these two conventions. The size of the U.S. continental shelf may be diminished (in comparison to that already delimited by the two sector lines provided in conventions 1825 and 1867) if Canada and Russia delimit their arctic continental shelf according to Art. 83 of UNCLOS, or according to Art. 6 of the Convention on the Continental Shelf 1958, which provides for "the principle of equidistance."

It is true that UNCLOS 1982 "shall prevail, as between States Parties, over the Geneva Conventions on the Law of the Sea" (1958, art. 311(1) of UNCLOS 1982). But this rule is not applicable to the four groups of relations, that is, to relations of each of the four Arctic coastal states with the fifth, the U.S. (which is not a party to UNCLOS 1982 or to the UNCLOS Implementation Agreement of 1994).

As confirmed by a number of documents, UNCLOS provisions on the area (the ocean floor beyond the continental shelf as the "common heritage of mankind") and on its boundaries are correctly not considered by the U.S. as a part of customary international law. In fact, the UNCLOS provisions on the area are not considered by many publicists as a part of customary international law either. These provisions are neither a part of a regional international legal regime of the Arctic Ocean, formed before UNCLOS was adopted (for example, the Agreement on Polar Bears of 1975), nor a regional "soft law" environmental regime constructed after UNLOS by the Arctic Council.

The Message from the President of the United States transmitting the UN Convention on the Law of the Sea, with Annexes, 1982, and the Agreement Relating to the Implementation of Part XI of the Convention 1994, provides, in particular, that "The objections of the United States and other industrialized States to Part XI were that: it established a structure for administering the seabed mining regime that did not accord industrialized States influence in the regime commensurate with their interests; it incorporated economic principles inconsistent with free market philosophy; and its specific provisions created numerous problems from an economic and commercial policy perspective that would have impeded access by the United States and other industrialized countries to the resources of the deep seabed beyond national jurisdiction." In this message the U.S. president states that the Implementation Agreement of 1994 "fundamentally changes the deep seabed mining regime of the Convention."[35] But the Senate did not react positively and did not give its consent to U.S. accession to the 1982 convention or to ratification of the agreement. As some U.S. legislators put it, "there was no reason to have signed this badly flawed treaty in the 1980s and even less justification today. In 1980, when it was clear that the United States and its allies would not sign the treaty, Congress enacted the Deep Seabed Hard Mineral Resources Act. This statute regulates the mining activities of U.S. citizens in the seabed beyond the jurisdiction of any country." Also: "The benefits to the United States by ratifying the treaty as it stands now are, at best, minimal. The United States already has taken the position that all the other parts of the Law of the Sea Treaty represent customary international law and we act accordingly."[36]

Since the U.S. is not a party to UNCLOS, and since Part XI thereof (the Area) and Art. 76 (new limits of the continental shelf) are not rules of customary international law, the American Arctic continental shelf is in a way legally "unlimited"; it extends – according to the Convention on the Continental Shelf of 1958 – "to where the depth of the superjacent waters admits of the exploitation of the natural resources" of submarine areas.[37] Therefore, a recent announcement by U.S. specialists that the U.S. continental shelf extends to more than 900 miles to the north of Alaska (without referring to relevant UNCLOS mechanisms) is in full accordance with art. 1 of the Convention on Continental Shelf, 1958, and is consequently legitimate.

Arctic Trans-Boundary Hydrocarbon Resources (Public and Private Law Models)

Having noted the possibilities of existing governance to overcome obstacles, it is appropriate to provide a recent successful example, that is, the Norway-Russia model of management of trans-boundary hydrocarbon resources, its public and private law components.

The Treaty between the Kingdom of Norway and the Russian Federation concerning Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean of 2010 entered into force in 2011. According to the treaty, the parties have defined geodetic lines that constitute the delimitation line between maritime areas of Norway and Russia in the Barents Sea and the Arctic Ocean (art.1). Each party shall abide by this maritime delimitation line and shall not claim or exercise any sovereign rights or coastal state jurisdiction in maritime areas beyond this line (art.2).

If a hydrocarbon deposit extends across the delimitation line, the parties shall apply Annex II to the treaty – “Trans-boundary Hydrocarbon Deposits.” The term “hydrocarbon deposits” is not used in the UN Convention on the Law of the Sea of 1982 or in the Geneva Maritime Conventions of 1958. So this term, according to art. 31 of the Vienna Convention on the Law of Treaties, 1969, should be interpreted “as accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.” That means, in particular, that Annex II to the Norway-Russia Treaty of 2010 is not applicable to all trans-boundary mineral resources; for example, to “hard” mineral resources, even in a case in which a deposit of such resources is crossed by the delimitation line provided by the treaty. If the existence of a hydrocarbon deposit on the continental shelf of one party is established and the other party is of the opinion that the said deposits extend to its continental shelf, the latter party may notify the former and submit the data on which it bases its opinion. So, according to the treaty, such a notification is a right, but not an obligation, of a party. If however such a right is realized, the obligation occurs to submit the relevant data.

So, according to the treaty, an opinion by either party as to the existence of a trans-boundary hydrocarbon deposit is of legal significance.

If such an opinion (supported by relevant data) is submitted, the parties are obliged to initiate discussions on the extent of the hydrocarbon deposit and the possibility for exploitation of the deposit as a unit. The party that initiates such a discussion is under obligation to "support its opinion with evidence from geophysical data and/or geological data, including any existing drilling data." Both parties "shall make their best efforts to ensure that all relevant information is made available for the purpose of these discussions."

The contribution of Russia in revealing such relevant information will be potentially bigger than that of Norway, bearing in mind the huge database on Arctic mineral resources accumulated by the former USSR. According to Professor A. A. Arbatov, for example, research by the USSR carried out in 1980 shows that the hydrocarbon province of Fedinskaya is assessed as having 3 billion tons of "calculated fuel."[38] And some of the hydrocarbon deposits in the province are crossed by the delimitation line provided by the treaty. On the other hand, Norway has a much better experience in the rational and ecologically sustainable management of trans-boundary hydrocarbon continental shelf deposits on the basis of international agreements. With such a balance of important contributions of the parties, performance of the treaty may be very promising and to the advantage of both parties.

According to the treaty, there are two levels of bilateral interaction in hydrocarbon resources management–intergovernmental and private law. In addition to what was mentioned above, an important intergovernmental obligation of any party is to reach a unitization agreement at the request of the other party in cases provided by the treaty. Such cases include: if the hydrocarbon deposit extends to the continental shelf of each of the parties and the deposit on the continental shelf of one party can be exploited wholly or in part from the continental shelf of the other party, or the exploitation of the hydrocarbon deposit on the continental shelf of one party would affect the possibility of exploitation of the hydrocarbon deposit on the continental shelf by the other party. Any party can exploit any hydrocarbon deposit that extends to the continental shelf of the other party only as provided for by the unitization agreement. This is an intergovernmental instrument to be agreed upon by the parties in the future, though its essential components are already defined by the parties in Annex II to the treaty.

Among such components are: a definition of trans-boundary hydrocarbon deposits and their geographical, geophysical and geological characteristics; the obligation of the parties to individually grant all necessary authorizations required by their respective national laws for the development and operation of the trans-boundary hydrocarbon deposits; the obligation of the parties to establish a joint commission for consultations between the parties on issues pertaining to any planned or existing unitized hydrocarbon deposit; and the obligation of the parties to require the relevant legal persons holding rights to explore for and exploit hydrocarbons on each respective side of the delimitation line to enter into a joint operating agreement.

The latter represents a private law legal instrument for regulation of exploitation of the trans-boundary hydrocarbon deposits as a unit. The parties of the joint operating agreement are not Norway and Russia, but legal persons that have rights to explore and exploit hydrocarbons according to the national legislation of Norway and Russia. So these may be legal persons of third countries. Such an instrument should to be in accordance with the unitization agreement. A joint operating agreement is to be approved by both parties in order to be legally valid. The legal persons holding the rights to exploit a trans-boundary hydrocarbon deposit as a unit are to appoint a unit operator "as their joint agent" upon the request of the parties. Such an appointment of, and any change of, the unit operator is subject to prior approval by the parties.

Of special importance for bilateral interaction both on an intergovernmental (parties) and private law level (legal persons) are such components of the unitization agreement as the "obligation of the Parties to consult with each other with respect to applicable health, safety and environmental measures that are required by the national laws and regulations of each Party." Since applicable national laws and regulations of the parties are different and the primary object of such national regulations is the same (trans-boundary hydrocarbon deposits as a unit), one may forecast that such consultations may not always be easy.

Questions may also arise as to the performance of other treaty provisions – the obligation of each party "to ensure inspection of hydrocarbon installations located on its continental shelf and hydrocarbon activities carried out thereon in relation to the exploitation of a trans-boundary deposit, the obligation of each Party to ensure inspectors of the other Party access on request to such installations, and to relevant metering systems on the continental shelf or in the territory of either Party."

In sum, such a legal mechanism of management of trans-boundary hydrocarbon deposits in the Arctic Ocean may be taken into account for future possible legal models of management of such deposits in areas of future High North delimitation lines between the Russian Arctic continental shelf and those of the U.S., Canada and Denmark (Greenland).

Additional Agreements and Arrangements

There are a number of suggestions on how to improve Arctic governance. Proposals to improve arctic governance are often connected *in concreto* with the need to improve legal regulation of economic activities in the Arctic Ocean before its permanent ice cap melts, as was suggested in a number of research papers. "The expansion of economic activity under conditions of environmental change poses new challenges for the entire Arctic region and the world. Access to open water across the Arctic Ocean is awakening interest from the energy, shipping, fishing, and tourism industries. Each of these globally important commercial activities, if not properly regulated, poses risks that together will be multiplied in the confined Arctic Ocean. Due to rapidly changing conditions and to inadequate baseline data regarding the dynamics of Arctic marine ecosystems, many vulnerabilities and potential consequences of anthropogenic impacts are poorly understood or unknown."[39]

The paper provides a number of carefully worded recommendations to stimulate cooperation between the Arctic states and North Pacific Rim countries, aiming at concluding relevant agreements and arrangements. One of the recommendations is for Canada – Russia negotiations aimed at recognition of their legal positions on the Northwest Passage and NSR. It may be useful to add the idea of future harmonization of legal rules for passing through relevant Canadian and Russian Arctic Straits and simplification of such rules for foreign shipping. This is not an easy task, bearing in mind the different national legal systems of the two countries and different requirements for vessels navigating the NSR and the Northwest Passage. "Requirements for the design, equipment and supplies of vessels navigating the Northern Sea Route," for example, provides for a number of mandatory conditions: "a double-bottom floor throughout the entire width of a vessel," specific requirements relative to machinery plants, to systems and devices, communications equipment, emergency facilities, and so on. The Soviet Union possessed a huge and "ongoing" database on the Arctic

Ocean from 1980 to 1990, and that fact was recognized even at the level of foreign national legislation. According to the Arctic Research and Policy Act of 1984 (amended in 1990), "most Arctic rim countries, particularly the Soviet Union, possess Arctic technologies far more advanced than those currently available in the United States." However, today the situation is different, and it is other Arctic states and North Pacific Rim countries that possess better Arctic technologies and financial resources for developing economic activities in the Arctic region. So cooperation between Russia and such states – especially in creating port-industry clusters along the NSR – is mutually beneficial.

Notes

1. The term "Arctic coastal states" usually means the group of five states bordering the Arctic Ocean, each having internal waters, territorial seas, exclusive economic zones and a continental shelf in the Arctic Ocean, i.e. Canada, Denmark (because of Greenland), Norway, Russia and the United States (because of Alaska). The term also means the group of eight states with territories that are crossed by the North Polar Circle; that is, in addition to the five states mentioned above, Finland, Iceland and Sweden. All these states are members of the Arctic Council.
2. R. Wolfrum. The Arctic in the Context of International Law. In: New Chances and New Responsibilities in the Arctic Region. *Heidelberg Journal of International Law*. 69/3 – 2009. p. 533.
3. Environmental Security in the Arctic Ocean. University of Cambridge, UK. October 13-15, 2010. 264 pp.; Environmental Security in the Arctic Ocean / ed. P.A. Berkman, A. N. Vylegzhanin. Springer. Dordrecht. The Netherlands. 2013. 459 pp.
4. Problemi Severnogo Morskogo Puti (Problems of the Northern Sea Route). Ed. A. G.Granberg, V. I. Peresypkin, Moscow, Nauka Publ., 2006. p. 106-132.
5. Zhudro and Dzhavad. Morskoe Pravo (Law of the Sea – in Russian). Transport Publ. Moscow. 1974. p. 151-152.
6. Pharand. "Legal Status of the Arctic Regions" in Kindred (ed) International Law: Chiefly as Interpreted and Applied in Canada(6th edition, Emond Montgomery Publications, Toronto, 2000). p. 425.
7. Mezhdunarodnoe Pravo (International Law – in Russian). Preface by S. Lavrov. Ed. A. Vylegzhanin, U. Kolosov, R. Kolodkin. M. 2010. p. 180-188.
8. European Parliament Resolution on Arctic Governance. September 30, 2008. Para. F.

9. Though agreed upon, the English, French and Russian languages of the agreement being "equally authentic," the authentic Russian text is yet not available according to procedures provided by the federal law "On International Treaties of the Russian Federation."

10. Common Concern for the Arctic. Copenhagen. ANP 2008: 750. 166 p. M. Byers, *Who owns the Arctic?* D&M Publishers INC. 2010. p. 15-16, 125. The European Union and the Arctic: Policies and Actions. Copenhagen. ANP 2008: 729. p. 17-25.

11. P. A. Berkman, O. R. Young. Governance and Environmental Change in the Arctic Ocean. *Science* vol 324. April 17, 2009. p. 340.

12. See documents adopted by the Russian Parliament (in Russian): Postanovlenie Gosudarstvennoi Dumi Federalnogo Sobrania Rossiskoi Federatsii, February 7, 1997, No 1072-P GD. Postanovlenie Gosudarstvennoi Dumi Federalnogo Sobrania Rossiskoi Federatsii, June 14, 2002. «O posledstviah primenenia Soglashenia mezhdu SSSR i SSHA o linii razgranichenia morskih prostranstv 1990 goda dla natsionalnyh interesov Rossiskoi Federatsii». «Parlamentskai Gazeta», June 26, 2002.

13. Problems of the Northern Sea Route. ... p. 9-10

14. Par. 1.2. Regulations for navigation on the Sea ways of the Northern Sea Route.

15. Problems of the Northern Sea Route. ... p. 10

16. I.C.J. Reports 1951. p. 130

17. Ibid. p. 139

18. Ibid. p. 133

19. Ibid. p. 130

20. Evans, *International Law* (2nd edition, OUP, Oxford 2006). p. 115.

21. It is notable that the International Law Commission (ILC), while considering in 1950 the concepts of continental shelf and regime of the high seas, observed:

    "Dès 1916, l'idée du 'plateau continental', c'est-à-dire la prolongation sous-marine du territoire continental, apparaît de deux côtés différents, en Espagne et en Russie. En Espagne l'océanographe Odon de Buen insiste sur la nécessité d'un élargissement de la zone territoriale, de manière à y englober la totalité du plateau continental; il justifie son opinion en faisant remarquer que le plateau continental est la zone d'élection des principales espèces comestibles. Le 29 septembre de la même année le Gouvernement impérial russe émet une déclaration, notifiant aux autres gouvernements, qu'il considère comme faisant partie intégrante de l'Empire ´les îles Henriette, Jeanette, Bennett, Herald et Ouyedinenie´, qui forment avec les îles Nouvelle-Sibérie, Wrangel et autres, situées près de la côte asiatique de l'Empire, une extension vers le nord de la plate-forme continentale de la Sibérie. Cette thèse fut reprise par le Gouvernement de l'Union des Républiques socialistes soviétiques dans un mémorandum du 4 novembre 1924." - UN ILC "Documents of the Second Session Including the Report of the Commission to the General Assembly" (1950) vol. II UNYBILC 49.

22. Ukases (orders) of the Tsars of Russia of the 15th-16th centuries. Sbornik Russkogo istoricheskogo obshestva. Tom 38. St. Petersburg. 1883 (In Russian). p. 112.

23. Decree of the Russian Senate of 1821. Polnoe sobranie zakonov Rossiyskoi Imperii. 1875. Tom XXXVII (in Russian). p. 903.

24. Note issued by the Russian Ministry of Foreign Affairs in 1916. Pravitelstvenniy Vestnik. St. Petersburg. 1916 (in Russian). p. 183.

25. Durdenevskiy. "Problema pravovogo regime poliarnih oblastei" ("Problem of Legal Regime of Polar Regions"). Vestnik Moskovskogo gosudarstvennogo universiteta (Review of Moscow State University) 7 (1950); the western boundary of the Canadian Arctic sector is formed by the Convention of 1825 concluded between Russia (for Alaska) and Great Britain (for the Dominion of Canada) (Convention between Great Britain and Russia, [signed in St. Petersburg, 28 (16) February 1825]). The text of the convention does not say that this boundary extends to the North Pole, though it may be interpreted in this way: "dans son prolongement jusqu'à la Mer Glaciale."These conventional words are stressed in the Russian translation of Hyde, International Law Chiefly as *Interpreted and Applied by the United States* (2nd edition, Little, Brown and Company, Boston, 1947); Russian translation: *Mezhdunarodnoe pravo, kak ono ponimaetsja i primeniaetsja Soedinennimi Shtatami* (Inostr. lit. Moscow 1950) 60-61.

26. Postanovlenie Prezidiuma Centralnogo Ispolnitelnogo Komiteta SSSR (Decree of the Presidium of the Central Executive Committee of the USSR) of April 15, 1926, printed in Durdenevskiy (ed) Mezhdunarodnoe pravo (izbrannie dokumenti) (*International Law [selected sources]*) part 1 (Voennoe izdatelstvo Moskwa 1955) (in Russian) 210; the boundary line provided by the Convention of 1867 (n 40) extends to the North "without limits": "remont en ligne direct, sans limitation, vers le Nord jusqu'à ce qu'elle se perde dans la mer Glaciale" (Art. 1).

27. Convention Ceding Alaska between Russia and the United States (signed March 30, 1867, entered into force June 20, 1867) (1867) 134 CTS 332.

28. Pharand. "Legal Status of the Arctic Regions" in Kindred (ed). *International Law: Chiefly as Interpreted and Applied in Canada* (6th edition, Emond Montgomery Publications, Toronto, 2000). P. 424-25. Years later, the ILC referred in a positive light to the Canadian legal position: "Le sénateur canadien Poirier, «père» du système des secteurs, disait devant le Sénat d'Ottawa le 20 Janvier 1907: «Nous n'avons qu'à ouvrir notre géographie pour voir que

la chose est toute simple ... Cette méthode écarterait les difficultés et elle supprimerait les causes de différends ou de conflits entre les Etats intéressés. Tout Etat limitrophe des régions polaires étendra simplement ses possessions jusqu'au pôle nord»". - UN ILC "Documents of the Second Session Including the Report of the Commission to the General Assembly". p. 107.

29. An Act, Respecting the Northwest Territories, 1906; The Northwest Territories Act, 1925. The latter provides for "territories," "islands" and "possessions." Relevant Russian legislation (Postanovlenie Prezidiuma Centralnogo Ispolnitelnogo Komiteta SSSR, 15.04.1926) uses similar wording.

30. Barsegov. *Arktika: interesi Rossii i mezhdunarodnie uslovia ih realizatsii /The Arctic: Russian Interests and International Environment/* Nauka, Moskwa 2002, in Russian. p. 10-15.

31. Kolodkin. "Arktika" ("The Arctic") in Kuznetsov and Tuzmuhamedov (eds). *Mezhdunarodnoe pravo* (International Law) (Norma Moskwa 2007) (in Russian). p. 608-611.

32. Nikolaev and Bunik. "Mezhdunarodnopravovie obosnovsnia prav Kanadi v arkticheskom sektore" ("International Legal Base of Canada's Rights in its Arctic Sector"). *Moscow Journal of International Law* 65 (2007) (in Russian) 12-14.

33. Melkov (ed). *Mezhdunarodnoe pravo* (*International Law*) (RIOR Moskwa 2009) (in Russian) 420-423.

34. D. R. Rothwell. *The Polar Regions and the Development of International Law*. Cambridge University Press. 1996. p. 4-5.

35. 103rd Congress, 2nd Session, Senate Treaty Document 103-39. U.S. Government Printing Office. Washington, 1994.

36. Committee on Merchant Marine and Fisheries, Subcommittee on Oceanography, Gulf of Mexico and the Outer Continental Shelf Hearing on Law of the Sea Treaty and Reauthorization of the Deep Seabed Hard Mineral Resources Act Serial No 103-97. April 26, 1994. U.S. Government Printing Office. Washington, 1994. p. 3.

37. Art. 1, Convention on the Continental Shelf. 1958.

38. A. A. Arbatov. Energy statistic file (in Russian). Council for Research of the Productive Forces (SOPS). Presidium of the Russian Academy of Sciences (unpublished paper).

39. Arctic Transform. Arctic Environmental Governance Workshop. Cambridge. January 23, 2009. p. 1.

Commentary: American Perspective

Jon M. Van Dyke

Michael Byers' paper entitled "Arctic Straits: The Bering Strait, Northwest Passage and Northern Sea Route" provides a fine overview of the issues raised by the navigational opportunities in the Arctic created by climate change. This commentary addresses several of the issues he discusses from the United States' perspective.

THE U.S.-RUSSIA MARITIME BOUNDARY

It may be somewhat optimistic to view the maritime boundary delimited in the 1990 U.S.-U.S.S.R as "for all intents and purposes, binding." The 1,600-nautical-mile boundary between the U.S. and Russia is "the longest maritime boundary in the world,"[1] extending from the Arctic through the Bering Sea to a point southwest of the farthest Aleutian Island. It was established by a treaty signed on June 1, 1990, and approved by the U.S. Senate on September 16, 1991,[2] but has still not been ratified by Russia's legislature. This boundary is based on the line drawn in the U.S.-Russia Convention of March 18/30, 1867,[3] which contained a Maritime Boundary Agreement in its Article 2. The U.S. has viewed this line as establishing the maritime boundary between the two countries throughout its entire length.[4] The result has been to give the U.S. substantially more maritime jurisdiction than it would have had utilizing an equidistant line and the equitable principles that govern maritime delimitation, and it also constitutes a claim to exercise jurisdiction over the continental shelf in areas where it extends beyond 200 nautical miles, in what is sometimes called the "doughnut hole" in the Bering Sea.[5]

The reliance by the U.S. on a nineteenth-century treaty not designed to allocate ocean space is inconsistent with its approach toward other maritime boundaries, and is inconsistent with the equidistance approach,[6] which it has sought to use in almost all of its other maritime delimitations. The U.S. endeavored to develop a consistent approach to its many maritime boundaries in 1976 by bringing together an inter-agency group chaired by the Department of State, with representatives from the departments of Defense, Justice, and Interior, the Federal Energy Agency, the Coast Guard, and the National Oceanographic and Atmospheric Administration.[7] This group decided that the U.S. should advocate using equidistant lines as the appropriate way to achieve equitable solutions in all regions except the Gulf of Maine, the northern sector of the boundary between Florida and the Bahamas, and the boundary between the U.S. and Russia in the Bering Sea and the Arctic.[8]

In 2002, the Russian Duma approved a resolution stating that the 1990 treaty was "not balanced and called into doubt" Russia's national interests.[9] The resolution asserted that through this treaty the U.S. had acquired substantial maritime areas that should be within the exclusive economic zone (EEZ) and continental shelf of Russia in the Bering Strait and Bering Sea areas and that Russia had lost substantial amounts of revenues from fish harvested in these areas.[10]

THE BERING STRAIT

With the beginning of regular navigation along the Northern Sea Route (NSR) and through the Northwest Passage, the U.S. will itself become a "strait state" with the challenges and responsibilities associated with this status. The Bering Strait certainly appears to be an Article 37 strait used for international navigation, but it is somewhat unique because it contains two separate straits, each within a single country–one strait between the Russian mainland and Russia's Big Diomede Island and another strait between the Alaska mainland and the U.S.' Little Diomede Island. Although the Law of the Sea Convention does not recognize any special regime for straits within a single country, in general, it does contain hints of such a regime, such as in the Messina-Strait Exception in Article 38(1), and the special regimes governing the Turkish and Danish Straits (and probably the Strait of Magellan), which are recognized in Article 35(c) of the convention. It may be, therefore, that a country can exercise greater control over a strait passing between two land areas it has sovereignty over, than with regard to a strait that passes through two separate countries.

WHAT CONTROLS CAN COASTAL STATES EXERCISE OVER VESSELS ENGAGED IN TRANSIT PASSAGE THROUGH INTERNATIONAL STRAITS?

The rules recognized in the 1982 Convention do not allow a strait state to suspend transit passage through the strait (Article 44), but they do impose some restrictions on transit passage, such as: (1) transit passage must be solely for the purpose of continuous and expeditious transit [Article 38(2)]; (2) transiting ships must comply with generally accepted international regulations, procedures, and practices for safety at sea [Article 39(2)(a)] and for the prevention, reduction, and control of pollution from ships [Article 39(2)(b)]; and (3) ships exercising the right of transit passage must proceed without delay through the strait, must not engage in any research or fishing activities, and must refrain from any threat or use of force [Articles 39(1), 40, and 42(1)(c)].

Article 38(3) of the Law of the Sea Convention states explicitly that "any activity which is not an exercise of the right of transit passage through a strait remains subject to the other applicable provisions of the Convention." Any such "non-transit" activity, if undertaken in the territorial waters of a coastal state, would have to comply with the innocent-passage provisions of Articles 17-26 of the convention, and the activity could be prevented if "non-innocent."

The Law of the Sea Convention allows countries bordering on straits to establish certain types of regulations:

1. Traffic separation schemes and other safety measures can be established under Articles 41 and 42(1)(a) of the Law of the Sea Convention, but Article 41(4) indicates that the International Maritime Organization (IMO) must approve a traffic separation scheme before it can be put into force.
2. Pollution control regulations can be adopted under Article 42(1)(b), which allows states bordering straits to adopt laws and regulations with respect to "the prevention, reduction and control of pollution, by giving effect to applicable international regulations regarding the discharge of oil, oily wastes and other noxious substances in the strait," provided that such laws and regulations are not discriminatory, and do not "in their application have the practical effect of denying, hampering or impairing the right of transit

passage" [Article 42(2)], and have been duly publicized [Article 42(3)].

3. Fishing regulations can be adopted under Article 42(c) to prevent fishing.
4. Regulations can be adopted to control the loading, unloading, or transfer of any goods, any currency, or any person in contravention of the "customs, fiscal, immigration or sanitary laws and regulations" of the coastal state, under Article 42(d).

The regulations issued by straits states cannot discriminate against foreign ships nor can they have the effect of "hampering or impairing the right of transit passage" [Article 42(2)], and due publicity must be given to these regulations. Nonetheless, they can be promulgated, and foreign states whose flag vessels do not comply are responsible for "any loss or damage which results to States bordering straits" [Article 42(5)].

CAN SHIPS BE CHARGED FOR PASSING THROUGH STRAITS?

Article 26 is entitled "Charges Which May Be Levied Upon Foreign Ships," and its paragraph 2 indicates that a coastal state can charge ships passing through its territorial sea "for specific services rendered to the ship." Does this provision apply to a ship in the territorial sea of a country bordering on a strait while the ship is exercising its right to transit passage through the strait? No provision in Part III on "Straits Used for International Navigation" says explicitly that it does not apply, and application of Article 26(2) does not directly conflict with the purposes of Part III governing straits used for international navigation. Satya Nandan has sided with the straits states on this issue and has said that "there is nothing in the Convention which prohibits charges for similar services [similar to the "specific services rendered to the ship allowed under Article 26(2)] in straits which are part of the territorial sea."[11] He has noted that the issue of compensation to strait states "has been festering for some time" and has explained that:

> *Straits States are legitimately concerned with the financial burdens they have to bear for establishing and managing traffic separation schemes, for*

> *installing and maintaining navigational aids, and by the pollution they must endure, without receiving any corresponding benefits, since many ships transit straits en route to ports in other States.*[12]

Nandan has noted that this "matter remains unresolved" and that "a meaningful global solution would be difficult to achieve," has suggested that the special circumstances of each strait need to be examined separately, and has recognized that "account also has to be taken of the sensitivity of the straits States to any diminution in the exercise of sovereignty over the strait."[13]

Article 43 calls for cooperation among strait states and those using the strait to establish navigational and safety aids and to control pollution. The first procedure to coordinate such activities was established in 2007 for the Malacca and Singapore straits. This process for coordination, called the Cooperative Mechanism,[14] may provide a model for other regions. Funds have been contributed by a number of organizations and countries, including India and China, to support and replace aids to navigation, develop preparedness and response mechanisms, and undertake other important projects designed to promote safe shipping and protect the environment of the Malacca Strait region.[15]

RUSSIAN AND CANADIAN CLAIMS THAT THE NORTHERN SEA PASSAGE AND NORTHWEST PASSAGE PASS THROUGH THEIR INTERNAL WATERS

In 1965, the U.S. challenged the Soviet Union's claim that the Dmitry, Laptev, and Sannikov Straits were historic waters of the Soviet Union "even assuming that the doctrine of historic waters in international law can be applied to international straits."[16] The U.S. has also consistently challenged the straight baselines drawn by Canada in 1985 around Arctic islands that enclose the Northwest Passage.[17] The U.S. has consistently taken the position that the transit passage regime applies to straits that can potentially be used for international transit, and that it is not necessary to establish that the strait has been so used historically.

Lewis M. Alexander has explained that the Soviet Union's refusal in 1967 to allow two U.S. Coast Guard vessels to pass through the Vil'kitsky

Strait (between Severnaya Zemla and the Tamir Peninsula of the Siberian mainland) could have been (1) because the Soviets did not think this strait connected two parts of the high seas with one another (because they did not consider the waters of the Laptev Sea to be high seas) or (2) because the Soviets considered the U.S. Coast Guard vessels to be warships and then claimed that warships had to obtain prior consent before passing through the Soviet territorial sea.[18] In any event, the U.S. does not appear to have made any attempt to pass through this strait since that incident.

The straight baseline claims of Russia and Canada in their Arctic regions are certainly unusual, but these regions are unusual, and perhaps require a special form of stewardship, as recognized in Article 234 of the Law of the Sea Convention. Canada's enactment in 1970 of the Arctic Waters Pollution Prevention Act, which regulates shipping within 100 miles of Canada's Arctic coast (enforced by refusing to allow noncomplying ships from entering Canadian ports), was an early environmental statute, widely viewed as appropriate at the time, and still viewed as sensible and necessary.[19] Alexander wrote in 1986 that the Northern Sea Passage "presumably is open to commercial vessels of all nations during the few months of open navigation, but it requires the cooperation of the Soviet Union in terms of information on weather and ice conditions and, in times of emergency, of Soviet assistance in ice-breaking operations and other related actions."[20] Perhaps the U.S. will become somewhat more sympathetic to the challenges faced by strait states in protecting fragile ecosystems from ship-based pollution now that it is becoming a strait state itself, with regard to the Bering Strait.

IS THE REGIME OF TRANSIT PASSAGE THROUGH INTERNATIONAL STRAITS NOW BINDING CUSTOMARY INTERNATIONAL LAW?

The United States has not yet ratified the Law of the Sea Convention, but has argued vigorously that the regime of transit passage through international straits is now part of binding customary international law. On August 17, 1987, the U.S. said:

> *The United States particularly rejects the assertions that the right of transit through straits used for international navigation, as articulated in the LOS*

> *Convention, are contractual rights and not codification of existing customs or established usage. The regime of transit passage, as reflected in the Convention, are clearly based on customary practice of long standing and reflects the balance of rights and interests among all States, regardless of whether they have signed or ratified the Convention.*[21]

Key straits states such as Turkey and Iran have also not ratified the convention and are less enthusiastic about the transit passage regime. Some countries have viewed transit passage as emanating directly from the Law of the Sea Convention, and thus not applicable to countries that are not contracting parties,[22] and some commentators have suggested that the transit passage regime in the Law of the Sea Convention may not yet have been confirmed as customary international law because of "the attitude taken by a significant number of States which appear reluctant, either explicitly or implicitly, to accept the transit passage regime as a whole or some of its implications."[23] Some Greek scholars have argued, for instance, that Turkey would not be entitled to invoke the right of transit passage through the Aegean Sea (if Greece were to claim 12-mile territorial seas around its Aegean islands), because Turkey is not a contracting party to the Law of the Sea Convention.[24]

Professor Scovazzi has explained that the convention does not adequately protect the "vital concern" of states bordering straits regarding the protection of their marine environment.[25] In particular, the convention provides only limited authority to the bordering states to enforce their environmental regulations, it does not create an adequate liability regime, nor does it require the prior notification of transit of ultra-hazardous cargoes that would allow coastal states to protect their coastal populations and resources.[26] These inadequacies have led a number of straits-bordering states to promulgate regulations that appear to go beyond what is permitted by the convention.[27] Professor Scovazzi has concluded that "it is therefore possible to argue that the LOS Convention transit passage regime is still far from fully corresponding to present customary international law."[28]

THE DUTY TO COOPERATE IN SEMI-ENCLOSED SEAS

Article 123 says that countries bordering semi-enclosed seas "should cooperate with each other in the exercise of their rights and the performance of their duties under this Convention." More specifically, they are instructed to "endeavor, directly or through an appropriate regional organization (a) to coordinate the management, conservation, exploration, and exploitation of the living resources of the sea" and also to coordinate their activities "with respect to the protection and preservation of the marine environment." Commentators disagree on whether the Arctic Sea should be characterized as a "semi-enclosed sea."[29] It is "surrounded by two or more States and connected to another sea or the ocean by a narrow outlet" as defined in Article 122 of the convention, but it is also substantially larger than other bodies that are viewed as "semi-enclosed."

The countries bordering on and situated near the Arctic Sea have cooperated somewhat through the Arctic Council and its working group, Protection of the Arctic Marine Environment (PAME). The Arctic Council consists of Canada, Denmark (Greenland, Faroe Islands), Finland, Iceland, Norway, Russian Federation, Sweden, and the U.S., and indigenous groups participate in the Council as "Permanent Participants." Some other countries have challenged the role of the Arctic Council, arguing that the Arctic should be managed globally.

The U.S. has, of course, cooperated with Canada in many respects regarding Arctic issues, and these two countries tend to try to overcome sovereignty disputes in order to promote management issues, as one would expect between countries that "are among the closest allies in the world."[30] In any event, as exploitation of resources in this region increases, it will be necessary to establish and develop appropriate regional and international organizations to coordinate activities, promote cooperation, and manage the living and nonliving resources of the Arctic effectively.

Notes

1. *International Maritime Boundaries* 447 (Jonathan I. Charney and Lewis M. Alexander eds. 1993).
2. Maritime Boundary Agreement Between the United States of America and the Union of the Soviet Socialist Republics, U.S. Senate Treaty Doc. 101-22, 101st Cong., 2d Sess. (1990), 29 I.L.M. 941 (1990), *International Maritime Boundaries*, supra note 1, at 447.
3. Convention Concerning the Cession of Alaska (United States-Russia), March 30,

1867, 15 Stat. 539, TS No. 301, 11 Bevans 1216.

4. *International Maritime Boundaries*, supra note 1, at 449.

5. It is unclear exactly what authority is claimed under this 1990 treaty, because Article I(2) says that the parties claim authority "as far as permitted under international law."

6. In the Beaufort Sea, Canada has rejected the equidistance approach supported by the United States and "claims a different boundary...based on its interpretation of the 1825 Treaty [of Saint Petersburg] between Russia and Great Britain." Mark B. Feldman and David Colson, *The Maritime Boundaries of the United States*, 75 AM. J. INT'L L.729, 750 (1981). That treaty says that the boundary between Alaska (then a Russian possession) and Canada (then a British possession) was at the 141 degree meridian of west longitude "in its prolongation as far as the Frozen Ocean." Canada argues that this boundary covers the adjacent maritime areas, as well as the land areas, but the U.S. (emphasizing the use of the French word "jusqu'a" for "as far as the Frozen Ocean") argues that the boundary covers the area "up to the ocean, not beyond, into, or under it. In the view of the U.S., the 1825 treaty did not establish a maritime boundary, but merely defined the boundary on land." Robert W. Smith, United States-Canada Maritime Boundaries: A Study of Negotiations, Arbitration, and Management 4-3-17 (Conference on Marine Policy and the Korea Economy: Issues and Opportunities, Korea Maritime Institute and University of Rhode Island, Seoul, October 22-24, 1998). The U. S. has thus proposed using an equidistance approach because "there are no relevant prior agreements or 'special circumstances.'" Id. The Beaufort Sea does not have any commercial fishing activity, but oil and gas potential exists, and both the U.S. and Canada have refrained from drilling in the disputed area.

7. Feldman and Colson, supra note 6, at 736-37; David A. Colson, The Maritime Boundaries of the Unites States: Where Are We Now? in The Law of the Sea: What Lies Ahead? 464, 466 (Law of the Sea Institute, Honolulu, Thomas A. Clingan, Jr., ed. 1988).

8. Smith (1998), supra note 6, at 4-3-9.

9. ITAR-TASS, Russian Duma Seeks Change to Sea Border Accord with US, BBC Monitoring Former Soviet Union – Political, June 14, 2002.

10. Id.

11. Satya N. Nandan, Legal Regime for Straits Used for International Navigation, in the Proceedings of the Symposium on the Straits Used for International Navigation 1,8 (Bayram Ozturk & Resat Ozkan eds., Turkish Marine Research Foundation, Istanbul, Nov. 16-17, 2002) .

12. Id. at 7.

13. Id. at 8.

14. Milestone Agreement Reached on Co-operation Over the Straits of Malacca and Singapore, *IMO News*, 2007 No. 4, at 8, http://www.imo.org/includes/blastDataOnly.asp/data_id%3D20746/IMONewsNo407LR.pdf.

15. SeeHasjim Djalal, The Development of Cooperation in the Straits of Malacca and Singapore (Nov. 24, 2008), www.nippon-foundation.or.jp/eng/current/malacca_sympo/6.doc; Joshua H. Ho, Enhancing Safety, Security, and Environmental Protection of the Straits of Malacca and Singapore: The Cooperative Mechanism, 40 Ocean Development & International Law 233-47 (2009); IMO Secretary-General, Protection of Vital Shipping Lanes – Recent Developments of the Cooperative Mechanisms for the Straits of Malacca and Singapore, IMO C 106/12 (March 28, 2011), http://www.amtcc.com/imosite/meetings/IMOMeeting2011/council106/C_106-12.pdf.

16. U.S. State Dept. Office of the Geographer, United States Responses to Excessive National Maritime Claims, Limits in the Seas No. 112 at 21 (1992) (citing U.S. aide-memoire to the Soviet Union dated June 22, 1965); see also id. at 71-73; J. Ashley Roach and Robert W. Smith, United States Responses to Excessive Maritime Claims 34, 51-52, 330-31 (2d ed. 1996) (citing and quoting from the same U.S. aide-memoire).

17. See Limits in the Seasupranote16, at 73-74; Roach and Smith, supra note 16, at 329-53.

18. Lewis M. Alexander, Navigational Restrictions Within the New LOS Context: Geographical Implications for the United States(Peace Dale, R.I., Offshore Consultants, Inc., 1986). The Soviet aide-memoire explaining its position is published in Roach and Smith, supra note 16, at 333-34.

19. See Richard M. Bilder, The Canadian Arctic Waters Pollution Prevention Act, in The United Nations and Ocean Management 208-09 (Law of the Sea Institute, Lewis M. Alexander ed., 1970).

20. Alexander, supra note18, at 317.

21. Nihan Unlu, The Legal Regime of the Turkish Straits 74(2002).

22. The Turkish scholar Nihan Unlu lists the countries that “consider the regime of transit passage as an exclusive part of the UNCLOS” as Chile, Denmark, Egypt, Greece, Iran, Indonesia, Italy, Japan, South Korea, Malaysia, the Netherlands, Oman, and Spain. Id. at 75.

23. Tullio Scovazzi, The Evolution of International Law of the Sea: New Issues, New Challenges 174 (The Hague: Martinus Nijhoff, 2001) (reprinted from Recueil des Cours, Volume 286 (2000)). Nihan Unlu agrees that “a general right of transit passage has not yet been established in customary law.” Unlu, supra note 21, at 75.

24. See, e.g., George P. Politakis, The Aegean Dispute in the 1990s: Naval Aspects

of the New Law of the Sea Convention, in Greece and the Law of the Sea 291, 303 (Theodore C. Kariotis ed. 1997) (similar to George P. Politakis, The Aegean Agenda: Greek National Interests and the New Law of the Sea Convention, 10 497 International Journal of Marine and Coastal Law 497 (1995)) (summarizing scholarly discussion that indicates that all aspects of the transit passage regime have not yet crystallized into customary international law), and Anastasia Strati, Greece and the Law of the Sea: A Greek Perspective, in The Aegean Sea After the Cold War 89, 94 (Aldo Chircop, Gerolymatos & Iatrides, eds., 2000) ("it is highly questionable whether the LOS Convention provisions on transit passage in all their detail reflect customary law, thereby entitling Turkey to benefit from them").

25. Scovazzi, Evolution supra note 23, at 174-75.

26. Id. at 175-77.

27. Id. at 177-87 (providing examples from the Malacca Strait, the Canadian Arctic Straits, the Russian Arctic Straits, and the Turkish Straits).

28. Tullio Scovazzi, Management Regimes and Responsibility for International Straits, in 344 The Straits of Malacca : International Cooperation in Trade, Funding and Navigational Safety 344 (Maritime Institute of Malaysia, Kuala Lumpur: Pelanduk Publications, Hamzah Ahmad ed., 1997); see also Hamzah bin Ahmad, Global Funding for Navigation Safety and Environmental Protection, in The Straits of Malacca, id, at 125, 131 ("the concept of transit passage is relatively new and cannot be said to have acquired the status of customary international law").

29. Lewis M. Alexander stated that "the Arctic Ocean is a major semi-enclosed sea with a very narrow connector to the Pacific Ocean via East and West Bering Straits, with the Northwest Atlantic through Kennedy and Robeson Channels and Nares Strait between Canada and Greenland; and with the Northeast Atlantic through the much broader Greenland and Norwegian Seas." Alexander, supra note 18, at 311.

30. James Kraska, International Security and International Law in the Northwest Passage, 42 *Vanderbilt Journal of Transnational Law* 1109, 1120 (2009); see, e.g., the 1988 Agreement on Arctic Cooperation, described in Roach & Smith, supra note 16, at 348-51.

Commentary: Chinese Perspective

Peiqing Guo

ARCTIC GOVERNANCE IN THE POST-NUUK ERA

The Senior Arctic Officials (SAO) Report to Ministers published during the Seventh Ministerial Meeting of the Arctic Council in Nuuk, Greenland, set up "the criteria for admitting observers and role for their participation in the Arctic Council." This report stipulates that those countries that want to be observers of the Arctic Council will have to meet very demanding requirements. These include recognition of the sovereignty, sovereign rights and jurisdiction of the Arctic countries. Their powers are very restricted and limited in contributing to the work of the council with scientific and financial resources. Ironically, it requires limitations on the financial contributions from observers to any given project, and these may not exceed the financing from the Arctic states!

Pointedly, the SAO report shows up the Arctic coastal states' undisguised exclusion of non-Arctic countries. Arctic governance presents a feature of regionalization marked with backsliding. It can be called the Arctic collective version of the "Monroe Doctrine," which proposes to carve up the Arctic "pie" within the countries bordering the Arctic Ocean.

The Arctic "collective Monroe Doctrine" originates from the Ilulissat Declaration of May 2008.[1] The declaration's central message is a preemptive one. It was designed to deter efforts by non-Arctic nations from interesting themselves in a domain that is conceived to be primarily the affair of the A-5.[2, 3] This concern was strengthened during the Nuuk, Greenland meeting.

From that time on, Arctic governance of these regions has become a tide carrying the main thinking around the Arctic. Why do the Arctic countries want to prevent non-Arctic lands from participating in Arctic affairs? Partly it is from a fear that the Arctic will be converted into the human family's common heritage.

On a large scale, the Arctic border countries share some common interest in Arctic governance. Perhaps they hope to break up Arctic resources, including navigation recourses, from the public space, as in the other three oceans. Each of the Arctic countries tries its best to privatize Arctic resources even though there are conflicts among the five states. The state of being semi-enclosed by five countries offers some convenience for their imagination of group privatization.

These words by Russian Foreign Minister Sergey Lavrov illustrated their concerns: "If given the green light early in the council, one hundred observers will require more and more rights, and then want to convert the Arctic into a heritage of humanity." The source stressed that "Russia wants to avoid this situation" and that "most Arctic countries share Russia's position."[4]

Perhaps we can think of what some see as obstructions by the Arctic states. To some extent, some Arctic countries' judgment is correct. Their obstruction perhaps will hinder or slow down non-Arctic countries from benefiting from Arctic development in shipping and resources.

However, their demands will face the challenge of the internal defects hiding in their principles. According to the SAO report, non-Arctic states are required to recognize the Arctic states' "sovereignty, sovereign rights and jurisdiction in the Arctic." A definition of sovereignty means "the land area of a state, its internal waters and its territorial sea, including the airspace above those areas." However, the problem is that they are not easily defined in this icy region called the Arctic, even by the Arctic coastal states. Some of these disputes have not been addressed at all among the Arctic states, for instance the disputes over maritime delimitations in the Beaufort Sea and the Bering Sea, both of which are abundant in oil. An example of this: There is a disagreement on the USA/USSR Maritime Boundary Agreement of 1990. The United States and Russia share about 15,000 square nautical miles of disputed area in the Bering Sea. What position will the Arctic coastal states require the observers to take on this issue related to sovereign rights and jurisdiction?

Under existing conditions, it is not feasible to ask a non-Arctic country to give clear recognition to "the Arctic states' sovereignty, sovereign rights and jurisdiction in the Arctic" regardless of so many disputes in this territory, the EEZ, and the continental shelf.

New shipping routes and natural resource discoveries would eventually place the region at the center of world politics.[5] Arctic governance is not only a regional issue, but an international one, let alone the central Arctic area consisting of an international seabed and high seas. There is no doubt that the management of the Arctic Ocean is inseparable from non-Arctic states' participation. In addition, many issues, including black carbon, ozone depletion, greenhouse gases, mercury, persistent organic pollutants

(POPs) and long-range, trans-boundary air pollution dictate involvement by many non-Arctic states.

Actually, it is not realistic to obstruct non-Arctic states from Arctic governance. On the contrary, there is an implicit logic in the basic principles proposed and complied with by Arctic coastal states, that they acknowledge the non-Arctic states' role in the regulation of the Arctic Ocean. The five Arctic states are committed to resolving territorial issues through the legal framework provided by UNCLOS. Both the Ilulissat Declaration and Nuuk Declaration admit to address disputes on the basis of UNCLOS. As the "constitution" of the law of the sea, UNCLOS empowers non-Arctic states with legitimate rights in the Arctic Ocean.

Arctic and non-Arctic states have to collaborate in the framework of the International Maritime Organization (IMO) to develop a new polar code for shipping, "strengthening global and regional efforts for the conservation and sustainable use of the Arctic marine environment."[6]

LEGAL ISSUES AND POLITICAL PROBLEMS IN THE ARCTIC PASSAGE

With the sea ice melting rapidly and with navigation guide development, we can say the technology of Arctic shipping has been resolved. Yet the biggest obstacles are shipping management rights, which involve political disputes and the laws of Arctic shipping. Summarizing the legitimate authority of Canada and Russia, we can conclude that it simply is about three aspects.

Sector Theory

This theory delineates a meridian line from the pole to the farthest extremity of the contiguous state's land mass. All territory within that sector is purported to be under the sovereignty of the claimant state. It should be noted that this theory is not universally recognized as the sole basis for claiming territory in these regions.

Historical Title (Treaty Law and Customary Law)

UNCLOS does not define clearly the concept of "historic title." However, based on the theory of customary law/unwritten law, the basic principles can be drawn from a previous case judged by the International Court of Justice. This is the Fisheries Case between the UK and Norway, which happened in 1951. These basic principles are effective occupation for a long history, exclusive national jurisdictional rule, and acquiescence by interested foreign states. The last piece is a very important justification.

Straight Baseline

How do we define a straight baseline? This can also be found in the UK vs. Norway case. According to the ICJ judgment it can only be effective when it meets these requirements:

A. The archipelago itself must be united, and its configuration must be parallel with the general direction of the coast. For the Canadian Archipelago the general direction is east-west on the Robinson projection map, but in the Lambert conic project, a south-north landscape is shown. For three Russian islands in the Arctic the south-north direction is explicitly shown.
B. Islands must be in proximity to the land, that is to say, there must be a close link between land and sea.
C. Special economic interests evidenced by long usage.
D. Acquiescence to by the international community.

In short, the grounds of argument for either NSR or NWP privatization have faced many challenges from the international community. The reason is largely that their claim for internal water Arctic passage is due to customary law that needs stakeholders to reach a consensus instead of going one's own way unilaterally. Russia and Canada have a long way to go in asking for acquiescence from international society.

Canada's and Russia's Control over the Arctic Passage

The regulation systems in the NSR and NWP are different. Canada has never historically denied navigation in the NWP, even though her management is getting stricter than before. Generally speaking, Russian management is stricter than Canadian domestic law and the related international law. Except for mandatory icebreaking and piloting in the four straits, Russian tariff policy has caused some controversy in the international community.

Russia charges high tariffs for ice-breaking assistance to vessels on the NSR, which is from 118 to 2,576 Rubles/ton according to the cargo shipped. Basically, NSR tariff rates for assistance to vessels shipping liquid and bulk cargoes are from four to six times higher than those of the Suez Canal: liquid cargo, with 5.6:20.8; bulk cargo 4.5:27.8.[8]

In recent years, the icebreaking fees, which have been increasing regularly, have also created a difficulty in the new conditions prevailing in the Russian economy. By early 1994, for instance, these fees had increased 1,376 times when compared to 1989. They are predicted to increase further in the near future.[9]

In article 26 of UNCLOS, "Charges which may be levied upon foreign ships" stipulates that "1. No charge may be levied upon foreign ships by reason only of their passage through the territorial sea. 2. Charges may be levied upon a foreign ship passing through the territorial sea as payment only for specific services rendered to the ship. These charges shall be levied without discrimination." Although the charge is different depending on different situations, a nondiscrimination principle is recognized by the international community. "Without discrimination" currently covers only foreign ships and does not include Russian domestic vessels. According to this article, the charge is only for the shipping in "territorial seas," but not above the continental shelf and EEZ.

Russia is planning to update the NSR to serve its energy projects and provide a shorter supply route to Asia; thus, the NSR can rival the Suez Canal. To achieve this goal, Russia has to address lots of relevant problems with the NSR, as of today, including outdated infrastructure and techniques on the Russian side, tariff rates and costs incurred that are too high, high risks (of delays, accidents, etc.) and insurance rates, and particularly unfavorable legal rules for foreign shipping companies.

EXPLORATION OF REGIMES OVER GOVERNANCE ON ARCTIC SHIPPING

Capitalizing on the Existing Regime

Many scholars believe and advocate that the existing international law, especially UNCLOS, and international organizations could serve well for the Arctic issues, including shipping. Actually, this idea has a realistic foundation.

The major Arctic countries playing leading roles in Arctic governance have indicated many times that they wish to resolve disputes based on the UNCLOS. It is now up to us to think about the basic UNCLOS principles that can be used for Arctic shipping. They include three basic principles: favorable to traffic, beneficial to the marine environment and its protection, and good for sustainable development.

Russia and Canada claim to have authority to enforce their domestic laws under Article 234 of UNCLOS, allowing coastal states with ice-covered areas to be able to prescribe and enforce rules over those areas. The problem is that lots of definitions in that clause have not been defined. That is, lawyers disagree on virtually most of the words in the descriptions. For example, what is an ice-covered area? Is it ice-covered 200 days a year, 365 days a year? Can it just be ice-infested waters? Is it ice-covered if it just has big chunks and is still dangerous to transit? Other key words such as "nondiscriminatory," "severe climatic conditions," "exceptional hazards to navigation," "major harm to or irreversible disturbance of the ecological balance," and "best available scientific evidence," have yet to be defined. The international community should work out more practical laws to facilitate ice shipping regulations.

The IMO is the most authoritative institution to regulate oceanic shipping. It is recognized by the international community, involving most countries worldwide. The latest development in Arctic shipping requires that new guidelines be established replacing the "Guidelines for Ships Operating in Arctic Ice-covered Waters" set up in 2002 by the IMO. The new guidelines being drafted by IMO will be mandatory.

Exploration of New Regimes of Arctic Shipping—Montreux Mode

Arctic coastal states are showing excessive concern with non-Arctic states' intentions and interest in the Arctic. Some diplomats think of non-Arctic states participating as a zero-sum world, but not being mutually beneficial.

It is a fact that non-Arctic states have no territory in these regions, but this does not mean they have no legitimate interests in the Arctic region. Actually, the concept of "interest" has become a term with wider scope, that is, multi-element, or all-directional, and not merely related to territory, but including science, the environment and navigation, and so on.

Non-Arctic states' interest in Arctic affairs could prove be a good opportunity for Arctic coastal states to voice their desire to foster cooperation in the region. Non-Arctic states are not wrong in seeking to play a constructive role in Arctic governance. On the contrary, they are what is right for Arctic governance if there can be unity of thought and relationships.

In this modern era of globalization, one-sided and isolated development at the sacrifice of others' legitimate interests is neither realistic nor reasonable. The interests of different countries have been closely related without divisions. Cooperation is the most cost-effective method, and perhaps the best way to defend a country's national interests. Non-Arctic states are constructive players in Arctic governance, especially in shipping, and will bring about a win-win situation. It will prove that Arctic coastal countries can gain benefits from non-Arctic states being involved in Arctic shipping regulations.

The fundamental prerequisite to deal with the relationship between Arctic coastal states and interested non-Arctic states may best be stated thusly: Let each of the Arctic states take into account the legitimate interests of non-Arctic states. Let each non-Arctic state acknowledge the legitimate concerns of Arctic coastal states. Both collaborate to improve dialogue, communications and cooperation.

The concerns of both Russia and Canada on the security and environmental protection of the Arctic passage should be taken into consideration by non-Arctic states. It is of no doubt that both countries enjoy primacy in shipping regulations. Their concerns about security, resources and environment should be respected by non-Arctic states, and their privilege will be respected by interested countries.

Based on the ideas here presented, the governance of the Arctic passage can be patterned after the mode of Montreux, which derives from the "Montreux Convention Regarding the Regime of the Turkish Straits." This convention was held in 1936. It gave Turkey full control over the straits and guarantees the free passage of civilian vessels in peacetime. It severely restricts the passage of non-Turkish military vessels.

Providing Arctic shipping management chiefly by the countries along the passage, the interest of related non-Arctic states can thus be taken into full account. This would not be against the interests of Arctic and non-Arctic states. This compromise will address the dilemma annoying both sides and will benefit all.

North Pacific Cooperation in Institutionalizing Comprehensive Multilateral Norms and Regulations

Besides the Arctic countries, other Arctic stakeholders are from East Asia, primarily China, Japan and South Korea. Arctic governance has been connected with the North Pacific on a large scale. These connections are reflected in two respects: firstly, Arctic shipping mainly serves the economic areas of East Asia, Northern Europe and North America. With a growing Asia market, regional developments in container shipping keep rising. The major operations of Arctic shipping in the coming decades will be from Asian countries. Secondly, East Asian countries have been the biggest potential buyers for natural resources in the Arctic. The great earthquake a few months ago in Japan will slow down nuclear development. Consequently there will be a large increase in the consumption of fossil fuel in the world, part of which will maybe come from the Arctic.

The extreme environmental conditions and fragile ecosystem in the Arctic determine that conflict is harmful to the fundamental interests of interested countries. The price of any conflict simply cannot be afforded by any side. Arctic coastal nations have realized that cooperation is the best way to solve the Arctic's security problems, and have been actively exploring ways to cooperate. However, lots of environmental problems inevitably involve many of the non-Arctic countries. Without cooperation by these many countries it is not going to be possible to address the Arctic issues.

So far as yet, there does not exist an authoritative international institution or world-wide international treaty regulating North Pacific cooperation. A potential North Pacific Rim Forum could include the three major Arctic countries Russia, the U.S. and Canada, and three major interested non-Arctic countries, all of which play key roles in today's world. A North Pacific Rim Forum may shape collaboration to enhance economic cooperation and maritime safety in the Arctic and North Pacific.

North Pacific Cooperation in Establishing an Arctic Seaway Management Corporation

Neither Russia nor Canada wants to close the Arctic passage along their coastal areas, because both realize that it is not in their interest. How to maximize their interest in the Arctic passage is their common concern.

In this respect, the St. Lawrence Seaway Management Corporation offers us an excellent point of reference for Arctic passage governance. Scott Borgerson is the first to suggest the establishment of an Arctic Seaway Management Corporation to run Arctic shipping. Actually, this move is similar to the management pattern of the St. Lawrence Seaway. In 1959, the St. Lawrence Seaway joint treaty-based initiative between Canada and the U.S. was completed and inaugurated by President Dwight D. Eisenhower and Queen Elizabeth II.

Is it practicable to establish an "Arctic Seaway Management Corporation"? With global warming so evident in the world today, there may come a need for an age of large-scale resource extraction. The development and refinement of resources will consequently cause transportation lines to boom. It well may bring about the emergence of a new circumpolar super-economic belt-zone made up of Russia, North America and North Europe, which could enhance interdependence within Arctic coastal countries, as well as between Arctic coastal states and non-Arctic states.

However, up until now large areas of the Arctic region are lacking in infrastructure, and millions of square miles have not been adequately surveyed, so there is a lack of reliable charts/navigation data. Ideas and abilities to control pollution are very limited. This brings about great challenges for emergency response, search and rescue, and pollution response. The possibilities for oil spills, shipwrecks and smuggling, etc., compel the coastal nations to rely on coordination and cooperation with the international community. This would have to include the major user countries: China, Japan, and South Korea. With the support of non-Arctic countries, Arctic countries can establish a risk-shared contractual mechanism by dispersing the investment risk, and improve the general economic situation in the northern maritime region of Russia and Canada, and so all sides would benefit from it.

The greatest possible obstacle will be from Russia, which has made long-term operations in NSR infrastructure. In particular, its national strategy is to make a profit from the NSR. This brings much more uncertainty to the assumed Arctic seaway management corporation.

Building a North Pacific Security Conference

At present, the six countries mentioned above can start with low politics such as environmental protection, science research, search and rescue, culture and fisheries. Then they could extend it to navigation cooperation, even security, and, as well, high politics. A potential North Pacific Security Conference could serve this purpose.

North Pacific security cooperation can compensate for the defects in current Arctic governance, that the Arctic Council is the center founded on the basis of the Arctic Environmental Protection Strategy, focusing on the environmental dimension, except military ones.[10]

While the Arctic Council has proven successful in serving as a forum for dialogue on soft-policy issues and as a body for coordinating research and knowledge-sharing, search and rescue, and environmental protection, with a number of initiatives already in place, its statute sets some limitations on its wider use, and a truly broad and all-encompassing Arctic cooperation is generally lacking.[11] The principal reason is that cooperation has been hampered by historical mistrust between Russia and the four Arctic NATO members.

The introduction of non-Arctic countries into the Arctic could effectively lessen the strong military conflict color of the NATO-Russia relationship and improve the level of international cooperation.

Notes

1. http://www.oceanlaw.org/downloads/arctic/Ilulissat_Declaration.pdf
2. A-5: The Ilulissat Declaration was prepared by five of the eight Arctic Council Countries, deemed by them to be the five Arctic coastal states, i.e., Canada, Denmark (based on Greenland and the Faroe Islands) Norway, Russia, and the United States.
3. Brooks B. Yeager, "The Ilulissat Declaration: Background and Implications for Arctic Governance," November 5, 2008. http://www.arcticgovernance.org/the-ilulissat-declaration-background-and-implications-for-arctic-governance.4626039-137746.html
4. Russia built a high wall and closed the gateway to China for Arctic resources, http://www.peopleforum.cn/redirect.php?fid=11&tid=94876&goto=nextnewset
5. WikiLeaks: A battle to "carve up" the Arctic http://english.aljazeera.net/indepth/features/2011/05/201151713273937174.html
6. Nuuk Declaration.
7. Vladimor Mihailichenko, "Transit through Northern Sea Route: Problems and Opportunities," Presentation at the 7th Arctic Shipping Summit in Helsinki.

8. Vladimor Mihailichenko, "Transit through Northern Sea Route: Problems and Opportunities," Presentation at the 7th Arctic Shipping Summit in Helsinki.
9. Erik Francks, "The Legal Regime of Navigation in the Russian Arctic," *Journal of Transnational Law & Policy*, Vol.18, No. 2, 2009, p. 340.
10. The Ottawa declaration of 2004.
11. MAJ Henrik Jedig Jørgensen, "Baby Steps: Developing Multilateral Institutions in the Arctic," http://www.nps.edu/Programs/CCS/WebJournal/Article.aspx?ArticleID=70

Commentary: Japanese Perspective

Hideaki Shiroyama

ISSUES OF THE ARCTIC OCEAN FOR JAPAN

The Northern Sea Route

The first issue for the future of Japan's policy concerning the Arctic Ocean is how to respond to the possibility of the opening of the Northern Sea Route (NSR), which is increasingly likely due to the melting of sea ice as a result of global warming and other factors.

More specifically, the possibility of shipping the natural resources of West Siberia to Asia using the NSR, or shortening the marine transportation route between Europe and Asia using the route, is discussed herein. The marine transport distance between Europe and Japan will be reduced to 60% of the current southward route, and this will also be reflected in fuel costs and transport time.

However, in order to take advantage of the NSR, there are technical challenges that will need to be addressed. In particular, there is the need to establish and implement a sea ice observation system using updated forecast technology, develop and implement a navigation support system that provides essential sea ice details, and develop high-performance, ice-capable merchant ships. With respect to the issue of the ships, there is the possibility to reevaluate the potential of nuclear-powered vessels for the Arctic. As a more fundamental issue, there is a critical need for charts, as the currently available ones are inadequate or nonexistent.

There is also a need to deal with regulations of the coastal state. In this regard, Russia has already enacted such rules as the Regulations[1] for Navigation on the Seaways of the Northern Sea Route in 1990,[2] the Regulations for Icebreakers and Pilot Guiding of Vessels through the Northern Sea Route in 1996, and the Requirements for the Design, Equipment, and Supplies of Vessels Navigating the Northern Sea Route.

Under these Russian regulations, permission for navigation within the NSR is conditioned on certain requirements concerning the vessel's ice capabilities and the master's experience in operating vessels in ice, such as requiring, in some circumstances, an experienced pilot.[3] The regulations also require the submission of a request at least four months in advance, insurance against environmental damage, and the use of ice-breaker guidance and/or pilotage under direction from the Administration of the Northern Sea Route. Russia justifies these requirements on article 234 of the United Nations Convention on the Law of the Sea (UNCLOS) on ice-covered areas, claiming that extended coastal state jurisdiction may be exercised over ice-covered areas. However, since these requirements are not necessarily enforced on Russian vessels, questions have been raised with regard to the discriminatory character and reasonableness of the regulations.

These regulatory issues are not insurmountable obstacles for the shipping industry. Fees required by the regulations may be paid where economically feasible, and problems may be avoided by chartering ships of Russian nationality. However, there are still other technical problems such as aging of the Russian icebreaker fleet.

Also among the regulatory issues is the future of international regulation of global warming. Increased regulations for the shipping industry with regard to global warming will make the NSR all that more appealing, since the reduced distance will result in less emission of carbon dioxide. However, from the viewpoint of the shipbuilding industry and national industrial policy, there are alternative responses to the change in the regulatory environment. Whether to respond by building high-performance, ice-capable vessels, lightweight eco-ships built with thinner steel, or next-generation vessels fueled by LNG or fuel cells is a matter of strategic choices. The prospect of the NSR will not necessarily ensure more opportunities.

There is a business dimension to the issue as well. For example, there is a problem concerning marine insurance policies. Since the NSR is outside the navigational limits set by the "trading warranty" provisions in commonly used marine insurance conditions, and is therefore uninsurable at the normal rates, insurance coverage is acquired on a case-by-case basis for an additional premium. However, this issue is likely to be solved by stabilization of expectations, if navigation in the NSR becomes routine, and the navigation conditions become established. The environment in which the cargo is transported presents a problem from a business perspective as well. From experience with the Trans-Siberian Railway, it has been pointed out that it is questionable whether the low temperatures of the NSR are suitable for transportation of goods such as precision machinery.

Resource Development

The second issue of interest for Japan's future Arctic Ocean policy is the issue of resource development. As reserves of oil and natural gas in the Arctic have come to be recognized, states have looked to the Arctic Ocean with increasing geopolitical interest, which is linked to tensions in security relations in the area as well.

At the same time, there is also a movement towards delimitation of boundaries between the coastal states. For example, on September 15, 2010, Norway and Russia reached an agreement on maritime boundary delimitation between the two countries, and signed a treaty between the Kingdom of Norway and the Russian Federation concerning Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean.[4] This treaty includes two annexes concerning fisheries and resource development. In connection with this development, with respect to the maritime areas around the archipelago of Svalbard, recent trends show that claims against Norway's continental shelf and exclusive economic zone have become less common, and the center of the dispute has shifted to the rights of the state parties to the Svalbard Treaty to participate in resource exploration in the relevant maritime areas.

The issue of resource development is not only about new resource development in the Arctic Ocean. Production facilities in oil and natural gas fields that were developed during the Soviet era are increasingly becoming outdated and continued investment is required for Russia to maintain its current production capacity. Ensuring such continuous and stable investment is also a major issue. Outside the ice-covered areas of the Arctic

Ocean, ensuring stable investment for resources also involves maintaining stable relationships with the indigenous population of the area. The Shakhalin-2 project in which Japan participated was temporarily stopped due to concerns over environmental damage, and the project's financial structure had to be modified. This development had its origins in the appeals to international financial institutions by indigenous organizations on environmental issues.

Environmental Management

Finally, the third issue of interest for Japan's future Arctic Ocean policy is environmental management. Increased utilization of the Arctic waters, in the form of marine resource development, and the use of the NSR may have negative consequences for the fragile natural environment and ecosystem, and balance must be achieved between utilization and environmental conservation. How to respond to oil spills in ice-covered waters is an example of such a challenge. There are no established methods for removing spilled oil from ice-covered waters in cases of oil pollution casualties, and if the ecosystem is destroyed, it will take an enormously long time to recover compared with other areas. This area is a good candidate for international cooperation led by Japan.

JAPANESE ARCTIC POLICY

With respect to the Arctic, Japan has been continuously engaged in various activities. First of all, Japan has long experience in Arctic observation and research. The National Institute of Polar Research has established an extensive observation network for monitoring climate change in the Arctic region, and has conducted a number of international joint studies. The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) has also been conducting research on the Arctic climate system, mainly based on research conducted by research vessels. Moreover, the Japan Aerospace Exploration Agency (JAXA), in cooperation with JAMSTEC, has been conducting an analysis of satellite data on the Arctic sea, atmosphere, land, and ice.

Research on the NSR has been led by the private sector. From 1993 to 1999, the Ship and Ocean Foundation of Japan, the Fridtj of Nansen

Institute (FNI) of Norway, and the Central Marine Research & Design Institute (CNIIMF) of Russia jointly pioneered research on the potential of the NSR as an international commercial shipping route, under the International Northern Sea Route Programme (INSROP).[5] Also, from 2003 to 2006, studies with a focus on the Russian Far East and Asia were conducted under INSROP II, as an extension of the previous study.

With these kinds of academic and privately led activities in the background, there is increasing interest from the government as well. Japan participated in the Ottawa Conference in 1996 as an observer, and has applied for permanent observer status at the Artic Council, which was established at the conference. Japan's interest in the increased potential use of the Arctic Ocean, and its position and role as a maritime and environmentally advanced nation were referred to as reasons for its application.

In these ways, Japan has been active in various activities related to the Arctic Ocean. However, these activities have not been well structured. For example, scientific observation and research is an indispensible factor in the management of the Arctic Ocean as a large-scale marine ecosystem. However, it is not clear whether the accumulated results of observation and research were properly utilized as input for governance of the Arctic Ocean. For example, article 234 of UNCLOS, on which the extension of coastal state jurisdiction over ice-covered areas is based, provides that the regulations of the coastal state "shall have due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence." Under this provision, scientific evidence may serve a certain role in controlling regulation by coastal states. However, this kind of utilization does not seem to have taken place.

The issue of Russia's regulatory powers over the NSR, for shipping companies, is an issue that could be managed according to economic principles. However, for Japan, whether to come to terms with Russia's position, or to firmly maintain the principle of freedom of navigation along with the United States and, to a lesser extent, the EU, is a matter of policy choice. While studies on the NSR have progressed under privately led initiatives, these kinds of policy options have not yet been clearly discussed.

At the domestic level, in September 2010, the "Arctic Task Force" was established within the Ministry of Foreign Affairs of Japan in order to put in place a framework for cross-sectoral discussion within the ministry. In the future, it is hoped that these kinds of discussions would be held with more wide-ranging stakeholders involved.

Notes

1. http://www.arctic-lio.com/docs/nsr/legislation/Rules_of_navigation_on_the_seaways_of_the_Northern_Sea_Route.pdf
2. See "The Legal Regime of Navigationin the Russian Arctic," by Franckx: http://www.law.fsu.edu/journals/transnational/vol18_2/franckx.pdf
3. In a case where these persons have no such experience, or when the master of the vesselrequests so, theadministration (Marine Operations Headquarters) may assign a state pilot to the vessel to assist in guiding her through the NSR.
4. http://www.regjeringen.no/upload/ud/vedlegg/folkerett/avtale_engelsk.pdf
5. http://www.fni.no/insrop/

Commentary: Korean Perspective

Keun-Gwan Lee

There has recently been a substantial increase in press coverage of the Northern Sea Route (NSR) that is opening for transit shipping due to the melting of Arctic ice caused by the changing climate and the increased warming of the Arctic region. Navigating the Arctic Sea route conjures up a romantic and heroic image of conquering the last frontiers of humanity. The allure of substantial economic benefits arising from, among others, the shortening of shipping distance and new demand for ice-breaking ships, has also added to the excitement. Will the NSR open a "brave new world" for the international community, in particular, the shipping and shipbuilding industries?

Amid the brouhaha around the opening of the NSR, there are some voices advising a healthy dose of skepticism about the route. Their biggest concern lies with the negative impact to be inflicted on the highly fragile Arctic environment by the use of the NSR. Some in the shipping industry call into question the commercial viability of the NSR. Even assuming, for the sake of argument, the commercial profitability of the route, the governance of Arctic matters, including the regulation of the NSR, is quite entangled and makes for tension and friction among the littoral and user states. Given these misgivings and entanglements, there is a need for a clarion call for a balanced approach that can do justice to all the legitimate stakeholders and all the relevant circumstances attending the use of the NSR.

In this comment, I will briefly discuss the following: (1) obstacles to the use of the NSR; (2) the existing governance over the NSR with particular reference to the Arctic Council; and (3) suggestions for normative and institutional reconfigurations.

OBSTACLES TO THE USE OF THE NSR

The obstacles to a more active use of the NSR are many:

1. There are navigational hazards and environmental concerns that are reflected in Article 234 of the 1982 UNCLOS, which reads as follows:

   "Coastal states have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance. …"

   This article of UNCLOS was negotiated mainly by Canada, the Soviet Union (USSR) and the United States with the Arctic Sea in mind.[1] The italicized part clearly describes the severe conditions of the Arctic and the danger arctic navigations can pose to the fragile environment.
2. The lack of knowledge and infrastructure is also a major obstacle. For instance, there is an acute shortage of reliable charts of the NSR. According to a U.S. expert on the issue, less than 10 percent of Arctic waters are charted to modern standards.[2] Other indispensable infrastructures and services such as port facilities, navigational aids,

weather forecasting and search and rescue arrangements are in need of substantial improvement.

3. A comprehensive and clear legal framework is yet to be established. At the multilateral level, Article 234 of the UNCLOS is the most important provision. However, this provision is regarded as "probably the most ambiguous, if not controversial, clause in the entire treaty."[3] There is also a heated controversy over the international legal status of various straits along the Russian Arctic coasts. The U.S. argues that they are subject to the very liberal regime of transit passage under the 1982 UNCLOS, while Russia claims the status of internal waters for them.[4]
4. Regulatory/governance entanglements over the Arctic region in general and the NSR in particular cause much confusion and ambiguity. Coastal states take unilateral measures such as the NORDREG (Northern Canada Vessel Traffic Services). Bilateral arrangements such as the 1988 U.S.-Canada Agreement on Arctic Cooperation are in place, too. The Arctic Council represents a regional approach to the issue. Multilateral/general approaches such as UNCLOS and International Maritime Organization (IMO) (for instance, the Polar Code) are in operation. The coexistence of various regulatory/governance arrangements at different levels is not a problem in itself. The problem is that these various arrangements are not well coordinated.
5. From the standpoint of the shipping industry, the crucial problem is uncertainty about the commercial viability of transit shipping through the NSR. Doubts have been expressed concerning the economic efficiency of the NSR against traditional ones such as the Suez and Panama canals in terms of convenience, predictability, depths, infrastructure, connectivity to rail and the realities of the Arctic. According to a person working for a major Japanese shipping company, it is doubtful that the NSR is more economical and useful at present.[5]

Despite these obstacles, it is also a fact that the NSR has become a reality from the perspective of the connection with transport of oil and gas development in the Russian and Canadian Arctic regions. For example, a major Korean shipbuilding company, Samsung Heavy Industries, has already delivered three ice-breaking tankers to Russia.[6] As far as destinational shipping is concerned, the use of the NSR is very much a reality that will assume an increasing importance in the future. Therefore, the question is not a dichotomous choice between use and non-use of the NSR, but an environmentally sound and sustainable use of the route, taking into account all the legitimate concerns of the stakeholders.

THE EXISTING GOVERNANCE OVER THE NSR WITH PARTICULAR REFERENCE TO THE ARCTIC COUNCIL

I have already mentioned the regulatory/governance entanglements over the Arctic region in general and the use of the NSR in particular. In this section, let me focus on the regional mechanism for Arctic governance, that is, the Arctic Council.

The council is composed of eight member states (five Arctic coastal states plus Iceland, Finland and Sweden), six permanent participants representing Arctic indigenous peoples, six permanent observer states (France, the United Kingdom, the Netherlands, Spain, Germany, Poland) and five *ad hoc* observers (China, South Korea, Japan, Italy and the European Union). That the council is run in a closed way is shown by its persistent refusal to admit the five *ad hoc* observers as permanent observers. China has been the most outspoken in arguing for opening Arctic governance to non-Arctic actors. One Chinese expert called the 2008 Senior Arctic Officials Report "the Arctic collective version of the 'Monroe Doctrine'."[7] Non-Arctic states led by China and India claim that the Arctic is a global common and thus should be accessible to all legitimate stakeholders.[8] To use Latin expressions, the Arctic should be transformed from *mare nostrum* into a genuine *mare communum*.

The rationales for an inclusive approach to Arctic governance include, among others: (i) the Arctic as a global common; (ii) the need to avoid unnecessary frictions and misunderstandings; and (iii) the necessity to secure investments by user states. Now the question is which direction should be taken in redesigning the institutional design of Arctic governance. Many models can be benchmarked. In my opinion, one of the most promising models can be found in the polar opposite, that is, Antarctica. Since the adoption of the Antarctic Treaty in 1959, this region has witnessed the gradual buildup of an inclusive governance structure that is generally regarded as highly successful. The Antarctic regime is built around the 1959 treaty, supported by other treaties dealing with specific subject matter such as conservation of marine living resources, environmental protection, mineral resource activities, and conservation of Antarctic seals.[9] As regards Antarctic governance, the Antarctic Treaty Consultative Meeting constitutes its core. In stark contrast to the Arctic Council, this arrangement is open and inclusive. For instance, if a party acceding to the Antarctic Treaty "demonstrates its interest in Antarctica by conducting substantial research activity there such as the establishment of a scientific station or the dispatch of a scientific expedition," it is qualified to be a member of the Consultative Meeting.[10]

It is to be stressed that a more inclusive approach does not mean the "meltdown" of sovereignty, sovereign rights and jurisdiction of the Arctic states. It means more accommodation of non-Arctic stakeholders, thus avoiding unnecessary frictions and achieving an optimal utilization of the Arctic region. In light of examples such as the Antarctic regime, it is desirable for the Arctic and non-Arctic states to articulate a properly balanced mechanism for Arctic governance.

SUGGESTIONS FOR NORMATIVE AND INSTITUTIONAL RECONFIGURATIONS

In this section, let me make some suggestions to improve Arctic governance in normative and institutional terms.

1. Reconfiguring multilateral norms, in particular, UNCLOS:
   The UNCLOS, often called "a constitution for the oceans," has only one provision (i.e., Article 234) that directly regulates Arctic waters. When the convention was adopted in 1982, commercial use of the NSR was hardly on anybody's mind. Given the "constitutional" importance of the convention, it would be best to put in place more detailed provisions relating to the Arctic waters in it. However, the Arctic states are very wary and critical of such a proposal. For instance, in the 2008 Ilulissat Declaration, they stated as follows:

   "This framework [the law of the sea] provides a solid foundation for responsible management by the five coastal States and other users of this Ocean through national implementation and application of relevant provisions. We therefore see no need to develop a new comprehensive international legal regime to govern the Arctic Ocean."

It is to be noted that the international community faces thorny law-of-the-sea issues that could not be envisaged in sufficient detail in the lead-up to the adoption of the UNCLOS in 1982. Sea level rise, the protection of underwater cultural heritage, the use of the NSR and principles of international environmental law (such as the precautionary principle and the polluter pays principle) are prime examples. This means the UNCLOS requires updating, at least in some parts.
Possible options for improving multilateral norms and regulations for Arctic governance would be as follows. First, the international community can adopt a separate multilateral treaty regulating Arctic matters. If one follows the example of the Antarctic Treaty, a general or framework treaty can be supplemented by specific protocols or conventions. Second, one could think of amending the 1982 UNCLOS itself. In this case, the procedures as provided for in Articles 312 and 313 can be utilized. This option is theoretically possible, but will be extremely difficult to act on. Given the highly interconnected nature of the UNCLOS regime, trying to amend a specific part of the convention will be like opening Pandora's Box. Thirdly, one can take a more toned-down approach to the question by adopting a series of soft-law documents on the Arctic region.

2. Reconfiguring institutional arrangements:
Concerning this question, let me just suggest some guidelines that should inform future discussions on how to improve Arctic governance.

- First, the new institutional mechanism should reflect the character of the Arctic waters as *mare communum* where the leading role of the Arctic states should be recognized.
- Second, at the same time, various stakeholders, including user states and non-state actors (in particular, indigenous peoples and the industries concerned) should be represented.
- Third, given the sharp divide of opinions between Arctic and non-Arctic states, an incremental and gradual approach for the establishment of a more inclusive governance structure is to be preferred.
- Fourth, in light of the importance of expert knowledge about the Arctic region, the new institutional design should be conducive to the heightened role of the epistemic community composed of specialists on various fields of different nationalities.

Notes

1. Kristin Bartenstein, "The 'Arctic Exception' in the Law of the Sea Convention: A Contribution to Safer Navigation in the Northwest Passage?" *Ocean Development & International Law* vol. 42 (2011), p. 24.
2. Ashley Roach, "Recent Developments in Enhancing Safe Navigation in the Arctic" (Paper presented at the Conference on Globalization and the Law of the Sea, December 1-3, 2010, Washington, DC), p. 11.
3. C. Lamson, "Arctic Shipping, Marine Safety and Environmental Protection," *Marine Policy* 11 (1987), p. 4.
4. For a detailed discussion of the question, see R. Douglas Brubaker, *Russian Arctic Straits* (Brill, 2004).
5. Hiroyuki Goda, Comments made at the 2011 EWC/KOTI Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security (August 8-9, 2011, Honolulu).
6. Information provided by Mr. C.H. Park, who is executive vice president and chief technical officer of the company.
7. Peiqing Guo, comments made at the 2011 EWC/KOTI Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security (August 8-9, 2011, Honolulu).
8. Kathrin Keil, "Potential Arctic Conflict II: Insiders v. Outsiders," Center for Circumpolar Security Studies, The Arctic Institute (October 25, 2011) http://www.thearcticinstitute.org/2011/10/2378-actual-arctic-conflict-arctic.html
9. For a detailed discussion of the question, see Gillian D. Triggs (ed.), *The Antarctic Treaty Regime: Law, Environment and Resources* (Cambridge University Press, 1987).
10. Article 9(2) of the Antarctic Treaty.