

1. Introduction and overview

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THE ARCTIC EMERGENT

The Arctic is experiencing transformative change. A remote region once often thought of as a theater of operations for strategic military forces, the Arctic is emerging as a more accessible region endowed with resources of interest to key players in the global economy. The shrinking of the Arctic's sea ice cover increases environmental fragility and threatens human security, especially for the Arctic's indigenous peoples. But melting ice also facilitates the use of the Arctic for shipping and increases access to untapped natural resources. Global demand for Arctic resources and Russia's intention to treat its vast Arctic domain as a "strategic resource base" will drive the growth of interest in the use of the Northern Sea Route (NSR) for commercial shipping and in the extraction of Arctic resources.

Recent commercial agreements highlight linkages between the Russian Arctic and the global economy. In June 2009, Lukoil and China Petroleum & Chemical Corporation (Sinopec) signed an agreement to transport 3 million tons of oil from the Varandey terminal in the Pechora Sea to China. In September 2010, Russia and Norway signed a treaty concerning "Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean," thereby ending 40 years of disagreement and establishing a stable and secure Arctic boundary. In November 2010, Sovcomflot and the China National Petroleum Company (CNPC) agreed to cooperate in using the NSR to ship Arctic oil and gas from Russia to China. In August 2011, ExxonMobil and the Russian oil giant Rosneft agreed to begin joint operations on Russia's Arctic sea shelf. Subsequently, in April 2012, Rosneft and ExxonMobil established a partnership to develop the Arctic's untapped oil and gas reserves. Shortly thereafter, Rosneft signed additional Arctic agreements with Italy's Eni and Norway's Statoil to explore offshore resources. Together, these deals provide a clear indication of Rosneft's global ambitions.

The NSR shows considerable potential as a commercial artery. During the summers of 2009 through 2011, large tankers and bulk carriers sailed the NSR to investigate prospects for carrying natural resources from Russia and northern Norway to Northeast Asia. During August and September 2009, two German heavy-lift ships, operated by Beluga, trans-

ported heavy plant modules from Ulsan, Korea to the Ob River in Siberia. In summer 2010, SCF Baltica completed an historic NSR voyage carrying 70,000 tons of gas condensate from Murmansk to Ningbo, China in 22 days, approximately half the time required to navigate the traditional shipping route through the Suez Canal. In September 2010, Tschudi Shipping Company organized a demonstration project to explore the feasibility of shipping iron ore from Kirkenes, Norway to Lianyungang, China via the NSR. This marked the first time a non-Russian bulk carrier used the NSR as a transit route departing from a non-Russian port and arriving at a non-Russian port. During August and September 2011, the Japanese bulk carrier Sanko Odyssey delivered 66,500 tons of iron ore from Murmansk, Russia to Xingang, China. The summer of 2011 also brought a test in which the first supertanker (the 160,000 ton Suezmax-class Vladimir Tikhonov) used the most difficult part of the high-latitude route from Europe to Asia through the Arctic. It carried a commercial cargo of over 120,000 tons of gas condensate from Cape Desire in the Kara Sea to Cape Dezhnev in the Bering Strait. This successful voyage opened up the prospect for further development of economically viable and sustainable routes for transporting hydrocarbons along the NSR.

Advanced ice-capable ships are able to operate in the waters of the Russian Arctic. But the economic and operational aspects of the NSR have not yet been fully explored. The NSR has apparent distance and time advantages compared to the route through the Suez Canal for the shipment of containerized freight between Northeast Asia and Northwest Europe. But the economic competitiveness of the NSR depends on the development of needed infrastructure, the progressive alleviation of technical constraints limiting navigation, and the setting of appropriate Russian tariff policies. Changes in the legal framework and fee structure along with climate change may make the NSR more competitive.

Increasing ship traffic along the NSR has the potential to increase pollution in the Arctic and heighten the risk of spills. There is a need for effective international regulatory arrangements to enhance marine safety and protect the environment. Arctic conditions will remain challenging and often unpredictable. Impacts of black carbon emissions on ice, ship strikes on whales and other marine mammals, and potential effects of noise from ships and other marine activities on marine mammals are all serious concerns. Facilitating the safe use of the Arctic Ocean while protecting the peoples of the Arctic and the marine environment will be a growing challenge during the 21st century. The Arctic Council has already begun to address these challenges in its Arctic Marine Shipping Assessment (AMSA) released in 2009 as well as the agreement on search and rescue negotiated under the council's auspices and signed in 2011. The International Maritime Organization (IMO)

provides an appropriate venue for addressing a number of these concerns. Taking the recommendatory guidelines applying to Arctic shipping adopted in 2002 as a point of departure, the IMO has commenced work on the development of a mandatory Polar Code for ships operating in polar waters. Negotiations on the provisions of the Polar Code are currently underway with the expectation of reaching agreement on the terms of the code during the next two to three years.

Commercial fishers are also watching the disappearance of Arctic sea ice with interest. Receding Arctic ice is already creating conditions favorable to commercial fishing in some areas. Two of the world's richest fisheries, in the Bering and Barents Seas, are located in areas involving extensive commercial shipping. Spills in these regions could have major economic, cultural, social, and environmental impacts. Other Arctic waters of interest to shipping, such as the Kara Gate in the Russian Arctic, the Bering Strait, the Hudson Strait and Lancaster Sound in the Canadian Arctic, and the Pechora Sea in the southeastern reaches of the Barents Sea, are ecologically significant and geographically restricted. Until a few years ago, these parts of the Arctic Ocean were locked in ice for most of the year. But now they are becoming seasonably accessible. In 2007, when sea ice cover in the Arctic reached a record low, 40% of the central Arctic Basin was open water.¹ A growing number of scientists, government officials, and conservationists are calling for international agreements to ensure that this transition is handled in an effective and responsible way. They advocate a moratorium on commercial fishing in the Arctic until conditions are better understood together with the creation of an Arctic Regional Fisheries Management Organization to manage future fishing on a sustainable basis. Others point to the apparent success of some existing regional fisheries management regimes and believe they have the potential to address Arctic issues.

With increased accessibility, Arctic oil and natural gas resources have become a focus of growing interest. There has been talk of a race for Arctic oil and natural gas resources and potential conflicts triggered by petroleum activities in the Arctic Ocean. The Arctic holds great potential for oil and gas development but is also characterized by significant legal and regulatory challenges. According to a U.S. Geological Survey assessment published in 2008, the Arctic including onshore areas may hold 13% of the world's undiscovered conventional oil resources and 30% of its undiscovered conventional natural gas resources. Gas deposits in the Russian Arctic together with oil deposits in the North American Arctic are of particular interest. Two Arctic states are already exploiting hydrocarbon reserves on their northern frontiers. Norway has developed the Snøhvit gas field in the Barents Sea 140 kilometers from shore with a liquefaction plant located near the fishing community-turned-industrial-port

of Hammerfest and is shipping liquefied natural gas (LNG) from this field to North America and Europe. Russia has developed plans for an LNG project on the Yamal Peninsula for shipment in an easterly as well as westerly direction and started shipping oil from an offshore terminal in the Pechora Sea to Murmansk and beyond. To develop the huge potential of oil and gas in Eastern Siberia and the Russian Far East, the Putin government is preparing broad development programs. Moreover, Russia's ambitions in the Far East, as exemplified by the decision to hold the 2012 APEC summit in Vladivostok, also involve a rebalancing of Russian oil and gas activities between Europe and the Asia-Pacific region. These shifts in Russia's energy policies may contribute to a substantial increase in Russia's hydrocarbon production in the Far East, thereby adding to global supplies of oil and gas. The availability of Russian Arctic oil and gas could provide North Pacific countries with alternative sources of these fuels, thereby increasing their energy security.

Current increases in the production of natural gas in other areas may make Arctic gas development especially challenging. The Arctic is rich in natural gas, but the costs of producing and shipping Arctic gas are high. Natural gas consumers live far from the Arctic, and transportation costs of natural gas are higher than those for oil and natural gas liquids. Along with economic challenges, environmental stewardship and regulatory concerns may affect timelines for exploration and production of Arctic resources. Environmental issues include the preservation of animal and plant species unique to the Arctic, particularly tundra vegetation, caribou, polar bears, seals, whales, and other sea life. Questions regarding the adequacy of existing technology to manage offshore oil spills in an Arctic environment constitute another unique challenge. Spills among ice floes can be much more difficult to contain and clean up than spills in open waters.

There are substantial uncertainties and knowledge gaps regarding the nature of environmental change, the geological potential of the Arctic, environmental baselines, and methods for dealing with the risks associated with significant Arctic industrial activities. Governments, research institutes, indigenous peoples' organizations, non-governmental organizations, and businesses can all contribute to closing these gaps, helping to reduce risks and ensuring that development takes place within sensible, well-defined, and ecologically appropriate limits. The environmental consequences of disasters in the Arctic are likely to be worse than in other regions. The challenges of Arctic development demand coordinated responses that are transparent and accord with best practices across the North. These frameworks need to be in place to enable sustainable development to occur and to protect the public interest. If the maritime Arctic is to be developed safely, greater attention to detail is

needed. International cooperation, better science, and knowledge of the local environment together with investment in appropriate infrastructure will be essential.

A matter now rising rapidly on the Arctic policy agenda focuses on finding ways to take into account the concerns and contributions of non-Arctic states that have a legitimate interest in Arctic developments, without impinging on the role of the Arctic states or distorting the cooperative efforts of existing arrangements like the Arctic Council. The essential puzzle here is easy to identify but difficult to solve. The key Arctic states—acting either as members of the Arctic Council or as members of the group of five Arctic coastal states—wish to maintain a position of preeminence when it comes to dealing with matters of Arctic Ocean governance. For their part, major non-Arctic states (e.g. Brazil, China, India, Japan, and Korea as well as a number of European states) and intergovernmental bodies (e.g. the European Union) have growing interests in the maritime Arctic relating to activities like commercial shipping, oil and gas development, fishing, and ship-based tourism; they believe that they have a legitimate claim to be consulted when it comes to addressing matters relating to the governance of such activities. The trick is to find a way forward that satisfies the interests of both groups. The transformative changes now occurring in the Arctic lend an air of urgency to this matter. Issues of governance relating to the maritime Arctic are evolving rapidly. It is not sufficient simply to adopt a watching brief regarding this matter with the idea that there will be ample opportunity to come to terms with the substance of these issues at some later time.

This volume addresses five major themes relating to the maritime Arctic: potential Arctic shipping, Arctic marine environmental protection, Arctic marine living resources, potential Arctic oil and gas development, and informal governance mechanisms. The individual chapters highlight the environmental and social aspects of developments occurring in the Arctic. They focus on identifying uncertainties, closing gaps in knowledge, and exploring policy innovations relating to Arctic marine issues. The thrust of the volume is to explore options for promoting informal consultation among North Pacific Rim states and mechanisms for communicating ideas to the Arctic Council and other international bodies addressing Arctic issues. Bringing together prominent Arctic experts from the three North Pacific Arctic countries (Canada, Russia, and the US) and three leading North Pacific non-Arctic countries (China, Japan, and Korea), the volume goes beyond generalities and gets down to the details of major concerns in an effort to identify practical solutions to Arctic issues and move them from paper to practice.

Part I contains a chapter and seven comments on potential Arctic shipping. Part II consists of a chapter and four commentaries on Arctic

marine environmental protection and the role of the IMO in promoting international cooperation in this realm. The chapter and four commentaries in Part III deal with Arctic marine living resources. The chapter and four commentaries in Part IV address potential Arctic oil and gas development. Part V consists of a chapter and six commentaries on the issue of providing a voice for non-Arctic states in Arctic Ocean governance, while acknowledging the primacy of the Arctic states in this realm.

PART I. POTENTIAL ARCTIC SHIPPING

In Chapter 2 entitled “Potential Arctic shipping: change, benefit, risk and cooperation,” Sung-Woo Lee begins with an assessment of the competitiveness of the Northern Sea Route (NSR) compared with the Suez Canal Route (SCR) and the Trans-Siberian Route (TSR). Based on a quantitative study carried out by the Korea Maritime Institute, he reports that transporting goods from Busan, Korea to Berlin, Germany takes 16 days via the TSR. It takes 18 days via the NSR and 26 days via the SCR to ship goods between Busan and Bremerhaven, Germany. Comparing the NSR with transcontinental rail, the author notes that rail is the shortest route to connect Europe and Asia, at least for container cargoes. He points out that the competitiveness of the TSR is sensitive to rail fare increases and that for many reasons the capacity of the TSR will remain low.

Chapter 2 argues that the TSR’s over-land route could complement the NSR because the service areas of the railway do not overlap with those of the NSR. Moreover, the TSR presently faces a capacity limitation estimated at 1 million twenty-foot equivalent units (TEUs) annually. The NSR offers a saving in distance of approximately 40%—and thus potentially also in time and expenses—in comparison to the route through the Suez Canal in shipping containerized freight between Northeast Asia and Northwest Europe. But its economic competitiveness depends on Russian tariff policies and on the progressive lifting of technical constraints on navigation.

Turning to the main obstacles and risks associated with the use of the NSR as a global trade route, the chapter identifies six concerns: the fee system for icebreaking, cargo imbalances between East Asia and the European Union, lack of necessary infrastructure, the need for an NSR information database, the importance of unified rules and regulations, and the challenge of developing adequate environmental and safety measures.

The author addresses ways to alleviate these obstacles to commercializing the NSR. He starts by arguing that China, Japan, Korea, and Russia should discuss and decide on an appropriate fee structure for

the use of the NSR. To mitigate the imbalance between eastbound and westbound cargoes traveling between East Asia and the EU, he explores the potential of cargoes including iron, steel, organic chemicals, and oil and gas in the Russian Arctic and the development of industrial parks in undeveloped regions like the Russian Far East, nearby the NSR.

To enhance safety in sailing the NSR, which covers 2,200~2,900 nautical miles through dangerous waters, the author discusses the need for supporting services. These include mid-point fueling and maintenance and repair services. In addition, there is a need to solve the problem of unbalanced shipping trade flow resulting from loading and unloading frequently in relay ports. To solve this problem, Lee argues that Russia should construct new relay ports at the mid-point, while improving and maintaining current facilities. He stresses that a modern shipping management system dealing with weather forecasts, navigation information, waterway status reports, and port operations and supporting information is essential for safe and efficient shipping operations. In this connection, the Arctic coastal states should be prepared to respond to maritime emergencies ranging from search and rescue to accidents at sea causing oil spills. Lee observes that an agreement between Russia and the US on traffic separation and monitoring in the Bering Strait will be an important step in addressing matters of safety and security in the Arctic.

Due to variation in the rules developed by Arctic states and key non-Arctic states, Lee argues that the use of the NSR will require multilateral cooperation. An unofficial forum like that provided by the annual North Pacific Arctic Conference (NPAC) may play a role in facilitating informal consultation on such matters. The next step will involve creating a governmental framework to discuss sensitive political issues. Lee proposes that an NSR information platform should be launched through cooperation among North Pacific countries. He concludes by offering some suggestions to facilitate the opening of the NSR; he proposes starting with an increase in intra-Arctic traffic followed by the growth of destination traffic and eventually the development of through traffic using the NSR.

In his commentary on Chapter 2, Lawson W. Brigham raises questions about the economic viability of the NSR compared with the SCR. He says that a fundamental question is whether the NSR can compete successfully for container traffic if it is usable only on a seasonal basis. If icebreakers must escort large container ships through thick ice for more than 2000 nautical miles, he wonders whether the resulting ship speeds would be high enough to make up for the savings in distance compared with the Suez Canal Route. He believes that more robust economic analyses of the NSR's viability are necessary, taking into consideration a complex of variables such as ice conditions, ship speeds, navigation season lengths, ice-class ship requirements, insurance requirements, operational fees for icebreaking,

and ice pilotage among others.

Brigham foresees a role for the NSR in coming years in facilitating the transport of natural resources out of the Russian Arctic during extended summer navigation seasons. He expects that the Russian government will focus NSR infrastructure investments primarily on ensuring the flow of natural resources from the Russian Arctic to global markets. The government will then attempt to capitalize on any container traffic for return voyages from the Pacific to Russia and Northern Europe.

Brigham congratulates the author of Chapter 2 on detailed analysis of the six main obstacles and risks associated with the use of the NSR. As practical challenges to the use of the NSR, he points to the ongoing work of the IMO on developing mandatory regulatory measures that would include three key elements: polar ship construction standards, polar marine safety equipment, and ice navigator training requirements and enhanced polar expertise in the pilothouse. He supports Lee's recommendation regarding enhancing international cooperation to meet these challenges. In particular, bilateral cooperation will be timely for the Bering Strait region where the US and Russia have contiguous Exclusive Economic Zones (EEZs).

In her commentary on potential Arctic shipping, Udloriak Hanson emphasizes that the Inuit are Arctic sea-oriented indigenous people. Some 160,000 Inuit live in the Arctic spread across Greenland, Canada, Alaska (USA), and Chukotka (Russia). The sea ice is a natural highway for Inuit. Life in the Arctic is dependent on movement, and sea ice provides the means for movement. Hanson identifies eight issues that Canadian Inuit will consider in thinking about the expansion of Arctic shipping. The first is that what happens in Arctic marine shipping will happen in their backyard. The second is that the Inuit have not been demographically displaced and constitute a large majority of the permanent population in much of the Arctic. The Inuit continue to sustain and safeguard the condition of their ancestral homeland. The third is that the Inuit have fundamental rights under international law in relation to the authorization of resource development and other commercial activities occurring in traditional indigenous homelands. The fourth is that the rights of Canadian Inuit are rooted in Canadian constitutional law. The fifth is that acknowledgement of the status of indigenous peoples' organizations as permanent participants in the Arctic Council constitutes a positive development. The sixth is that Inuit participation in developing logistics for Arctic shipping is essential to avoid barriers to the growth of commercial shipping. The seventh is that the Inuit seek a balanced, responsible, and diversified approach to increased shipping in the Arctic. The Inuit want negative impacts reduced and potential benefits maximized. The eighth consideration is that an optimistic scenario

for Arctic development depends on forging a creative and in-depth partnership between the Inuit and other stakeholders.

Commenting on Chapter 2, Vladimir Mikhaylichenko presents data pertaining to current shipping along the NSR and provides interesting information regarding adjustments in Russian policies toward a more favorable fee structure associated with icebreaking and other services. This is an indication that Russia intends to develop the NSR in the near future. He treats Arctic navigation in 2011 as a preparatory phase for commercialization of the Northern Sea Route. Based on data from the NSR Administration, he estimates the total amount of cargo shipped along the NSR in 2011 to be more than 3 million tons, compared with about 2 million tons in 2010. In 2010, 10 ships transited the NSR, a number that jumped to 41 in 2011. The amount of transit cargo also grew dramatically, rising from 145 thousand tons in 2010 to 835 thousand tons in 2011, the largest amount in the history of transit shipping on the NSR. In 2011, the largest tanker in NSR history, Vladimir Tikhonov, transited the entire sea route. In summer 2011, the tanker Palva transited the NSR in 6.5 days, the shortest time ever. Thus, 2011 produced a breakthrough from the previous occasional and experimental shipping to stable commercial operation of the NSR.

Regarding the economic comparison between the NSR and the SCR for shipping Russian natural resource cargoes from the Russian Arctic to East Asian destinations, Mikhaylichenko estimates that the 10 day time saving resulting from using the NSR may reduce the ship owners' expenses by \$250,000-\$900,000 per voyage. A serious problem affecting the economic attraction of the NSR, however, lies in the lack of return cargoes from East Asia to the Russian Arctic or Europe. To prove the economic effectiveness of the NSR, Russia has been searching for return cargoes, such as exports from the Red Dog Mine in Alaska.

Mikhaylichenko provides insightful information regarding Russian initiatives designed to insure that the NSR is economically competitive with the SCR by adjusting fees for icebreaking and other services. This is an indication that Russia intends to develop the NSR in the near future. Russia has already taken major decisions to modernize the NSR infrastructure to reduce safety risks, to simplify administrative procedures, and to streamline the tariffs for services on the NSR. Mikhaylichenko reports that currently there are nine icebreakers working on the NSR, among them five are nuclear-powered and four are diesel-electric. To replace two decommissioned nuclear icebreakers and to meet the demand for icebreaker escorts on the NSR, Russia will build three new nuclear icebreakers. The first new generation nuclear-powered icebreaker is expected to enter into service in 2017; two sister ships are scheduled for delivery by 2020.

Russia is now updating the law on navigation along the NSR; the state Duma has completed the first reading of the new law. The adoption of the new law will establish central government management of the NSR in order to assure conditions for safe navigation and to provide equal access to the NSR to all carriers including foreign carriers. The Administration of the Northern Sea Route will be located within the Ministry of Transportation, a federal government agency, which will replace the existing Department of Rosmorrechflot and significantly raise the status of the administration. The new law on the NSR will also make rules governing navigation simple and understandable to all ship owners including foreigners. Starting from this year, an application for permission to sail in the NSR will be simplified by posting the application form on the website of the Russian Agency of Sea and River Transport. According to Mikhaylichenko, Russia is also streamlining the tariffs for services on the NSR. In June 2012, unified limits on tariffs for icebreaker escorts were introduced. To assure the economic competitiveness of the NSR, Russia is seeking to keep the tariff for icebreaker services on the NSR equal to or even 10~15% below the tariff for using the SCR.

In his commentary on Chapter 2, Jerome Verny argues that the shortest distance between the industrial clusters in Northeast Asia and the European consumer market is by intermodal transportation using the NSR and the TSR. He finds that the cost for shipping one TEU between Shanghai and Rotterdam is more expensive via the NSR than the SCR. According to Verny, the NSR will become economically competitive compared to the SCR if it is linked to geography. The new geography of freight flows depends on the relocation of industrial clusters toward Central and Eastern Europe and toward Western China. This new economic geography can explain the renewal of interest in the NSR and the TSR. Verny argues that the development of the NSR could depend on the viability of the TSR; the prospective link between the NSR and the TSR requires further analysis. Verny proposes an intermodal transportation system including links between the NSR and the TSR at two Russian Arctic ports, Murmansk and Indigirka.

Commenting on Chapter 2, Xu Hua provides a quantitative model for traffic on the NSR, indicating that timing is the critical factor with regard to container traffic. For the foreseeable future, a very short Arctic shipping season from late summer until early fall is likely. If everything is lined up—ice is in the right place and ships are available for breaking the ice—we might see some progress. He notes three major determinants: icebreaking fees, sea ice extent, and bunker fuel price. He uses these to evaluate different strategies under three distinct conditions. He describes his cost model and compares the SCR and the NSR using this model.

He develops a route optimization model with equations. Then, he finds minimum August through October costs for the NSR and the SCR. Because of the seasonal fluctuation of the sea ice extent, the distance of the ice legs can vary substantially. The bunker fuel price and the ice breaking fee also influence the result. If the ice breaking fee is higher, a ship is more likely to remain on the SCR. However, the effect of the price of bunker fuel is less important.

In his commentary on Chapter 2, Ryuichi Shibasaki reports that the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of Japan organized an internal Arctic study meeting on August 3, 2012 including representatives from the Maritime Bureau, the Ports and Harbors Bureau, the Hokkaido Bureau, the Coast Guard, and the Meteorological Agency. According to Shibasaki, the meeting concluded that since Japan is located at the eastern extremity of the Far East, the NSR would reduce distances from Japan to northern Europe; there is also potential for a Japanese port to serve as a gateway for Arctic shipping.

In commenting on Chapter 2, Seo Hang Lee argues that Korea is one of the key stakeholders in Arctic shipping. Korea is interested in the NSR as an efficient potential maritime transportation route because Korea depends on commercial shipping for the vast majority of its exports and imports. Furthermore, as one of the world's leading shipbuilders, Korea is interested in building icebreakers, drill ships, and other vessels which can operate safely in the exploration and development of Arctic resources. Lee argues that the most urgent task facing all those interested in facilitating the commercialization of Arctic shipping is how to cope with a number of obstacles and challenges outlined in Chapter 2. He suggests that all stakeholders, including not only Arctic but also non-Arctic states and relevant international organizations, should be included in efforts to address these issues.

PART II. THE IMO AND ARCTIC MARINE ENVIRONMENTAL PROTECTION

In Chapter 3, entitled “The IMO and Arctic marine environmental protection: tangled currents, sea of challenges,” David VanderZwaag reflects on existing IMO standards and guidelines and explores options for the future. He begins by highlighting many shortcomings regarding Arctic matters. First, VanderZwaag argues that the existing array of IMO standards and guidelines applicable to the Arctic has failed to keep pace with protective measures for the Antarctic. Second, he indicates that the existing IMO standards and guidelines are weak regarding matters of sewage discharges from cruise ships and polar seafarer training. For example, MARPOL Annex IV sets weak discharge standards for

sewage. This annex allows raw sewage to be discharged at a distance of more than 12 nautical miles from the nearest land and does not cover grey water from showers, laundries, and galleys. Third, there is no designation of Emission Control Areas for air pollution in the Arctic. Fourth, no Particularly Sensitive Sea Areas (PSSAs) have been designated in the Arctic. Fifth, VanderZwaag notes that vessel-routing is very limited in Arctic waters. Finally, he points out that the existing Polar Shipping Guidelines focus almost entirely on maritime safety rather than environmental protection.

On the positive side regarding IMO standards and guidelines, VanderZwaag mentions that a strengthening of environmental standards has occurred involving amendments to Annex IV adopted in July 2011 (entry into force to occur on January 1, 2013) and Annex V on discharges of garbage adopted in 2011 (entry into force to occur on January 1 2013). The drafting of a mandatory Polar Code for shipping is continuing, albeit with some uncertainties.

Turning to the “Sea of challenges,” Chapter 3 explores ten challenges confronting the governance of Arctic shipping. The first challenge is to reach agreement on a mandatory Polar Code. All sections of the draft code are still under discussion and numerous issues remain to be resolved including the best way to “legalize” the code. The second challenge is to decide whether to ban the use or carriage of heavy fuel oil (HFO) on ships operating in the Arctic. The third challenge is to address black carbon and greenhouse gas (GHG) emissions from ships. Black carbon emitted from ships as a result of incomplete combustion of diesel fuel is a growing concern because of its climate warming potential (estimated to cause some 680 times more warming than the same amount of CO₂ over 100 years).

The fourth challenge is to deal with noise associated with commercial shipping. Addressing noise from commercial shipping and its adverse impacts on marine life is a work in progress within the IMO. The fifth challenge is to ensure full ratification of all relevant IMO agreements. The sixth challenge is to promote effective implementation of negotiated commitments under IMO, with special attention to the implementation of the Ballast Water Convention. VanderZwaag regards this task as one of the biggest looming challenges. He argues that the phase-in of ballast water management systems (BWMS) by 2016 on various ships seems especially problematic with key constraints including costs, limited shipyard capacity, and insufficient manufacturing capabilities on BWMS installations. The seventh challenge is to sort out the roles of IMO and the Arctic coastal states in protecting the marine environment from shipping impacts.

The eighth challenge is to identify and take protective measures covering ecologically and culturally sensitive areas. The ninth challenge

is to improve Arctic infrastructure in support of safe and environmentally friendly shipping. Since infrastructure improvements in such areas as navigational charts, aids to navigation, communication systems, port services, and waste reception facilities are primarily coastal state responsibilities, a looming challenge is to understand and track national initiatives to strengthen shipping infrastructure. VanderZwaag notes that part of the infrastructure challenge involves the need to develop clear national policies regarding future Arctic shipping and related infrastructure. The tenth challenge is to understand and address the interests/impacts of the actions of non-Arctic states on future Arctic shipping.

In commenting on “Arctic Marine Environmental Protection” from a scientific perspective, Thomas Laughlin focuses on the impacts of shipping on social/culture uses of the Bering Strait region. Based on the outcomes of the Arctic Marine Ecosystem-Based Management Project, he identifies Saint Lawrence Island, the Bering Strait, and Wrangel Island as “Super” Ecologically or Biologically Significant Areas (EBSAs). He discusses measures to protect EBSAs, such as communications/outreach measures, designation of Particularly Sensitive Sea Areas (PSSAs) by IMO, bilateral approaches featuring American and Russian actions in the Bering Strait, and the development of the mandatory Polar Code. Laughlin concludes his commentary with a suggestion regarding contributions by the North Pacific states. To ensure a safe and environmentally sound Arctic marine transportation system, he suggests that the North Pacific states strongly support development and adoption of the mandatory Polar Code, support designation of protected areas through international instruments, contribute to the installation of search and rescue and navigation services, and explore appropriate cost-sharing arrangements to fund ice breaking vessels with firefighting and spill response capacity.

Udloriak Hanson presents an Inuit perspective on Arctic environmental protection. When Arctic governments and international Arctic bodies pursue collaboration on the contents of the Polar Code, Hanson advocates the development of a creative partnership with indigenous peoples. The negotiations can benefit from indigenous peoples’ traditional knowledge and skills. Hanson urges those who are working on Arctic marine issues to acknowledge the value of the indigenous “Resource Development Declaration” not only as a careful, balanced, and equitable contribution to the building of a positive international order in the Arctic, but also as an appropriate benchmark of contemporary Inuit positions and expectations. This declaration addresses seven broad areas: Inuit as Partners in Policy Making and Decision Making; Global Environmental Security; Healthy Communities in a Healthy Environment; Economic Self-Sufficiency and the Sustainable Development of Resources in Inuit Nunaat; Impact Assessment and Mitigation; Improving Inuit Living Standards and Expanding Inuit Governance, and Promoting and Accommodating a Dynamic Inuit Culture.

Commenting on VanderZwaag's chapter, Toshiyuki Kano points out that if the research and monitoring data on Arctic environmental protection are available to Arctic stakeholders, they can close the knowledge gap regarding Arctic environmental protection. He adds that non-Arctic countries such as China, Japan, and Korea should play a role in ensuring Arctic environmental protection because they are major potential users of Arctic marine resources. Kano argues that the comparative advantage of the NSR versus the SCR should be evaluated not only from the perspective of distance and time savings but also from an environmental conservation perspective. Drawing on previous Japanese research results, he shows that the energy efficiency of an ice-capable ship is inferior to that of conventional ships in the open sea as well as in Arctic waters. Therefore, decreases in GHG emissions resulting from the time and distance saving should be compared with increases in GHG emissions due to the lower energy efficiency of ice-capable ships. Kano then mentions Japanese concerns about the environmental safety of nuclear icebreakers in the Northern Sea Route arising from the traumatic experience of the Fukushima nuclear disaster. He concludes his commentary by introducing the IMO E-navigation system developed to achieve increased safety in navigation along the Northern Sea Route, thereby enhancing Arctic environmental protection.

Hyun-Kyo Seo provides the Korean perspective on "Tangled Currents, Sea of Challenges." Seo recommends that the Korean government and industry recognize the importance of sustainability in the polar regions by supporting the Polar Code. He adds that Korea fully complies with international standards in the operation of its infrastructure. Regarding the issue of heavy fuel oil (HFO), he observes that Araon, Korea's ice-breaking research vessel, and the King Sejong station, Korea's research station in Antarctica, are presently using marine gas oil (MGO). Korea supports the Search and Rescue (SAR) agreement in the Arctic. Seo reports that Araon was involved in SAR activities in the Antarctic, rescuing 31 crew members from the Sparta, a Russian fishing vessel trapped in thick sea ice in the Ross Sea in December 2011. To strengthen environmental protection in the Arctic, Seo proposes promoting international cooperation in scientific research on the part of Arctic and non-Arctic countries.

PART III. ARCTIC MARINE LIVING RESOURCES

In Chapter 4, David Fluharty focuses on "Arctic marine living resources." He considers the use and management of living marine resources in the Arctic at present and in the future. He raises issues concerning human uses of species and ecosystems under conditions of significant climate

change. In the process, he discusses the roles of the Arctic coastal states and other interested parties in managing living marine resources.

Fluharty begins with an account of existing Arctic fisheries and management regimes. As documented by the Arctic Climate Impact Assessment (ACIA), large-scale commercial fisheries exist in four Arctic continental shelf ecosystems: the Northeast Atlantic (Barents and Norwegian Seas), the Central North Atlantic (Iceland and East Greenland), Northeast Canada (Newfoundland and Labrador Seas), and the North Pacific (the Bering Sea). Fluharty notes that the Central Arctic Ocean currently has no commercial fisheries. But this area sustains significant subsistence fisheries and could become an area of interest to commercial fishers in the future. He adds that there are smaller, non-commercial subsistence fisheries in Canada, Greenland, Norway, Russia, and the United States that are important to indigenous communities in the Arctic.

Fluharty then reviews how existing Arctic fisheries are managed. Indigenous peoples currently manage the subsistence fisheries on a relatively independent basis. The coastal states manage the fishery resources located within their EEZs in accord with the provisions of the UN Convention on the Law of the Sea, the UN Food and Agriculture Organization's code of conduct, and various regional regimes (e.g. the Norwegian-Russian bilateral regime for the Barents Sea). In the North Atlantic, according to Fluharty, management arrangements include the FAO's National Aquaculture Sector Overview (NASO), the Northeast Atlantic Fisheries Commission (NEAFC), the Northwest Atlantic Fisheries Organization (NAFO), and the North Atlantic Salmon Conservation Organization (NASCO). The International Council for Exploration of the Seas (ICES) conducts scientific research pertaining to the NEAFC area and provides scientific advice to the North Atlantic governments. In the North Pacific, the Bering Sea ecosystem includes resources located within the jurisdiction of the United States and Russia as well as in international waters in the Central Bering Sea. A six-nation agreement signed in 1994 establishes a regime for the Pollock stocks of this so-called "donut hole" area.

Fluharty reviews and assesses management arrangements for living marine resources, including seabirds, marine mammals, and marine biodiversity. Seabirds are an important component of Arctic and sub-Arctic ecosystems. Because of the extreme seasonality of the Arctic, most seabirds migrate northward in the spring and southward in the fall, so managing seabirds requires measures applicable to vast flyways. Although seabirds are managed by nations within their own jurisdictions, some bilateral and multilateral treaties deal with migratory birds. Now, the Convention on Biological Diversity provides a global overarching framework for migratory bird management. In North America, Canada,

Mexico, and the United States cooperate in managing the entire Pacific Flyway. There are bilateral agreements between Japan and Russia, Russia and Korea, the US and Japan, and the US and Korea covering the Asia-Pacific Flyway.

Arctic marine mammals include seals (three species year round and four seasonal), whales (three species year round and five seasonal), and polar bears. National governments are responsible for the management of seals. Whales are managed under the provisions of the International Convention on the Regulation of Whaling. The governments of the Arctic coastal states manage polar bears under the 1973 Agreement on the Conservation of Polar Bears. Polar bears are also subject to bilateral agreements between the United States and Canada and the United States and Russia. Regarding marine ecosystem biodiversity, Fluharty reports that the Arctic will be gaining species, and ecosystems will be adjusting to these new circumstances in contrast to the projected losses of biodiversity in most other regional systems. Finally, Fluharty reviews the prospects for international cooperation to protect potential fisheries from possible negative externalities generated by shipping, oil and gas development, and tourism. He suggests that scientific cooperation may be the most effective way forward. With respect to the development of scientific understanding, North Pacific rim states have invested significant resources in efforts to understand changes in the abundance of walleye Pollock in the "donut hole" area in the central Bering Sea. North Pacific rim nations are also members of the North Pacific Marine Science Organization (PICES). Fluharty remarks that the formation of PICES led to a significant focus on North Pacific ecosystem research. Joint efforts among PICES scientists and their ICES counterparts have led to a growth in attention devoted to Arctic systems.

In his commentary on Chapter 4, Alf Håkon Hoel reviews the status of fisheries in the Arctic. Commercial fisheries are concentrated in the Subarctic seas surrounding the Arctic Ocean, including the Bering Sea and the Aleutian Islands, the Northwest Atlantic between Canada and Greenland, the waters around Greenland and Iceland, the Norwegian Sea, and the Barents Sea. There are virtually no commercial fisheries in the Central Arctic Ocean. Some of the world's largest commercial fisheries (e.g. Alaska walleye Pollock, North Atlantic cod, and Norwegian Sea herring fisheries) are located in these seas. Other important species include redfish, saithe, haddock, crab, shrimp, and shellfish as well as a number of marine mammal species. Aquaculture in Norway produces more fish than capture fisheries.

Hoel then points out that the Subarctic commercial fisheries are well managed through a regime complex including global, regional, and national components. At the global level, the legal foundation for fisheries

management is the 1982 United Nations Convention on the Law of the Sea supplemented by the 1995 UN Fish Stocks Agreement, global instruments on fishery management adopted by the UN Food and Agriculture Organization, and the 2009 Port State Agreement. Arctic coastal states (Russia, the US, Canada, Denmark/Greenland/Faroe Islands, Iceland, and Norway) implement these arrangements, except in relatively small high seas areas. The transboundary fisheries shared by two or three countries are managed through bilateral or trilateral arrangements, such as the Norway-Russia bilateral fisheries commission.

Hoel explains that fisheries located in the high seas are regulated by regional fisheries management organizations, such as the Northeast Atlantic Fisheries Commission, the North Atlantic Salmon Conservation Organization (NASCO), the North Atlantic Marine Mammals Commission (NAMMCO), the Northwest Atlantic Fisheries Organization (NAFO), and the agreement covering the “donut hole” in the Bering Sea. He argues that further development of management regimes requires adoption of an ecosystem approach to living marine resources in the Central Arctic Ocean. The International Council for the Exploration of the Seas (ICES) and other scientific fora such as the North Pacific Marine Science Organization (PICES) will play critical roles in the future of Arctic living marine resources management. He also conjectures that the growing importance of aquaculture and marine bio-prospecting will characterize the future of Arctic living marine resources management. He concludes that the success of fisheries management involves three functions—research, regulation, and enforcement—and that these functions are well institutionalized in the Arctic coastal states.

In the Arctic, marine ecosystems are subject to large natural variability and the impacts of anthropogenic actions affecting plankton, fish, and marine mammals. In his commentary on Chapter 4, Trevor Taylor uses the case of the Bering Sea “donut hole” to remind us of the effects of unregulated fishing in international waters. The 1994 agreement was signed by the two coastal states (Russia and the US) and the four distant-water fishing states (China, Japan, Korea, and Poland) to ensure the long-term sustainability of the Pollock fishery only after the occurrence of severe stock depletions. Taylor argues that unless a solution is found for potential Arctic fisheries at this stage, a similar pattern of overfishing and stock depletions is likely to occur. The first step is to gather the information required to determine if and under what circumstances commercial fisheries in Arctic waters are possible. The next step is to establish an appropriate Arctic fisheries management regime. The engagement of Inuit in Arctic fisheries management should be acknowledged as an important principle.

Commenting on Chapter 4, Zhou Ying Qi makes the point that the

destruction of any ring of the ecosystem may lead to a collapse of the entire system. Zhou supports the adoption of a precautionary approach for the Central Arctic Ocean, including a moratorium on commercial fisheries until we have a better understanding of the relevant ecosystems. He supports the establishment of a new Regional Fisheries Management Organization (RFMO) for the Arctic Ocean. He remarks that lessons we have learned from the Bering Sea “donut hole” include the need to establish a strong regulatory framework before commercial fisheries get underway.

Zhou reports that in July 2010, the Chinese scientific research icebreaker *Xue Long* conducted her fourth Arctic survey and research expedition focusing on the effects of rapid changes in the Arctic.² Based on the scientific results of this expedition, Zhou argues that noise produced by ships and engineering activities have already caused a certain degree of harm to marine animals and aquatic organisms, including fish, whales and other marine mammals, in the Arctic. He adds that noise might drive fish stocks away from their normal migration routes or habitats. He suggests that additional research on Arctic marine living resources should be conducted on the basis of international cooperation.

In his commentary on Chapter 4, Jong Deog Kim observes that the three Northeast Asian countries have major interests in Arctic fisheries and a substantial capacity to engage in research in this field. China, Japan, and Korea have conducted scientific research and exchanged data on the Pollock resources of the Bering Sea. Beyond this, Chinese and Korean icebreakers have the capacity to conduct scientific research in the Arctic. The Korean government is interested in facilitating greater cooperation in managing the living resources of the Arctic. Kim notes that Arctic fisheries could become important for Korea’s seafood security in the future.

PART IV. POTENTIAL ARCTIC OIL AND GAS DEVELOPMENT

In Chapter 5, entitled “Potential Arctic oil and gas development: what are realistic expectations,” Arild Moe explores the outlook for development of Arctic energy resources in Norway and Russia.⁴ He considers the key factors determining development pathways, including the resource base, the cost of developing and delivering the resources to markets, the interests and strategies of the owners of the resources, and the merits (both economic and political) of Arctic supplies compared with supplies from other regions. He then turns to public policy responses to these considerations; he addresses the potential for interstate conflicts over offshore energy resources and concludes that there is little to worry

about in this regard.

Moe starts by reviewing the Arctic oil and gas resource base. According to US Geological Survey estimates published in 2008, the Arctic holds about 30% of the world's undiscovered gas and 13% of the world's undiscovered oil. The largest deposits are located off the coast of Russia. Moe remarks that USGS figures are often misused or misunderstood. The resources referenced are only probabilities, not proven recoverable reserves. Although the estimates are based on scientific principles, the actual location of the resources is not known. Some areas are more probable than others. For oil, the area north of Alaska is most probable. For gas, the Barents and Kara Seas are most likely. But most of the offshore Arctic has not been drilled. Thus, while the hydrocarbon resource base in the offshore Arctic is expected to be huge, the resources remain undiscovered. This means that extensive exploration must be carried out to determine exactly where these resources are located and to calculate the cost of developing them. This is a process that will take many years and involve sizable investments.

Moe then notes that Arctic offshore energy resources are expected to be located on the continental shelves of the Arctic coastal states in areas under their jurisdiction. There are just a few jurisdictional disputes in the Arctic, and they are not likely to cause serious conflict. Although the settlement of outer boundaries of jurisdiction over the continental shelves is controversial, this issue has little significance for resource exploitation. Most oil and gas deposits are not located in disputed areas, and disagreements regarding outer continental shelf boundary delimitation can be contained without conflict.

Turning to the cost of developing and delivering resources to markets, Moe stresses that development of Arctic oil and gas will be costly and time consuming. Even if the resource base is large, there are still questions regarding how much of it is exploitable. Development costs and market prices are key factors. As long as market prices remain high, the development of Arctic gas will be feasible. Moe notes that the world market price for oil has been high enough to justify Arctic oil development. But world liquid fuel supplies are quite large, and the market price for oil depends on what happens in the world economy. Gas markets have changed within the past few years due to the shale gas revolution, and this has raised doubts about the prospects for Arctic gas development. Moe points out that dramatic improvements in the efficiency of Arctic gas projects will be critical to the development of these resources.

Moe discusses the national strategies of Russia and Norway regarding offshore oil and gas development in the Arctic. Russia is the most important player with the largest continental shelf and the largest potential

gas reserves. Moe explains the importance of issues pertaining to the Shtokman gas field. Although this field is one of the largest offshore gas fields in the world, with reserves of 3,800 billion cubic meters (bcm), the final decision to develop the field has been delayed several times due to declining international gas prices. In parallel with Shtokman, the Yamal project, a new Russian LNG project, is expected to begin production in 2016 and increase to 16 million tons per year. A final investment decision is expected at the end of 2012. The production of Yamal natural gas may be of interest to North Pacific consumers. Part of the development plan for Yamal gas envisions shipping LNG both westward and eastward using the Northern Sea Route in order to reach the most favourable markets. Still, the economics of transportation using the Northern Sea Route to reach Asian markets remain uncertain.

Moe asserts that actual oil and gas development in the Russian Arctic has failed to match declared policies. Recently, the government has supported the initiatives of Russian companies to enter into cooperative agreements with foreign companies. In April 2012, following the agreement between Russia and Norway regarding their maritime boundary, Rosneft and ExxonMobil established a partnership to develop the untapped oil and gas reserves of the Russian Arctic. Shortly thereafter, Rosneft signed Arctic agreements with Italy's Eni and Norway's Statoil to explore offshore resources. Despite the major breakthroughs in 2012, Moe believes it is still too early to tell whether the Russian Arctic continental shelf will become a major arena for the international energy industry in the next ten years. On other hand, Moe remarks that oil from the Norwegian and Russian Arctic is likely to be sold freely on the international market. If the use of the Northern Sea Route to transport oil becomes economically feasible, this route is likely to emerge as a new supply corridor to the North Pacific. Recently, several tankers carrying gas condensate have sailed from west to east along the NSR.

Moe emphasizes that onshore oil and gas production in the Russian Arctic is another matter. Some 12-15 million tons are shipped westward each year from the terminal near Varandey in the northeastern part of European Russia. If prices are favourable, these resources could be shipped eastward as well. He also notes that oil from the huge Vankor field in Northeast Siberia, which was originally intended for shipment by sea, has been connected to the trunk pipeline system instead. This field is the primary source of Russian oil exported to China and will contribute to filling up the Eastern Siberia-Pacific Oil Pipeline (ESPO). The development of this pipeline is itself a reflection of the growing importance of production in Eastern Siberia and the resultant determination to reach Asian markets.

Moe also discusses the demand side of Arctic oil and gas development.

China, Japan, and Korea are large consumers of energy and want to diversify their sources of supply. This makes the Arctic attractive. But other sources of LNG for these countries are emerging, including Australia and North America, making supply options look better than a few years ago. The Russian Far East outside the Arctic also has potential, and Russia is eager to develop this area. In the longer term, transportation is a key issue. Stability will be essential to make the NSR an attractive option. The shipment of Russian LNG to North Pacific markets is possible, though the economics remain uncertain. Meanwhile, other sources of supply for consumers in the North Pacific are emerging.

Finally, Moe notes that the Asia-Pacific region is becoming more important in Russia's energy strategy both as a means of diversifying export markets and as a means to support domestic regional development. Major development projects in the Russian Far East are underway with the hope of fulfilling these goals. The additional value for Russia of exports from the Arctic will be marginal since energy from fields in the Far East can serve these markets just as well as Arctic oil and gas. Nevertheless, the Russian goal of maintaining and developing the NSR provides an argument in favour of Arctic projects.

Nodari Simoniya focuses his comments on the implications of Russian oil and gas development in the Arctic, Eastern Siberia, and the Far East for the energy security of Northeast Asia. Simoniya confirms that Russia is concerned about its dependence on western markets for its oil and gas. President Putin has sought to develop markets in China and other Asian countries. Simoniya explains that oil exports from Russia since the opening of the Eastern Siberia-Pacific Oil (ESPO) pipeline have changed the structure of oil supply to the Asia-Pacific region. The second component of ESPO will come on stream by the end of 2012, giving the pipeline an annual capacity of 80 million tons. In 2011, moreover, the Sakhalin-2 project produced exports of 14.5 bcm of gas to the East Asian countries. President Putin has decided to accelerate construction of the Sakhalin-1-Khabarovsk-Vladivostok gas pipeline as well as work on the Kirin Block of the Sakhalin-3 project. Simoniya also notes Russia's efforts to extend the Sakhalin-1-Khabarovsk-Vladivostok pipeline to connect to the Trans-Korean gas pipeline.

Simoniya describes Putin's efforts to develop Eastern Siberian and Far Eastern energy resources and, more generally, to modernize Russia's oil and gas industry as a matter of priority. In 2010, Putin (then Prime Minister of Russia) established the "Far East and Baikal Region Development Fund." He created a "private-state partnership" to replace the system of "bureaucratic capitalism" in an effort to modernize the Russian oil and gas industry. In November 2011, he set up an "Autonomous State Corporation" to develop Eastern Siberia and the Far

East. In May 2012, the Ministry for the Development of the Russian Far East was formed as a federal executive body, responsible for the economic and social development of the Russian Far East. Rosneft has signed a cooperation agreement with this new ministry with the goals of developing infrastructure in the Far East Federal District of Russia, tackling economic and social challenges, and improving the investment climate.

To promote the role of foreign corporations in developing the Russian Arctic shelf, President-elect Putin signed a financial agreement on April 16, 2012 that will eliminate export duties and lower mineral taxes for a minimum of 15 years. Simoniya regards this as a fundamental step in the modernization of the Russian oil and gas industry. ExxonMobil and Rosneft signed an agreement in April 2012 covering Pechora Sea exploration. Shortly thereafter, Rosneft signed Arctic agreements with Italy's Eni and Norway's Statoil to explore offshore resources.

In a second commentary on Chapter 5, Kang Wu outlines the Chinese perspective on Arctic oil and gas development. Wu remarks that China, as the world's largest consumer of energy, faces a huge gap in the supply of oil and gas. Net energy imports have reached unprecedented levels. Wu points out that China has been aggressive in overseas oil and gas acquisitions. As existing overseas investment options are running out, China is looking to the Arctic for new supplies of oil and gas resources. This is one reason why China has taken a growing interest in Arctic affairs.

Wu explains that while Chinese thinking about the Arctic is still evolving, China is pursuing bilateral relationships with individual Arctic countries (e.g. Denmark/Greenland, Iceland). China seeks permanent observer status in the Arctic Council. China has purchased an icebreaker and is building a second of its own. China has established a research station at Ny-Ålesund on Svalbard. China's national oil corporations have been working with Russia's Rosneft.

Yugi Tagki begins his commentary on Chapter 5 by outlining Japan's challenge to innovate following the March 11, 2011 Fukushima disaster. The energy challenge continues to attract the greatest national concern. Japan now faces power shortages. The need is to increase energy supplies, while taking steps to reduce demand. In the long term, the biggest problem stems from likely cuts in nuclear energy. The latest version of the government's Basic Energy Plan addresses the future of nuclear energy, the promotion of renewable energy, the enhancement of energy efficiency, and the development of the best energy mix. Current thinking is to reduce dependence on nuclear power to a level between zero and 25% of the total, below the level of 30% prior to the Fukushima disaster.

Tagaki highlights Japan's dependence on the Middle Eastern oil and gas. The countries of the Persian Gulf are especially crucial because nearly 90% of Japan's crude oil supply comes from these countries. If Japan takes steps to reduce its dependence on nuclear energy, relations with the Persian Gulf countries will become even more important. Last year's earthquake and the recent exchange rate appreciation of the yen have had a large impact on the economy, leading in 2011 to the first trade deficit since 1980. Tagaki then argues that Japan must diversify its energy sources. Australia and Sakhalin in Russia are attractive as stable sources of energy. Whether Arctic oil and gas will become important for Japan is a function of their speed of development and their economic competitiveness. But the allure of the Arctic is strong at a time when Asian powers are eager to diversify energy sources and to find secure sources of oil and gas.

Tagaki concludes that Arctic oil and gas will have to compete with other sources, including LNG from America, Eastern Siberia, or newly discovered sources as well as renewable energy or unconventional sources like wave power. From both a commercial and a geopolitical viewpoint, Arctic oil and gas has major hurdles to overcome to compete effectively with all these other potential sources. Technological developments will play a key role in this realm. The history of energy has been teaching us for decades that the development and application of new technologies play critical roles in shaping global energy markets.

In his commentary on Chapter 5, Yoon Hyung Kim presents the Korean perspective on Arctic oil and gas as a mid-term solution to energy needs. He suggests that we adopt a medium thirty-year time horizon. It takes ten years of preparatory work to bring new fields on stream and twenty years of production to recover development costs. During this time, technological breakthroughs affecting the production and shipping of Arctic oil and gas may occur.

Kim then describes Korea's involvement in Arctic activities. Korea is the world's second largest importer of LNG. The shale gas revolution in the US has been transforming the global primary energy scene. The hydrocarbon era will be extended. The global security of energy supplies will improve. The shale gas revolution makes nuclear and renewable energy for electricity production uncompetitive. The Korean government perceives the sequencing of unconventional gas development as follows: shale gas first followed by coal-bed gas and tight gas and then Arctic gas. Arctic gas now looks more like one of several options rather than the major source of gas. In addition to diversification of supplies, the Arctic may also have another attraction for China, Japan, and Korea: large volumes and long term commitments.

Kim reports that President Lee Myung-bak and Russian President

Dmitry Medvedev agreed in November 2011 to work closely together to push the development of a pipeline to send Russian gas to South Korea via North Korea. Subsequently, a tentative agreement between Kogas and Russia's Gazprom called for construction of a pipeline through North Korea to start in 2013 to be able to supply pipelined natural gas (PNG) of 7.5 mtpa to South Korea in 2017. But a South Korean government source indicated in October 2012 that talks have dragged on because North Korea is demanding a transit fee that is two to three times the normal international rate.

Korea has been active in the Arctic in a number of ways. The Korea Polar Research Institute (KOPRI) opened the DASAN station in Ny-Ålesund in 2002. Korea obtained ad hoc observer status in the Arctic Council in 2008 and constructed its first research icebreaker Araon in 2009. In May 2012, Korea's icebreaker explored Canada's Arctic Ocean to check the seafloor for gas hydrate reserves. In February 2011, Kogas acquired a 20% stake in the Canadian Umiak gas reserve owned by Calgary-based MGM Energy. This investment by Kogas is significant as it is the first Arctic resource investment by a South Korean firm; it may serve as a bridgehead to enable additional investments.

PART V. INFORMAL ARCTIC GOVERNANCE MECHANISMS

In Chapter 6, Oran Young addresses the theme of "Listening to the voices of non-Arctic states in Arctic ocean governance." He focuses on finding ways forward that allow non-Arctic states to have a voice in Arctic affairs, supporting rather than interfering with the work of the Arctic Council. He starts by outlining what he describes as the new Arctic policy agenda arising from the transformative changes now occurring in the circumpolar Arctic. Young then explores two distinct but not mutually exclusive ways to move forward under these new conditions. One strategy centers on the roles that issue-specific international fora (e.g. the International Maritime Organization, the International Arctic Science Committee) can play in addressing specific matters relating to Arctic Ocean governance. The other emphasizes the value of informal mechanisms that can provide a means for effective communication without running into the political difficulties that afflict efforts to devise more formal solutions. Young proposes practical steps that all parties concerned may want to pursue in the near future.

The Arctic has become a focus of global attention as a result of the impacts of climate change and the prospect of new economic activities

resulting from increasing accessibility. Marine issues have taken center stage, producing socioeconomic changes of direct interest to the five Arctic coastal states (Canada, Finland, Norway, Russia, and the United States) and indirect interest to the other Arctic states (Iceland, Finland, and Sweden). Many non-Arctic nations (e.g., Brazil, China, India, Japan, Korea, and several European states) as well as the European Union have become interested in the prospect of commercial shipping in the Arctic and in the development of the region's natural resources. Young argues that managed development is now overshadowing sustainable development in the region. Some of the issues arising in the Arctic can be resolved through bilateral agreements (e.g. the Norway-Russia treaty delimiting the Barents Sea boundary between the two nations) and multi-lateral agreements pertaining to specific areas (e.g. the Barents Euro-Arctic Region). But some issues (e.g. the regulation of commercial shipping) will require broader international agreements involving bodies like the IMO, a United Nations specialized agency responsible for the safety of shipping and the prevention of marine pollution resulting from shipping.

Young argues that Arctic issues are becoming matters of high politics. The Arctic states have issued new Arctic policies; the European Union is in the process of articulating an Arctic policy for its members. A number of high-level conferences have focused on Arctic issues, ranging from the NATO-sponsored Conference on Environmental Security in the Arctic Ocean (2010) to the Newly Emerging Arctic Security Environment gathering (2010) organized at the request of the Canadian Defense & Foreign Affairs Institute. As a result, issues of Arctic governance have become hot topics.

The stance the Arctic states have adopted in response to these developments is not tenable. The view of the five Arctic coastal states, articulated most clearly in the May 2008 Ilulissat Declaration, is that they can be trusted to handle Arctic policy matters in a manner that proves beneficial to the Arctic Ocean as well as to all those interested in the use of Arctic resources. Others should therefore acknowledge their preeminence and leave issues pertaining to Arctic Ocean governance to them. Nevertheless, non-Arctic states have rights and legitimate interests in the Arctic under the terms of the UN Convention on the Law of the Sea (UNCLOS). They also have responsibilities in the Arctic both as sources of environmental change and as signatories to international agreements. Above all, geopolitical shifts make it hard to ignore the concerns of countries like Brazil, China, India, Mexico, and South Africa in the future of the Arctic region.

Membership in the Arctic Council is not negotiable. Many non-Arctic states have applied to become permanent observers in the council. But

the benefits of this status are limited. As those states that are already permanent observers (e.g. France, Germany, the UK) regularly make clear, the status of permanent observer in the Arctic Council is highly unsatisfactory from their perspective. Their role in Arctic Council meetings is marginal. Clearly, something else is needed to address the concerns of the non-Arctic states.

Young then turns to potential solutions to the resultant puzzle. He first explores the idea of developing what is known as a “regime complex” for the Arctic Ocean or, in other words, a collection of issue-specific but related arrangements. Regime complexes are collections of non-hierarchically related governance arrangements that deal with various aspects of a recognized issue domain or spatially-defined area, such as international trade, climate change, or Antarctica. In the Arctic, such a complex might include arrangements like the Polar Code for commercial shipping, an Arctic Regional Fisheries Management Organization, procedures designed to minimize the dangers of oil spills arising from offshore energy production, a code of conduct for those engaged in ship-based tourism, and so forth. The Arctic Council could play a central role in such a complex, acting to integrate the elements of the complex on the basis of a framework featuring ecosystem-based management and the idea of stewardship.

A complementary strategy for enhancing Arctic governance focuses on the development of an “informal consultative mechanism” to allow non-Arctic voices to be heard without undermining or detracting from the work of the Arctic Council. Although there is no blueprint for such an arrangement, it is possible to seek guidance from the experiences of: (a) the Working Group on Arctic International Relations, (b) the Standing Committee of Parliamentarians of the Arctic Region, (c) the Commission on Security and Cooperation in Europe, (d) the North Sea Conferences operating within the ambit of the OSPAR Convention, (e) the World Economic Forum and the World Social Forum, and (f) issue-specific caucuses operating on the margins of broader fora like the G20.

As a basis for further discussion, Young proposes the creation of an unofficial Arctic Ocean Forum (AOF). He notes that Arctic Ocean development, including commercial shipping, the extraction of oil and gas, industrial fishing, and ship-based tourism, will move forward in the coming years whether we like it or not. The involvement of non-Arctic states and multinational corporations in this process is essential. The Northern Forum, a body that operates concurrently with the Arctic Council, provides a mechanism for articulating the concerns of subnational units of government (e.g. states, counties, territories, oblasts) and for allowing representatives of these units to interact both with one another and with representatives of national governments. The mission of

the AOF would be to serve as an arena in which representatives of Arctic states and non-Arctic states could engage in regular interactions designed to identify emerging issues of mutual concern, frame these issues in a manner conducive to effective policymaking, canvass innovative responses to the issues, and explore the prospects for resolving them in a cooperative manner. The issues considered should involve not only the interests of non-Arctic states in the development of Arctic resources (e.g. the rules governing commercial navigation in the Arctic, the regulations pertaining to oil spill prevention, preparedness, and response) but also the responsibilities of non-Arctic states for actions affecting the well-being of Arctic communities (e.g. the EU ban on the importation of seal products, emissions of black carbon soot).

The North Pacific Arctic Conferences (NPAC) taking place at the East-West Center in Honolulu may offer a way forward in this connection. The 2012 NPAC included thoughtful and well-connected individuals from Canada, Norway, Russia, and the United States and from China, France, Japan, and Korea who engaged in a substantial dialogue in their personal capacities over two days regarding a range of Arctic issues. The East-West Center, formally an American organization, is dedicated to "... bringing people together to exchange views, build expertise, and develop policy options." The center has a particular interest in cross-cultural communication. While it is premature to make any predictions regarding the effectiveness of this informal venue, there is much to be said for proceeding in this realm on a highly informal basis.

Robert Corell, offering the first commentary on this chapter, believes that the Arctic Council has the potential to serve the interests of all Arctic and non-Arctic nations. He suggests that greater pressures should be brought to bear on the Arctic Council to serve these broad interests. Subject to adequate Terms of Reference, adjustments might include raising the status of non-Arctic nations (e.g., Associate Arctic Nation status) to a level adequate to enable these nations to participate directly in policy development. Observer status should be redefined so that there is differentiation among the various types of observers from the scientific and technical to NGOs. All have profoundly important roles to play in the deliberations of the Arctic Council and in the development of Arctic policy.

Corell argues that science and knowledge broadly defined constitute a fundamental foundation for the development of Arctic policies, particularly Arctic Ocean policies. A far-reaching action by the Arctic Council would be to establish the International Arctic Science Committee (IASC), the International Arctic Social Sciences Association (IASSA), and possibly others with appropriate expertise as official scientific advisors to the Arctic Council. Corell suggests a variety of options for pur-

suing this goal, ranging from a special category of science advisors to the Arctic Council to making these bodies Associate Working Groups of the council with responsibilities that parallel the council's current Working Groups, while augmenting the contributions of the existing Working Groups. The objective is to strengthen the direct input of science from responsible bodies into the Arctic policy development process.

Corell suggests that governance in the Arctic will be well served, at least for now, by honoring, implementing, and enhancing existing treaties among nation states, such as UNCLOS, the United Nations Framework Convention on Climate Change (UNFCCC), and other intergovernmental agreements, treaties, and customary law arrangements. He argues that since science has played an important role in the development of Arctic policy, there is a clear need to establish a closer relationship between science and policy to ensure that research agendas focus on issues of clear relevance to policy and that scientific findings are conveyed to policymakers.

Corell moves on to recommend that there are prudent reasons to establish regulatory mechanisms in anticipation of economic development and industrial activities in the Arctic along with the emergence of new issues of environmental protection. There are increasingly clear needs for mechanisms to promote interactions among individuals interested in the Arctic in off-the-record and relaxed settings to build trust among a wide range of actors, to facilitate knowledge exchange, to encourage innovative thinking, and to stimulate learning among those concerned with Arctic issues. The goal would be to enrich the efforts of bodies like the Arctic Council rather than to dilute or detract from their efforts.

Commenting on "Listening to the Voices of Non-Arctic States in Arctic Ocean Governance," Bernard Funston outlines a different perspective on ways for the Arctic Council to accommodate non-Arctic state voices. Funston argues that non-Arctic states have had some voice in Arctic governance through an existing Arctic Ocean regime complex. As members of international agreements, they already have played a significant role in establishing the legal foundation for international governance in the Arctic. Funston observes that non-Arctic states play ongoing roles in implementing and regulating trade, commercial shipping, oil and gas development, transboundary pollution, industrial fishing, ship-based tourism, climate change, and environmental protection under existing conventions such as UNCLOS, UNFCCC, and so forth.

Turning to the establishment of an AOF, Funston argues that the author's proposal appears to be oriented toward providing civil society with a voice in Arctic governance. Young suggests that participants act in their personal capacities and observe Chatham House rules. Presumably, Arctic or non-Arctic government officials who attend would not be rep-

representing state interests. Funston argues that this proposal for an Arctic Ocean Forum begs several questions. Would states really want to send their officials to participate in their personal capacities? Would such a forum have any influence among policymakers in Arctic or non-Arctic states? Would representatives of NGOs, businesses, and indigenous peoples' groups also appear in their personal capacities or would they be expected to represent their organizations' interests?

The process of creating an AOF as an informal mechanism including key non-Arctic countries could raise the same sorts of time-consuming issues that the Arctic Council faced during its founding process. Who is allowed in; what would be the rules of procedure; how would the forum speak on complex issues where there is no consensus; who will organize and pay for the meetings; how will the forum conduct its intersessional work; would there be a role for Permanent Participants from non-Arctic states? Would the Arctic states want to participate in both the Arctic Council and a new AOF? Funston wonders whether an AOF could be the solution to the puzzle posited in Chapter 6.

As an alternative to an AOF, Funston suggests the creation of "trans-regional mechanisms" within the Arctic Council, which is an existing forum for high-level policy discussion on Arctic issues, to foster greater scientific cooperation among Arctic and non-Arctic interests as a means to enhance the contributions of observers, particularly non-Arctic states, within the Council. He believes that scientific cooperation can advance policy-relevant dialogue between the Arctic states and the international community just as it has done among the Arctic states themselves.

Finally Funston observes that the Arctic is not a closed system. The Arctic should be viewed as a barometer that is highly responsive to global processes. The solutions to some Arctic problems cannot be achieved through actions in the Arctic. On the other hand, Funston notes that non-Arctic regions may be unable to address some of their pressing problems without giving due attention to the Arctic. He emphasizes that what happens in the Arctic does not stay in the Arctic, and vice versa. The Arctic will not be saved by building a wall around it or by focusing only on governance within the region. He remarks that the Arctic is a region that helps open a dialogue on how we govern outside the Arctic. For this to occur, the voices of non-Arctic states must be heard.

Arild Moe, in his commentary on Chapter 6, notes that "what are really the Arctic issues" is a better question for effective governance of the Arctic Ocean than "who should be regarded as the legitimate players." Moe suggests that we should distinguish between issues that are pan-Arctic and issues that are sub-regional. Different issues engage different stakeholders. Moreover, there are issues that have stronger

links to processes outside the Arctic than to other processes in the Arctic. Moe remarks that while climate change is a global issue and should be handled through global processes, regional fisheries occurring within exclusive economic zones in the Arctic represent the other extreme. Shipping is a global industry, and the IMO plays a crucial role. But there is also a need for a Polar Code. The issue of search and rescue falls squarely in the sphere of responsibility of the Arctic states. Moe also suggests the importance of rethinking the role of the Arctic Council within a broader regime complex. An obvious risk relying on a diversified and specialized institutional architecture is the fragmentation Young mentions. Regarding the establishment of a high-level informal consultative mechanism including key non-Arctic states, Moe recommends that the Arctic states take the initiative to organize such meetings. To become an effective channel for communication, an AOF would need to have a concrete agenda. This would mean that participation might vary from meeting to meeting. The goal must be not only to include relevant states, but also relevant authorities and knowledge holders from these states. Finally, Moe observes that a framework featuring an informal consultative caucus under the G20 would exclude the smaller Arctic States and thus represent another extreme in Arctic governance. It is easy to predict the position of European Arctic states to such a proposal: Non-starter!

Peiqing Guo focuses his comments on the new criteria for admitting permanent observers in the Arctic Council as set forth in the 2011 report of the Senior Arctic Officials to the Arctic Council ministerial meeting. Guo interprets the new requirement of recognizing the “sovereignty, sovereign rights, and jurisdiction of the Arctic countries” as unprecedented. According to Guo, non-Arctic states will find it problematic to recognize Arctic states’ sovereignty, including territorial land, internal waters, territorial waters, and territorial air. He comments on the advantages and disadvantages of observer status and concludes that permanent observer status in the Arctic Council is not an optimal choice for non-Arctic states under current conditions. For now, one practical alternative may be to apply for ad hoc observer status on a meeting-by-meeting basis.

In his commentary on Chapter 6, Fujio Ohnishi considers how best to realize the idea of an AOF. He proposes that the North Pacific Arctic Conference (NPAC) should take initiative in organizing a start-up meeting and inviting the governments of non-Arctic states to discuss the idea of an AOF. Alternatively, the country serving as chair of the Arctic Council could take on this innovative task of organizing an AOF as an efficient mechanism for informal dialogue between Arctic and non-Arctic countries. He warns that if the AOF turns out to be an in-

effective mechanism for dialogue, this failure may lead to the establishment of a non-Arctic council. As the second vital point for realizing the AOF idea, Ohnishi recommends that the range of appropriate issues for AOF consideration should be agreed upon at a start-up meeting.

In his commentary on Chapter 6, Sung-jin Kim points out that since the Arctic Council is likely to lose momentum as a result of internal conflicts regarding the claims of member states to jurisdiction over marine resources under UNCLOS, it would be more efficient for the non-Arctic countries to promote cooperation with each of the Arctic coastal states rather than joining the Arctic Council. Kim also argues that non-Arctic countries should pursue observer status so that they can participate in the general discussion at the Arctic Council. Kim believes that Young's suggestions on ways forward, featuring an Arctic Ocean regime complex and an informal consultative mechanism, offer the most practical and realistic alternative for non-Arctic states within the current Arctic Council framework. Regarding participation in the AOF, Kim suggests that the membership should be comprehensive, including not only the non-coastal and EU countries but also natives, scientists, and policy experts as well as representatives from business and international organizations. To develop concrete terms of reference for the AOF, he proposes to set up a small technical group within the North Pacific Arctic Conference.

CONCLUSION

In the opening section of this chapter, we identified five major issues that will shape the future of the maritime Arctic. The 2012 North Pacific Arctic Conference (NPAC 2012) examined these issues through a series of major presentations, briefer commentaries, and open discussions. The body of this book is divided into sections that cover each of the five issues in depth. Here, we comment briefly on the major findings emerging from these deliberations, highlight some critical determinants of future developments in each case, and single out some themes for consideration in future sessions of the North Pacific Arctic Conference.

Commercial shipping in the Arctic is feasible but likely to develop in several stages starting with an increase in intra-regional traffic, followed by a growth in destination traffic, and leading eventually to some through transit traffic using the NSR as an artery for international commerce. Russian policies are adjusting to produce a more favorable fee structure for icebreaking and other services. This is an indication that Russia intends to develop the NSR in the near future. On the other hand, there is a lack of ports and other infrastructure in the

Arctic. Alleviating the resultant problems will be a critical determinant of the future of commercial shipping in the region. Destinal traffic may include shipments not only of oil and gas but also of hard-rock minerals, fish products, and even fresh water. In each case, the willingness of investors to provide the resources needed to build infrastructure will determine the timing and extent of expanded commercial shipping in the region. It is difficult to determine the extent to which states will sponsor development to attract people and industries to the Arctic or the growth of human activities in the Arctic will provide the impetus for the mobilization of resources needed to invest in infrastructure.

With regard to maritime safety and environmental protection, the completion and implementation of a mandatory Polar Code is essential to protect Arctic peoples and ecosystems. While the need has existed for some time, international, harmonized, and legally-binding rules and regulations covering the design, construction, and operation of ships operating in the Arctic are urgently required today. The IMO, which includes both the Arctic states and key non-Arctic states as members, is the proper forum for the development of the Polar Code. The Arctic and non-Arctic states need to cooperate in this endeavor to achieve success in the development of the code in a timely manner. Working together, they can provide commercial shipping interests with a level playing field that will treat all segments of the industry equally and equitably. Other tools at the disposal of the IMO include the designation of specific areas (e.g. the Bering Strait Region) as Particularly Sensitive Sea Areas (PSSAs). A system of well-defined PSSAs and designated sea lanes would complement the provisions of the Polar Code in providing proper protection for the human communities and ecosystems of the Arctic

There is a long history of aboriginal subsistence harvesting of fish and marine mammals in the Arctic. Commercial fisheries are currently limited to the marginal seas (e.g. the Norwegian, Barents, and Bering Seas); there are no commercial fisheries in the Arctic Ocean as such. Existing fisheries are generally well-managed either by individual coastal states within their EEZs or by regional arrangements such as the Norwegian-Russian regime for the fisheries of the Barents Sea. Yet challenges for the future lie in the facts that commercially significant fish stocks may move northward into the Arctic Ocean, climate change may trigger processes that are disruptive to marine ecosystems, and migratory species (e.g. grey whales) require international cooperation—sometimes extending to non-Arctic countries—to ensure that human activities affecting them are managed sustainably. Illegal, unregulated, and unreported (IUU) fishing may emerge as a serious concern in the Arctic. Bioprospecting is another potential issue that could generate a

need for governance. Experience suggests that it is useful to anticipate trends in human uses of living resources and to put in place management arrangements before activities begin on a large scale and interests become fixed. From this perspective, the creation of a Regional Fisheries Management Organization (RFMO) for the Arctic Ocean or even for the western portion of this ocean is an idea worthy of serious consideration in the coming years. Although the offshore oil and gas resources of the Arctic are thought to be large, most of these resources have yet to be discovered, much less proven to be profitable to produce and transport to relevant markets. Russia is the most important player in Arctic energy development with the largest continental shelf by far and the most favourable prospects especially for natural gas. The Russian government is determined to accelerate the development of hydrocarbons in Eastern Siberia and the Far East and to engage foreign companies in offshore development projects. The Arctic may thus become a source of natural gas for consumers in Asia; one project on the Yamal Peninsula already includes shipment eastward as part of its business plan. China, Japan, and Korea are all potential consumers of Arctic hydrocarbons. What is important in this connection, however, is not only the size of resource base but also market accessibility and the attractiveness of alternative sources. The prospects for shipping oil and liquid natural gas through the NSR will be an important consideration. The shale gas revolution, especially in the United States, is another important factor affecting the economic attractiveness of Arctic hydrocarbons. Still, the need for long-term secure contracts for natural gas is likely to favour Arctic sources of supply in the coming decades. Commercial development of Arctic oil and gas on an ongoing basis must include indigenous peoples in the decisionmaking process.

Finally, we need to look forward rather than backward in finding ways to include the concerns of non-Arctic states in the deliberations of the Arctic Council and in other governance arrangements for the Arctic. There is a need for innovation to address this issue. Representatives of non-Arctic states have engaged in the activities of some of the council's working groups, and there may be opportunities to build on this experience to devise constructive procedures for addressing trans regional issues that reflect the interests of all parties concerned. The implications of recent developments regarding matters like the treatment of applications for permanent observer status in the Arctic Council, however, are more complex. The issue of permanent observership has become highly politicized in the deliberations of the council. Even those non-Arctic states that have the status of permanent observer (e.g. Britain, France, Germany) find that this role offers limited opportunity to voice their concerns in a meaningful fashion. Although non-Arctic states will continue to submit applications, the mechanism

of permanent observership seems unlikely to provide a satisfactory solution to the challenge of listening to the voices of non-Arctic states in Arctic affairs.

The speed of change affecting the Arctic and the rise of global interest in this region have taken many participants in settings like the Arctic Council by surprise. The council has made some efforts to adapt to these changing conditions, but its ability to address the concerns of non-Arctic states is limited. What is missing is a mechanism that allows the non-Arctic states to voice their concerns in an effective manner, while acknowledging the primacy of the interests of the Arctic states in what happens in this region. One way forward could be the development of an Arctic Ocean Forum understood as an informal and inclusive consultative mechanism that would operate with a minimum of procedural arrangements. The forum should encourage innovative thinking about emerging Arctic issues rather than seeking a more formal role in decision-making. It would complement the work of the Arctic Council rather than trespassing on the council's turf. In this way, the forum would emphasize the development of intellectual capital and the establishment of organized channels of communication between the Arctic states and the rest of the world. The North Pacific Arctic Conferences might well serve as a kind of informal launching pad for the creation of an Arctic Ocean Forum.

To conclude, NPAC 2012 uncovered a number of topics that could be taken up at the 2013 North Pacific Arctic Conference. One idea is to promote North Pacific/North Atlantic dialogue in order to identify common concerns and to explore ways to ensure that they are considered in Arctic policymaking. Finding ways to move the Polar Code toward completion and to encourage serious consideration of the responsibilities of non-Arctic states for emerging challenges in the Arctic as well as the rights of these states to benefit from the extraction of Arctic resources are also important topics. Looking further into the future, there are issues relating to the impact of global environmental change in generating a role for the Arctic in providing for global food security and the accommodation of large numbers of environmental refugees. Two major forces are driving the transformation occurring in the Arctic: climate change and economic globalization. In an important sense, commercial shipping is an enabler of cutting-edge developments in the Arctic, including the growth of trade, the extraction of natural resources, and the expansion of tourism. These developments in turn produce a set of issues involving pollution control, stemming the loss of biological diversity, the protection of indigenous rights, and governance more generally that can only be addressed through international cooperation. Together, these themes present a rich agenda for consideration at NPAC 2013.

Notes

1. Sea ice in the Arctic Basin reached a new record low in August-September 2012.
2. In 2012, the XueLong made a complete transit of the NSR from East to West.

