PART II

The IMO and Arctic Marine Environmental Protection
3. The IMO and Arctic Marine Environmental Protection: Tangled Currents, Sea of Challenges*

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INTRODUCTION

In the wake of the 1982 UN Law of the Sea Convention (LOSC), the International Maritime Organization (IMO) and its complex array of rules and standards governing international shipping are certainly central to marine environmental protection in all ocean regions including the Arctic. Article 211(1) of LOSC requires states to work through the IMO to establish international rules and standards to prevent, reduce and control vessel-source pollution and to promote the adoption of routeing systems designed to minimize accidents which might cause pollution of the marine environment. Article 211(2) requires all flag states to adopt laws and regulations for the prevention and control of pollution from vessels flying their flag with such laws and regulations having at least the same effect as that of generally accepted international rules and standards. Article 94(4)(c) obligates all flag states to ensure their masters, officers and crews observe all applicable international regulations relating to the safety of life at sea and the prevention and control of marine pollution. Article 211(5) allows coastal states to adopt vessel-source pollution laws and regulations applicable to foreign ships in exclusive economic zones (EEZs), but those laws and regulations must conform to generally accepted international rules and standards. For straits used for international navigation, LOSC provides all vessels the right to transit passage and a coastal state’s pollution control powers are limited to giving effect to applicable international regulations.

However, the role of the IMO and the applicability of its international shipping standards may be limited in some waters of the Arctic in two ways. First, Article 234 provides coastal states with special legislative and enforcement powers to control marine pollution from vessels where waters are ice-covered for most of the year. An example of an Arctic coastal state exercising such powers is Canada, which has unilaterally imposed zero discharge standards for oil and garbage from ships and in 2010 imposed, without seeking IMO approval, mandatory reporting for some vessels before entering the Northern Canada Vessel Traffic Services Zone covering all of Canada’s Arctic waters (Figure 3.1).
The Russian Federation has also imposed special restrictions on shipping through the Northern Sea Route, for example, tankers are not allowed to discharge oily ballast water and deposits of garbage from ships are prohibited.\textsuperscript{9} Denmark in its Strategy for the Arctic 2011-2020, issued in August 2011, gives notice that it may also consider the adoption of unilateral measures relying on Article 234 of LOSC.\textsuperscript{10}

Many questions of interpretation surround Article 234.\textsuperscript{11} Those questions include, among others: What constitutes ice-covered waters for most of the year? What is the significance of giving special coastal state powers only in the exclusive economic zone?\textsuperscript{12} How far may navigational reporting and safety requirements be imposed by an Arctic coastal state without IMO approval? Canada’s unilateral imposition of mandatory reporting through NORDREG for ships entering Canadian Arctic waters raised considerable expressions of concern by other states on various grounds including the fail-
ure to work through the IMO Sub-Committee on Safety of Navigation in seeking formal approval.13 Canada helped to “calm the waters” by subsequently clarifying in an explanatory document that it was relying on Article 234 for its unilateral measures14 and Canada requested that the IMO bring the NORDREG system to the attention of Member Governments through an information circular which did occur.15

A further issue raised by Article 234 is whether the special legislative and enforcement powers bestowed on coastal states also apply to straits used for international navigation.16 Since Article 233 of LOSC, which sets out various safeguards for straits used for international navigation,17 does not specifically exempt straits from the application of Article 234, there is a strong argument for the extension of special coastal state powers to international straits meeting the various requirements of Article 234 including the required ice coverage.18

A second manner in which IMO and its standards may be limited is through the exercise of general coastal state jurisdictional rights over internal waters and the territorial sea. Having complete sovereignty in internal waters, such as ports, a coastal state may impose its own special discharge conditions on foreign vessels and might even seek to require specific equipment and crewing requirements. In the 12 nautical mile (nm) territorial sea, a coastal state may also prescribe and enforce its own discharge standards19 but a coastal state is not allowed to apply its design, construction, manning or equipment standards to foreign ships unless giving effect to generally accepted international rules or standards.20

What constitutes internal waters in the Arctic continues to be an area of considerable controversy.21 For example, Canada has enclosed its Arctic Archipelago with straight baselines and considers the enclosed waters of the Northwest Passage to be internal.22 The United States continues to argue that the Northwest Passage is an international strait where the right of transit passage applies.23 The controversy is partly fueled24 by the uncertainty in international law as to what is exactly required in the way of shipping use, for example, the number of foreign ships transiting, their total tonnage and the diversity of flags represented.25

This chapter provides an overview of the IMO’s role in Arctic marine environmental protection through a two-part “cruise”. Part 1 reviews the tangled array of IMO conventions and guidelines relevant to Arctic shipping. Part 2 highlights the sea of challenges confronting the future governance of Arctic shipping. Those challenges include: completing negotiations for a legally-binding Polar Shipping Code; deciding whether to ban the use or carriage of heavy fuel oil in the Arctic; addressing black carbon and greenhouse emissions from ships; identifying
and taking protective measures for ecologically and culturally significant Arctic waters; dealing with noise from commercial shipping; and ensuring full ratification of key IMO conventions.

Since the focus of this chapter is on the IMO and Arctic marine environmental protection, a number of closely related topics and their relevant conventions are not specifically addressed. Those topics include: maritime safety, maritime labour, training standards and liability and compensation for vessel-source pollution.

TANGLED CURRENTS

A complex array of IMO agreements and guidelines are relevant to Arctic marine environmental protection. Law and policy currents fall into three categories: IMO marine environmental conventions, IMO general shipping guidelines and IMO Arctic-specific guidelines.

**IMO marine environmental conventions**

Besides two agreements encouraging bilateral and regional cooperation in responding to oil and hazardous substances pollution incidents, four IMO conventions (with two having protocols) are central to marine environmental protection. Those conventions are: the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78), the International Convention on the Control of Harmful Anti-Fouling Systems on Ships, the International Convention for the Control and Management of Ships’ Ballast Water and Sediments and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter and its 1996 Protocol.

**MARPOL 73/78.** Probably best known for establishing special construction provisions for oil tankers, such as double hull requirements, MARPOL also sets out international standards for pollutant discharges from ships through six annexes. Annex I includes detailed regulations to prevent and control vessel-source oil pollution and sets discharge limits for oily ballast and bilge water. Regulation 15 of Annex I establishes a 15 ppm discharge limitation on oily bilge water from oil tankers as well as other ships. Regulation 34 of Annex I limits the discharge of oily ballast water from oil tankers to a rate of 30 litres per nautical mile while a tanker is en route and over 50 nautical miles from the nearest land. Special areas may be established through the IMO where stricter oil discharge standards may apply, such as for the Antarctic, where oily discharges are prohibited from any ship.
MARPOL’s Annex II, besides setting design, construction and equipment requirements for ships certified to carry noxious liquid substances (NLS) in bulk, seeks to limit discharges of noxious liquid substance residues, particularly from deballasting operations or tank washings. Regulation 6 of Annex II provides for dividing NLS into four categories for control purposes: Category X—substances presenting a major hazard to either marine resources or human health; Category Y—substances presenting a hazard to marine resources or human health; and Category Z—substances presenting a minor hazard to marine resources or human health. The fourth category, Other Substances, contains substances not considered harmful that are not subject to any requirements of the Annex. The International Bulk Chemical Code in its chapter 17 lists hundreds of chemicals with their categorized hazard (X, Y or Z) while its chapter 18 lists chemicals not posing a hazard.

Regulation 13 of MARPOL Annex II sets out detailed discharge controls for the three categories of hazardous NLS. For example, discharges into the sea generally may not occur unless: the ship is proceeding on route at a speed of at least 7 knots; the discharge is below the waterline; and the discharge is made at a distance of not less than 12 nm from the nearest land in a water depth of not less than 25 metres. For category X substances (the most hazardous), a stringent tank prewash requirement at a reception facility applies before a very diluted residue may be discharged in accord with the above requirements. A prewash requirement is not normally required for residues in category Y and Z. The Antarctic is designated a special area where no NLS discharges are allowed.

Annex III of MARPOL includes regulations for the prevention of pollution by harmful substances carried by sea in packaged form. Packages are to be adequate to minimize the hazard to the marine environment and labels on packages containing harmful substances must be able to survive at least three months’ immersion in the sea. Harmful substances are required to be properly stowed and secured to minimize hazards to the marine environment and jettisoning of packages containing harmful substances is generally prohibited.

MARPOL Annex IV contains regulations to control the pollution of sewage from ships. Ships of 400 gross tonnage and above and ships carrying more than 15 persons, when engaged in international voyages, are required to be equipped with sewage systems, either a sewage treatment plant, a sewage comminuting and disinfecting system or a holding tank. Comminuted and disinfected sewage may be discharged at a distance of more than 3 nm from the nearest land, while untreated sewage in a holding tank may be discharged more than 12 nm from the nearest land if the ship is proceeding at not less than 4 knots and the discharge is
not instantaneous but at a moderate rate.\textsuperscript{48}

Amendments to Annex IV, adopted by the IMO Marine Environment Protection Committee (MEPC) in July 2011,\textsuperscript{49} promise to further tighten sewage discharge standards, particularly from passenger ships. The amendments designate the Baltic Sea as a special area and allow for additional special areas to be designated where special sewage treatment and discharge requirements will apply.\textsuperscript{50} Discharge of sewage will be prohibited in special areas except when a sewage treatment plant has been installed meeting standards to be developed by the IMO.\textsuperscript{51}

MARPOL Annex V regulates garbage discharges from ships. While prohibiting the disposal of plastics into the sea,\textsuperscript{52} various garbage disposals are allowed from the normal operations of a ship dependent on the distance from land. For example, disposal of food wastes and other garbage, such as rags, bottles and metals, is allowed if 12 nm or more from the nearest land.\textsuperscript{53} In special areas, which include the Antarctic,\textsuperscript{54} garbage disposals are prohibited except for food wastes.\textsuperscript{55}

Amendments to Annex V, adopted by the MEPC in July 2011, will substantially curb future garbage discharges.\textsuperscript{56} A much more preventative approach to garbage discharges is adopted with a general prohibition on garbage discharges into the sea\textsuperscript{57} with limited exceptions spelled out in the regulations. Outside special areas, allowable discharges while the ship is en route include: comminuted or ground food wastes not less than 3 nm from the nearest land;\textsuperscript{58} untreated food wastes if 12 nm or more from the nearest land;\textsuperscript{59} cargo residues not recoverable using commonly available methods for unloading (if 12 nm or more from the nearest land);\textsuperscript{60} animal carcasses as far from the nearest land as possible;\textsuperscript{61} and cleaning agents or additives contained in wash water (linked to cleaning cargo hold, deck, and external surfaces) so long as they are not harmful to the environment.\textsuperscript{62}

Within special areas, stricter discharge standards will apply. For example, food wastes may only be discharged if comminuted or ground and not less than 12 nm from the nearest land or the nearest ice shelf.\textsuperscript{63} Only cleaning agents or additives contained in deck and external surfaces wash water may be discharged taking into account IMO guidelines.\textsuperscript{64}

To protect the Antarctic special area, each party at whose ports ships depart en route to or arrive from the Antarctic area is required to ensure as soon as practicable adequate garbage reception facilities and flag states are required to ensure their vessels have sufficient garbage retention capacity on board before entering the Antarctic area and have concluded arrangements to discharge garbage at reception facility after leaving the area.\textsuperscript{65}

MARPOL Annex VI, first adopted in 1997 and substantially revised
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in 2008, regulates air pollution from ships. The deliberate emission of ozone depleting substances is prohibited. Emission standards for marine diesel engines are set according to the date of installation. One of the most important controls is setting a limit on the sulphur content of fuel oils used on board ships with the standard evolving from: 4.5 percent m/m prior to January 1, 2012; to 3.5 percent on and after January 1, 2012; and 0.50 percent on and after January 1, 2020. Special emission control areas may also be designated through the IMO where more stringent air pollution controls from nitrogen oxides (NOx), sulphur oxides (SOx) and particulate matter might be imposed. For emission control areas the maximum sulphur content of fuel is set lower than the general standard, evolving from 1 percent after July 1, 2010 to 0.10 percent m/m on and after January 1, 2015.

Canada and the United States have designated a North American Emission Control Area for NOx, SOx and particulate matter. The Area covers marine waters off both the Pacific and Atlantic coasts, but does not extend north of 60° latitude (Figure 3.2).

Annex VI also restricts the incineration of waste other than in a shipboard incinerator. The following cannot be incinerated: Annex I, II, and III residues; PCBs; Annex V garbage containing more than trace concentrations of heavy metals; petroleum products containing halogenated compounds; and sewage sludge and sludge oil not generated on board the ship. Polyvinyl chlorides (PVCs) may be incinerated, but only when the incinerator is of an approved type.

At the MEPC meeting in July 2011, initial steps to address greenhouse gas emissions from ships were taken through additional amendments to Annex VI. A new Chapter 4 was added setting out regulations on energy efficiency for ships of 400 gross tonnage and above. New ships will be required to meet Energy Efficiency Design Index (EEDI) requirements set out in Regulation 21. Each ship, including existing ships, will be required to keep on board a Ship Energy Efficiency Management Plan (SEEMP).

Anti-fouling Systems (AFS) Convention. The AFS Convention, adopted in 2001 and coming into force on 17 September 2008, provides a framework for controlling the use of anti-fouling systems, including paints, that may have toxic effects on human health or the environment. The Convention allows systems to be listed in Annex 1 for prohibition or restriction but only one listing has occurred to date, organotin compounds which act as biocides. The Convention prohibits the application or re-application of such compounds and ships are not allowed to bear such compounds on their hulls or must bear a protective coating to prevent leaching.

Ballast Water Convention. Adopted in 2004 but not yet in force, the
Ballast Water Convention (BWC) aims to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens from ships’ ballast water and sediments. Two main management approaches, ballast water exchange and treatment, are followed. Ships are required, whenever possible, to conduct ballast water exchanges at least 200 nm from the nearest land and in water at least 200 metres in depth. By 2016 all ships carrying ballast water, with limited exceptions, will be required to have ballast water management systems (BWMS) meeting a performance standard set out in Regulation D-2 and approved in accordance with Regulation D-3.

The BWC encourages regional cooperation in ballast water research and management. Article 13(3) calls upon Parties, particularly those bordering enclosed or semi-enclosed seas, to endeavour to enhance regional cooperation including through the conclusion of regional agreements. An example of a regional effort to address ballast water threats is provided by the Antarctic. Antarctic interested states agreed interim regional cooperation was necessary to prevent potential invasive marine or-
ganisms from being transported into the Antarctic Treaty Area by ships through their ballast water and worked with the IMO in adopting Guidelines for Ballast Water Exchange in the Antarctic Treaty Area in July 2007. The Guidelines encourage vessels to exchange ballast water before arrival in Antarctic waters and, if that is not possible, to undertake exchanges in water at least 50 nm from the nearest land in waters of at least 200 metres depth. Vessels, having spent a significant time in the Arctic, are encouraged to discharge their ballast water sediments and to clean ballast water tanks before entering Antarctic waters.

No parallel initiative has occurred for the Arctic region where the Arctic Council has given minimal attention to ballast water issues to date. The Council’s 2009 Arctic Marine Shipping Assessment merely urged Arctic states to consider ratifying the Ballast Water Convention and encouraged Arctic states to assess the risk of introducing invasive species through ballast water so that adequate prevention measures could be implemented in waters under their jurisdiction.

While the global market for ballast water treatment technologies is expected to be huge and approved treatment technologies have been quite rapidly progressing, questions remain whether states and the shipping industry will be able to meet the BWC deadlines for installing ballast water management systems to meet the D-2 performance standards. In 2012 various countries reported on the very limited installation of BWMS, for example, India and Sweden indicated that 93.6 per cent of their ships had not yet installed management systems while Hong Kong, China reported 98.96 per cent of its ships with ballast water capacity between 1,500 m$^3$ and 5,000 m$^3$ had not installed BWMS and none of its ships with ballast water capacity of less than 1,500 m$^3$ or greater than 5,000 m$^3$ had made installations. China, Japan and the Republic of Korea also reported very low percentages of their vessels having installed BWMS. A number of delegations to the MEPC’s 63rd session in 2012 expressed concerns over the slow implementation of the BWC in light of various constraints, including limited shipyard capacity and costs involved, and suggested that application of the dates contained in regulation B-3 may have to be reconsidered. The MEPC has invited member states to provide updated information on the status of BWMS implementation in their respective countries.

Of the BWMS approved for use by the MEPC, a considerable number make use of chlorine compounds as Active Substances. In the case of systems utilizing chlorination, by-products are a potential concern. Chlorination by-products (such as trihalomethanes, a possible human carcinogen) are included in the risk assessment, however the assessment is performed by the applicant. This is potentially troublesome as a lack of transparency has been noted in some applications. Further, the risk as-
sessments are performed for a single system—there appears to be no
analysis of the potential cumulative effect of multiple ships deballasting
in one area in a relatively short period of time.\textsuperscript{101} The Joint Group of
Experts on the Scientific Aspects of Marine Pollution (GESAMP) has
included the potential impact of disinfection byproducts in the marine
environment as a topic in its New and Emerging Issues Programme.\textsuperscript{102}

Convention takes quite a permissive approach by allowing dumping of
almost all types of wastes pursuant to national ocean dumping permits,
except for wastes listed on a global prohibited list,\textsuperscript{103} the 1996 Protocol
adopts a precautionary approach.\textsuperscript{104} Only wastes listed on a global “safe
list” may be disposed of at sea\textsuperscript{105} and even then Parties are to ensure
dumping proposals are subject to waste prevention audits before granting
a dumping permit.\textsuperscript{106}

\textbf{IMO general shipping guidelines}

While numerous IMO guidelines have been forged to govern various as-
pects of international shipping, such as those governing ballast water
management,\textsuperscript{107} ocean dumping\textsuperscript{108} and places of refuge for ships in need
of assistance,\textsuperscript{109} two sets of generally applicable guidelines may be partic-
ularly relevant to the Arctic,\textsuperscript{110} namely, Revised Guidelines for the
Identification and Designation of Particularly Sensitive Sea Areas
(PSSAs)\textsuperscript{111} and Guidelines for the Designation of Special Areas under
MARPOL 73/78.\textsuperscript{112} In addition, the IMO has issued a Guidance
Document for Minimizing the Risk of Ship Strikes with Cetaceans.\textsuperscript{113}

\textbf{PSSA Guidelines.} Adopted in December 2005, the Revised PSSA
Guidelines provide guidance to IMO Member Governments in how to
formulate and submit applications for designation of a particularly sensi-
tive sea area where special protective measures may be taken. A PSSA
is an area that needs special protection because of its ecological, so-
cio-economic or scientific significance, and the area is vulnerable to in-
ternational shipping impacts.\textsuperscript{114} When a PSSA is approved, one or more
associated protective measures may be imposed including special dis-
charge restrictions, mandatory ship routeing and reporting systems, and
areas to be avoided.\textsuperscript{115} After a PSSA receives final designation, all asso-
ciated protective measures should be identified on nautical charts in ac-
cord with the International Hydrographic Organization’s symbols and
methods.\textsuperscript{116}

Thirteen PSSA’s have been designated around the globe to date.\textsuperscript{117}
However, no PSSA has yet been established in the Arctic or the
Antarctic.

\textbf{Guidelines for the Designation of Special Areas under MARPOL 73/78.}
Revised in 2001, the Guidelines provide guidance to MARPOL Parties on the formulation and submission of applications for designating special areas under Annexes I, II and V of the Convention. The Guidelines note that a special area may encompass the maritime zones of several states or even an entire enclosed or semi-enclosed area. The Guidelines set out criteria in three categories, oceanographic conditions, ecological conditions and vessel traffic characteristics, that must be met. A special area designation can only become effective when adequate reception facilities are provided for ships in accordance with MARPOL provisions. Proposals are to be submitted to the MEPC and should include all the information listed in the Guidelines including precise geographical coordinates for the area to be designated and a background document explaining the need for designation.

In light of recent amendments to MARPOL Annex IV allowing the designation of special areas to more strictly control sewage from passenger ships, the MEPC has approved draft 2013 Guidelines for the Designation of Special Areas under MARPOL 73/78. The Guidelines will cover the possibility of further Annex IV designations and the Guidelines are expected to be adopted at the twenty-eighth session of the IMO Assembly in December 2013.

Guidance Document for Minimizing Ship Strikes with Cetaceans. The Guidance Document, approved by the MEPC in July 2009, suggests general principles and possible actions to be taken by Member Governments to reduce and minimize the risk of ship strikes with cetaceans. Governments are encouraged to: establish mechanisms whereby ship strikes can be reported and documented; promote education and outreach, for example, through Notices to Mariners regarding concentrations of whales; and consider various operational measures such as routeing and reporting requirements. Governments are also urged to cooperate with other states in whose waters a shared whale population occurs and coordination could include the development of joint proposals for specific measures through the IMO.

IMO Arctic-specific guidelines


Guidelines for Ships Operating in Polar Waters. Adopted by the IMO Assembly on 2 December 2009, the Guidelines for Ships Operating in Polar Waters replaced earlier Guidelines for Ships Operating in Arctic Ice-covered Waters (2002) and extended coverage to both the
The 2009 Guidelines are largely aimed at ensuring safe shipping by recommending construction and design standards for new Polar Class ships, and suggesting various equipment, personal survival and crewing measures applicable to ships engaged in international voyages in Arctic waters.

Only one short Chapter, Chapter 16 consisting of about one page, is devoted to environmental protection. The overall emphasis is on ensuring damage control in case of accidents. All ships are encouraged to have the capability to contain and clean up minor deck spills and contain minor over side spills. Ships should also be equipped to make temporary repairs in case of a minor hull breach. Following applicable national and international pollution standards and industry best practices is recommended.

**Guidelines on Voyage Planning.** The Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas, are aimed at preventing groundings and collisions and do not include recommendations for avoiding environmentally sensitive areas or restricting ship movements in the vicinity of marine mammals. The Guidelines urge passenger ships operating in remote areas, including in Arctic and Antarctic waters, to develop detailed voyage and passage plans. Such plans should consider such factors as: quality of hydrographic data; availability of aids to navigation; places of refuge; availability of ice navigators; no-go areas because of ice conditions; and safe distance to icebergs.

### SEA OF CHALLENGES

By far the greatest challenge confronting shipping governance in the Arctic is the need to conclude a mandatory and effective Code for Ships Operating in Polar Waters. Other key challenges include: deciding whether to ban the carriage of heavy fuel oil (HFO) in the Arctic; addressing black carbon and GHG emissions from ships; identifying and taking protective measures for ecologically and culturally sensitive areas; dealing with noise from commercial shipping; and ensuring full ratification of key IMO agreements.

**Completing Negotiations for a Mandatory Polar Code**

The development of a legally-binding Polar Code to provide a regulatory overlay to existing international agreements applicable to polar shipping has been a work in progress since the IMO’s Maritime Safety Committee in 2009 tasked its Design and Equipment (DE) Sub-Committee with drafting a Polar Code with a target completion date of 2012. Scores of discussion and position papers have been sub-
mitted by NGOs, industry organizations and governments on best ways forward in crafting the Code. The DE Sub-Committee has used various working and correspondence groups to push drafting forward with the most recent draft contained in the February 2012 Report of the Working Group on the Development of a Mandatory Code for Ships Operating in Polar Waters to the DE Sub-Committee.\footnote{139}

Some aspects of the Code seem certain. The bulk of the Polar Code will be devoted to design, construction, equipment, and operational requirements in support of maritime safety. The Code is expected to have 2 parts, Part A setting out mandatory requirements and Part B providing additional guidance. The Code will include an environmental protection chapter.\footnote{140}

However, drafting efforts have proven to be difficult with all sections of the Code still under discussion and numerous issues remaining to be resolved including:

- Whether the geographical scope of the present voluntary guidelines (Figure 3.3) should be broadened to include more southerly waters in the Pacific and Atlantic?\footnote{141}
- Which ships should be covered beyond passenger and cargo ships?\footnote{142}
- What type of phase-in provisions, if any, should be allowed for existing ships?
- Which provisions should be mandatory versus recommendary?
- Should differential as well as common standards be adopted for the Arctic and Antarctic?
- What training standards should be included, for example, for ice navigators?

One of the most contentious issue areas has been over the inclusion of environmental provisions in the Code. IMO convened a workshop on environmental aspects of the Polar Code in September 2011 but the workshop avoided making specific regulatory or drafting recommendations.\footnote{143} Numerous issues surround the proposed environmental protection chapter including:

- What vessel-source pollution discharge standards should be included?\footnote{144}
- Whether and how to address ballast water and hull-fouling threats?\footnote{145}
- Whether to include special requirements for anti-fouling systems in polar waters, for example, requiring the use of ice abrasion resistant coatings and the use of biocide-free systems?\footnote{146}
- Whether to include special measures for keeping containers carrying
harmful substances or dangerous goods from being lost at sea and causing adverse environmental impacts?

• Whether to restrict incineration in certain parts of the Arctic?¹⁴⁷
• What measures to include, if any, relating to avoidance of interactions between ships and marine mammals or disruption of subsistence hunting?¹⁴⁸

Consensus has also yet to be reached regarding the best way to make the Polar Code mandatory with three main routes possible. Those options are: adopting the Code through amendment of the SOLAS Convention; developing amendments to key conventions, such as SOLAS, MARPOL, the AFS Convention and the BWC; and making the Code a stand alone agreement.¹⁴⁹

The Polar Code remains a “work in progress.” The DE Sub-Committee at its 56th session in February 2012 decided to refer
various chapters of the Code other relevant sub-committees for their consideration with their comments expected to be submitted to the DE Sub-Committee’s 57th session in March 2013. The Polar Code Correspondence Group has been re-established to further develop parts of the draft Code not referenced to other bodies and to report to DE 57. The original target completion date for negotiations in 2012 has now been extended to 2014.

**Deciding Whether to Ban the Use or Carriage of Heavy Fuel Oil on Ships in the Arctic**

Since the IMO’s Marine Environment Protection Committee in March 2010 adopted a ban on the use or carriage of HFO on ships operating in the Antarctic Treaty Area, effective from 1 August 2011, the question of whether a similar ban should be adopted for the Arctic continues to be debated. The Arctic Council’s Protection of the Arctic Marine Environment (PAME) Working Group is undertaking a project led by Norway to study the risks of HFO use in the Arctic and to possibly suggest international regulation.

Two options would exist for imposing a ban on HFO use or carriage in at least some Arctic waters. Annex I of MARPOL could be amended, as for the Antarctic or such a ban could be incorporated into the new Polar Code.

**Addressing Black Carbon and GHG Emissions from Ships**

While Arctic states might eventually work through the IMO to designate one or more areas of the Arctic as emission control areas, two air emission issues, black carbon and greenhouse gases, are presently taking priority attention within the IMO. Black carbon, emitted from ships through incomplete combustion of fuel, is a growing concern because of its climate warming potential. The MEPC has tasked the Bulk Liquids and Gases (BLG) Sub-Committee with investigating appropriate control measures to reduce the impacts of black carbon and to submit a report to the 65th session of the MEPC where the Committee would agree on appropriate action(s). The BLG Sub-Committee has established a correspondence group to examine issues pertaining to black carbon and the group is to report back to BLG 17.

While the IMO has adopted new regulations on energy efficiency for ships, sorting out further measures for reducing GHG emissions from ships remains a major challenge. Countries have disagreed over the most appropriate forum to address GHG emissions, IMO or the UN
Framework Convention on Climate Change processes, and whether a common but differentiated responsibility principle should apply in the shipping context. The possible adoption of market-based measures (MBM) has been particularly controversial with some delegations oppose to developing MBM as they believe the IMO should just focus on technical and operational measures. The MEPC has agreed that a further impact assessment on market-based measures is needed with a focus on possible impacts on consumers and industries in developing countries and will consider terms of reference for the assessment at its 64th session. The possible setting of GHG emission reduction targets for international shipping has also been deferred to MEPC 64.

Identifying and Taking Protective Measures for Ecologically and Culturally Significant Arctic Waters

While the Arctic Council’s 2009 Arctic Marine Shipping Assessment report, as one 17 recommendations, urged Arctic states to identify areas of heightened ecological and cultural significance and to implement protective measures, follow-through remains a challenge. Three working groups of the Council, the Sustainable Development Working Group, the Arctic Monitoring and Assessment Programme and the Conservation of Arctic Flora and Fauna, are cooperating in a study of areas of heightened ecological and cultural significance. Vessel-routeing measures in the Arctic remain sparse. Whether coastal states may move unilaterally to establish mandatory routeing in their EEZs by relying on the special legislative and enforcement powers given by Article 234 of LOSC is also a looming issue.

Dealing with Noise from Commercial Shipping

The need to address the issue of noise from commercial shipping and its adverse impacts on marine life remains a further challenge. The IMO’s DE Sub-Committee has been directed to develop non-mandatory technical guidelines for ship-quieting technologies as well as potential navigational and operational practices. The DE Sub-Committee at its 56th session decided to establish a Correspondence Group on Minimizing Underwater Noise with a mandate: to examine available options for ship-quieting technologies and operational practices; to develop non-mandatory draft guidelines for reducing underwater noise from commercial ships; and to submit a report to DE 57 in March 2013. Meanwhile, the International Standards Organization (ISO) has been developing a standard for the measurement and reporting of underwater
noise radiated from merchant ships with the publication of the final version of ISO 16554 expected in the second half of 2012.\textsuperscript{173}

**Ensuring Full Ratification of Relevant International Agreements**

While a detailed review of ratification records of key IMO conventions by Arctic states and other states is beyond the scope of this chapter, full ratification has been limited with the Ballast Water Convention and 1996 London Protocol being particularly problematic.\textsuperscript{174} As of 31 August 2012 only Canada, Norway, Sweden and the Russian Federation among Arctic states had ratified the Ballast Water Convention, and only 35 states overall, representing 27.95 percent of the world tonnage, had formally adopted the Convention. Only 42 states were Party to the London Protocol and, among Arctic states, non-Parties included Finland, the Russian Federation and the United States.

The record of ratification by East Asian states is also not strong. For example, the Ballast Water Convention has not been ratified by key countries, such as China, Japan and Singapore. Only China, Japan, the Philippines and South Korea have adopted the LP 1996.

**CONCLUSION**

The fast-changing Arctic, linked to thinning and decreasing ice-cover and globalization realities, is mirrored by a shifting governance regime for Arctic shipping. A mandatory Polar Code promises to join, hopefully within the next few years, the tangle of changing regulatory currents applicable to ships operating in the Arctic.

While the role of IMO is critical in ensuring safe and environmentally friendly shipping, the central roles of Arctic coastal states must not be forgotten and their sea of challenges. Improving Arctic marine infrastructure remains an especially daunting challenge with many dimensions including: port services and waste reception facilities; ice-breaker assistance; vessel traffic systems; navigational aids; hydrographic charting; and circumpolar environmental response capacity.\textsuperscript{175} Shipping infrastructure is clearly more advanced in the Barents Sea and Northern Sea Route regions than other areas of the Arctic.\textsuperscript{176}

The interests and values of Arctic indigenous peoples and local communities must also be recognized.\textsuperscript{177} Future shipping developments may bring both benefits but also potential risks and costs, both social and environmental, in the North. Identifying and protecting areas of heightened ecological and cultural significance in the Arctic from shipping impacts is a voyage hardly begun.

In light of the plethora of challenges, the time seems ripe for ex-
panding international dialogues on the future of Arctic shipping and how to ensure shipping occurs in harmony with environmental and human values in the Arctic. The roles of flag states, including those in Asia, and their interests and capacities must also not be forgotten! The proposed 2012-2016 North Pacific Arctic Conferences offer a promising venue and might even become closely linked with the ongoing work of the Arctic Council in relation to marine shipping.

Notes

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2. Art 211(6) does allow coastal states to work through the IMO to adopt special pollution prevention and navigational measures in their EEZs where international rules and standards are considered inadequate.
3. LOSC, supra note 1 at Art 38.
5. Article 234 states: Coastal States have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or the irreversible disturbance of the ecological balance. Such laws and regulations shall have due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence.
6. Arctic Shipping Pollution Prevention Regulations, CRC, c 353, s 29. The Regulations do allow limited exceptions such as engine exhaust and in emergency situations where deposits may be necessary for saving life or preventing the loss of a ship.
7. Arctic Waters Pollution Prevention Act, RSC 1985, c A-12, s 4.
8. Northern Canada Vessel Traffic Services Zone Regulations, SOR/2010-127. Vessels covered include, among others, those of 300 gross tonnage or more and those carrying as cargo a pollutant or dangerous goods.
12. One interpretation is that coastal states are given no greater powers over foreign shipping than those applicable in the territorial sea while another is that coastal states are granted broader powers, in particular to unilaterally adopt special ship construction, crewing and equipment requirements. AMSA, supra note 9 at 53. For strong support for the latter view with the negotiators implicitly accepting that the exceptional powers applicable to the EEZ would also apply to the territorial sea, see Pharand, supra note 11 at 47.
15. IMO, Information on the Mandatory Canadian Ship Reporting System in Canada’s Northern Waters (NORDREG), IMO Doc SN.
1/Circ. 291 (5 October 2010).

16. AMSA, supra note 9 at 53.

17. For example, Art 233 limits enforcement powers against non-sovereign immune vessels by states bordering straits. Enforcement measures for violations of navigational or environmental standards may only be taken if a foreign ship is causing or threatening major damage to the marine environment of the strait.

18. Pharand, supra note 11 at 46-47.


20. LOSC, supra note 1 at Art 21(2).

21. AMSA, supra note 9 at 53.


24. The first criterion for an international strait in Art. 37 is clearly met, namely, a geographical requirement that the strait connect one part of the high seas or an exclusive economic zone and another part of the high seas or an exclusive economic zone. The Northwest Passage links EEZs in the eastern and western Arctic. Pharand, supra note 11 at 36-37. Further controversy surrounds whether Canada can justify its drawing of straight baselines based on historic waters status or relying upon international law requirements for drawing baselines around a group of islands in the vicinity of the coast. See Donat Pharand, Canada’s Arctic Waters in International Law (Cambridge: Cambridge University Press, 1988) at 91-132 and 133-179.

25. Pharand, supra note 11 at 34-35.


27. For a review of the Maritime Labour Convention, 2006, see Moira McConnell, Dominick Devlin & Cleopatra Doumbia-Henry, The

28. Manila amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) and its Code, adopted on 25 June 2010, did establish new training guidance for personnel serving on board ships operating in polar waters. An overview of the Convention and Code is available through the IMO website at <http://www.imo.org/About/Conventions/ListofConventions/Pages/Default.aspx> (accessed 20 January 2012). The STCW Code provides rather general and rather minimal guidance, for example, for masters and officers in charge of a navigational watch in polar waters, the Code recommends training in various subjects including: knowledge of ice characteristics, a ship’s performance in ice and cold climates, voyage and passage planning, regional regulations and recommendations, equipment limitations, safety precautions and emergency procedures, and environmental considerations. Manila Amendments to the STCW Code, STCW/CONF. 2/34, 3 August 2010, Part B, s. B-V/g.

29. For a review of IMO’s liability and compensation agreements, see AMSA, supra note 9 at 65-66.


34. December 21, 1972, 1046 UNTS 120.
36. MARPOL, supra note 31 at Annex I, Regs 19 and 20.
37. Ibid at Reg 15(4).
38. Ibid at Annex II, Reg 11.
39. Ibid at Reg 13(2.1).
40. Ibid at Reg 13(6.1.1).
41. Ibid at Reg 13(8.2).
42. Harmful substances are those identified as marine pollutants under
the International Maritime Dangerous Goods Code, Annex III, Reg
1(1.1).
43. Ibid at Reg 2.
44. Ibid at Reg 3(1).
45. Ibid at Reg 5.
46. Ibid at Reg 7(1).
47. Supra note 31 at Annex IV, Reg 9.
48. Ibid at Reg 11. The IMO’s Marine Environment Protection
Committee has further recommended standards regarding the rate of
sewage discharge. See Res MEPC157(55) (13 October 2006),
Recommendation on Standards for the Rate of Discharge of
Untreated Sewage from Ships.
Environment Protection Committee on Its Sixty-Second Session,
50. Ibid through a new para 5bis added to Reg 1.
51. Ibid through a replaced Reg 11.
52. Supra note 31 at Annex V, Reg 3(1)(a).
53. Ibid at Reg 3(1)(b)(ii).
54. Ibid at Reg 5(1)(g).
55. Ibid at Reg 5(2). Except for the Wider Caribbean Region, such dis-
posal must be made not less than 12 nm from the nearest land.
56. Res MEPC. 201(62) (15 July 2011); MEPC, supra note 49 at Annex
13. The amendments will enter into force on 1 January 2013.
57. Ibid at Reg 3(1). The discharge of all plastics and cooking oil is al-
so specifically prohibited. Ibid at Reg 3(2)(3).
58. Ibid at Reg 4(1).
59. Ibid at Reg 4(2).
60. Such cargo residues must not contain any substances classified as
harmful to the marine environment taking into account IMO
guidelines. Ibid at Reg 4(3). Guidelines for the implementation of
the revised Annex V, adopted by the Marine Environment
Protection Committee in 2012, list various parameters where cargo
residues are considered harmful including carcinogenicity, muta-
genicity and reproductive toxicity. Res MEPC. 219(63) (2 March
2012); MEPC, Report of the Marine Environment Protection
Committee on Its Sixty-Third Session, MEPC 63/23/Add. 1 (14 March
2012), Annex 24, s 3.2.
61. The 2012 Annex V Guidelines further recommend that animal car-
casses generated during the normal operation of a ship should be discharged greater than 100 nm from the nearest land and in the maximum water depth possible. Ibid at s 2.12.5. Large mortalities in excess of those generated during the normal operation of a ship, for example, from an infectious disease outbreak or a heat wave, are not considered garbage and may be subject to the international ocean dumping regime. Ibid at s 2.12.12.

62. The 2012 Annex V Guidelines provide further guidance that a cleaning agent or additive is considered not harmful to the marine environment if it: is not a harmful substance in accordance with the criteria in Annex III and does not contain any carcinogenic, mutagenic or reprotoxic components. Ibid at s 1.7.5.

63. MARPOL Annex V (amendments), supra note 56, Reg 6(1.1).

64. Ibid at Reg 6(2).

65. Ibid at Reg 6(3). This is already a requirement under the existing Annex V.


67. MARPOL, supra note 31 at Annex VI, Reg 12(2).

68. Ibid at Reg 13.

69. Ibid at Reg 14(1).

70. Emission Control Areas may be designated for NOx or SOx and particulate matter or for all three types of emissions. Ibid at Reg 2(8).

71. Ibid at Reg 14(4).

72. See IMO, Information on North American Emission Control Area (ECA) under MARPOL Annex VI, MEPC.1/Circ 723 (13 May 2010). Effective for SOx and particulate matter emissions on 1 August 2012.

73. MARPOL, supra note 31 at Annex VI, Reg 16(1).

74. Ibid at 16(2).

75. Ibid at 16(3).


77. A considerable phase-in period is allowed as Administrations may choose to waive the mandatory requirements until at least 1 January 2017. Ibid at Reg 19(4)(5). A complex methodology is established for calculating energy efficiency designs for ships and three sets of guidelines have been issued: 2012 Guidelines on the Method of Calculation of the Attained Energy Efficiency Design Index (EEDI)
for New Ships; 2012 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI) and Guidelines for Calculation of Reference Lines for Use with the Energy Efficiency Design Index (EEDI). MEPC, supra note 60, Annexes 8, 10 and 11, respectively.

78. Ibid at Reg 22. Guidelines for the Development of a Ship Energy Efficiency Management Plan (SEEMP) were adopted in March 2012 and suggest various best practices for fuel efficient operation of ships such as: improved voyage planning; weather routeing; speed optimization; optimum trim and ballast; hull and propulsion systems maintenance; waste heat recovery; alternative fuels; and renewable energy sources such as wind or solar. Ibid., Annex 9.

79. AFS Convention, supra note 32 at Arts 4 and 5.

80. Ibid at Annex 1.

81. Article 18 of the Convention provides for entry into force twelve months after the date on which not less than thirty states, the combined merchant fleets of which constitute not less than thirty-five percent of the gross tonnage of the world’s merchant shipping, have become Parties.


83. Ballast Water Convention, supra note 33 at Reg B-4.

84. Ibid at Reg B-3.

85. The performance standard sets limits on the number of viable organisms in ballast water discharges and on the level of indicator microbes, such as E-coli and Vibrio cholera.

86. For systems using Active Substances, including the use of chemicals, the IMO has issued procedural guidelines and has established a technical GESAMP-Ballast Water Working Group to review management system applications and a three-stage approval approach applies: Basic Approval (allowing land-based and ship board testings to proceed), Final Approval (by the Working Group and MEPC) and Type Approval (by a Flag Administration). See “Procedure for approval of ballast water management systems that make use of Active Substances (G9), Res MEPC 169(57) (4 April 2008) [G9 Guidelines]. For management systems not using an Active Substance, for example deoxygenation, a testing procedure is outlined in IMO Guidelines for approval of ballast water management systems (G8) and only a Type Approval is required. Res MEPC 174(58) (10 October 2008). For a further review of the testing processes, see Lloyd’s Register, Ballast Water Treatment Technology: Current Status (June 2011) at 5-6.
88. Ibid at Annex, s 5.
89. Ibid at s 9.
91. AMSA, supra note 9 at 7.
92. The global market for purchasing and installing ballast water management systems has been estimated to be in the range of US $50 to $74 billion. Institute of Marine Engineering, Science and Technology (IMarEST), “Preview of global ballast water treatment markets”, MEPC 63/INF 11 (23 December 2011) at 1.
93. Between March 2006 and August 2011, 34 ballast water management systems making use of Active Substances, received Basic Approval and 20 received Final Approval in accordance with procedure G9. IMO, “List of ballast water management systems that make use of Active Substances which received Basic and Final Approval,” BWM.2/Circ.34 (9 August 2011).
94. “Present status of availability of ballast water management system installations on ships registered under the Indian flag” MEPC 64/INF. 27 (27 July 2012) and “Present status of ballast water management system installations on ships managed by Swedish shipowners” MEPC 64/INF. 5 (29 June 2012).
96. “Current status of the installation of ballast water management systems on board, submitted by China” MEPC 64/2/13 (27 July 2012); “Updated data and information on the status of ballast water management system installations submitted by Japan” MEPC 64/2/10 (27 July 2012); and “Current status of installation and information on availability of ballast water management systems, submitted by the Republic of Korea” MEPC 64/INF. 19 (27 July 2012).
97. MEPC, supra note 60 at para 2.22.
98. Ibid at para 2.24.
100. Report of the eighteenth meeting of the GESAMP—Ballast Water Working Group, MEPC 63/2/10 at para. 4.3.3.4 (11 November 2011).
101. However, it should be noted that the G9 Guidelines do provide that risk evaluations should qualitatively take into account cumulative effects that may occur due to the nature of shipping and port operations. G9 Guidelines, supra note 86 at para 6.4.2.

103. London Convention, supra note 34 at Annex I.


105. Wastes listed in Annex 1 which may be considered for dumping include: dredged material; sewage sludge; fish wastes; vessels and platforms or other man-made structure at sea; inert, inorganic geological material; organic material of natural origin; bulky items primarily comprising iron, steel, concrete and similarly unharmful materials for which the concern is physical impacts (limited to where wastes are generated at locations, such as small islands with isolated communities, having no practicable access to other disposal options); and sequestration of carbon dioxide under the seabed.


107. For a review of 17 guidelines supporting implementation of the Ballast Water Convention, see Rolim, supra note 82 at 130-134.

108. For a summary of the various ocean dumping guidelines, see VanderZwaag and Daniel, supra note 104 at 527-532.


110. The Arctic Marine Shipping Assessment specifically called upon Arctic states to explore the need for internationally designated areas for the purpose of environmental protection in regions of the Arctic Ocean, possibly by the designation of “Special Areas” or “Particularly Sensitive Sea Areas” through the IMO. AMSA, supra note 9 at 7. No such designations have yet been sought to date.

111. Adopted on 1 December 2005, IMO Res A. 982(24) [PSSA Guidelines].

112. Adopted on 29 November 2001, IMO Res A. 927 (22), Annex 1 (superceding previous Guidelines contained in resolution A. 720(17)).

113. IMO, MEPC.1/Circ.674 (31 July 2009).

114. PSSA Guidelines, supra note 111 at para 1.2.

115. Ibid at paras 7.1, 7.5.2.3. At least one proposed association protective measure should be included with a PSSA submission along with the legal basis.
117. They are: the Great Barrier Reef, Australia (1990); the Sabana-Camagüey Archipelago, Cuba (1997); Malpelo Island, Colombia (2002); the sea around the Florida Keys, USA (2002); the Wadden Sea, Denmark, Germany, Netherlands (2002); Paracas National Reserve, Peru (2003); Western European Waters (2004); extension of the Great Barrier Reef PSSA to include Torres Strait (2005); Canary Islands, Spain (2005); the Galapagos Archipelago, Ecuador (2005); the Baltic Sea area, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Sweden (2005); the Papahānaumokuākea Marine National Monument, USA (2007); and the Strait of Bonifacio, France and Italy (2011). IMO Particularly Sensitive Sea Areas, <http://www.im.org/OurWork/Environment/Pollution Prevention/PSSAs/Pages/Default.asp> (accessed 19 January 2012).

118. Supra note 112 at para 2.2.
119. Ibid at para 2.3.
120. Ibid at para 2.7.
121. Ibid at para 3.1-3.3.
122. MEPC, supra note 60 at Annex 27.
125. Ibid at para 10.
126. Demonstrated by proposals by Canada and the United States to establish routeing and reporting measures to protect the highly endangered North Atlantic right whale. Ibid at para 12.1.
127. Ibid at para 13.4.
128. IMO, Res A. 1024(26) [Polar Shipping Guidelines].
131. Polar Shipping Guidelines, supra note 128 at para 1.1.2 and Part A.
132. For example, all ships are urged to carry at least one Ice Navigator with the Navigator having documentary evidence of satisfactorily completing an approved programme in ice navigation, and on-the-job training of Ice Navigators is encouraged. Ibid at para 1.2.1 and 14.2.
133. Ibid at para 1.1.1 and 1.1.3.
134. Ibid at para 16.2.2.
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135. Ibid at para 16.2.1.
136. Ibid at para 16.3
137. The Guidelines only make one environmental reference, recommending special consideration be given to the environmental nature of the area of operation along with the limited resources and navigational information. The wording “environmental nature” appears to refer to the various possible hazards, such as ice, winds, tides and fog. Guidelines on Voyage Planning, supra note 129 at para 1.1.
140. As decided by the DE Sub-Committee in March 2011 and noted by the Marine Environment Protection Committee in July 2011. See MEPC, supra note 49 at para 11.14.
141. As suggested by a group of NGOs, FOEI/IFAW/WWF/Pacific Environment in submission to the DE Sub-Committee regarding the Pacific, DE 55/12/X (14 January 2011) and the Atlantic, DE 55/12/17 (28 January 2011).
142. For example, possible extension to cover barges, fishing vessels and pleasure craft. The DE Sub-Committee has decided that the Code should initially be developed to apply to SOLAS passenger and cargo ships with the possibility of expanding the scope of the Code to cover other vessels in the future. DE Sub-Committee Report to the Maritime Safety Committee, DE 56/25 (28 February 2012) at para 10.7.
144. For example, various NGOs have been urging prohibitions on discharges of oil, noxious liquid substances and garbage (except possibly for food wastes) in the Arctic and restrictions on the discharge of untreated sewage and greywater. See DE Sub-Committee, Report of the Correspondence Group, DE 56/10/1 (11 November 2011) at chapter 15, paras 15.3.2-15.3.7
145. The IMO has already adopted guidelines to control biofouling of ships with various measures urged, such as development of a biofouling management plan for each ship and regular inspection and cleaning. See 2011 Guidelines for the Control and Management of Ships’ Biofouling to Minimize the Transfer of Invasive Aquatic Species, Res MEPC. 207(62); MEPC 62/24/Add.1, Annex 26 (Adopted on 15 July 2011).
146. As suggested by FOEI/IFAW/WWF/Pacific Environment in a submission on the environmental protection chapter, DE 56/10/12 (24 December 2011) at paras 15 and 16.

147. See Report of the Correspondence Group, supra note 144 at para 15.3.8.

148. The IMO Sub-Committee on Safety of Navigation, requested to review possible inclusion in the Polar Code of provisions on polar vessel planning and operations to avoid interactions with cetaceans and marine mammals, decided at its 57th Session in June 2011 that the existing Guidance Document for Minimizing the Risk of Ship Strikes with Cetaceans was sufficient. See IMO, Outcome of NAV 57, MEPC 62 and FP 55, DE 56/2/1 (22 September 2011) at para 6. The United States has recently suggested including vessel planning in the Polar Water Operational Manual being proposed for carriage aboard ships in the Arctic. See IMO, Voyage Planning in the Polar Water Operational Manual, DE 56/10/9 (24 December 2011).


150. DE Sub-Committee, supra note 142 at para 10.25.

151. Ibid at para 10.32.

152. Ibid at Annex 16, 2.


155. MARPOL, supra note 31 at Annex 1, Reg 43.

156. See Submission on the environmental protection chapter, supra note 146 at para 11. As suggested by a number of NGOs.

157. Black carbon has been estimated to cause 680 times more warming than the same amount of CO₂ over 100 years and 2,200 times over 20 years. IMO, Reduction of emissions of black carbon from shipping in the Arctic, MEPC 60/4/24 (15 January 2010) at para 3.

158. Various measures have already been identified, such as reducing vessel speed, modifying vessel and propeller designs to reduce fuel consumption, use of wind-sails, improved ship routeing and installation of diesel particulate filters. See Reduction of emissions of black carbon from shipping in the Arctic, MEPC 60/4/24 (15 January 2010).

159. MEPC, supra note 49 at para 4.20.

160. BLG Sub-Committee, Report to the Maritime Safety Committee and the Marine Environment Protection Committee, BLG 16/16 (20 February 2012) at para 8.59.
161. See notes 76–78, supra and accompanying text.
162. For a comprehensive review of international efforts to reduce air pollution from shipping including IMO initiatives to address GHG emissions see Sherry P Broder and Jon M Van Dyke, “The Urgency of Reducing Air Pollution from Global Shipping”, in Aldo Chircop, Norman Letalik, Ted L McDorman and Susan Rolston (eds), The Regulation of International Shipping: International and Comparative Perspectives (Leiden: Martinus Nijhoff, 2012) at 249–291.
163. The nature of disagreements may be seen in the statements by delegations of Brazil, China, India, Saudi Arabia and Venezuela upon the adoption of the energy efficiency standards for ships at the MEPC’s 62nd session. MEPC, supra note 76 at Annex 20.
164. MEPC, supra note 60 at para 5.25.7.
165. Ibid at para 5.14.
166. Ibid at para 5.18.
167. Ibid at para 5.42.
168. AMSA, supra note 9 at 7, Recom II(c).
170. With Art 234 bestowing special powers to prevent, reduce and control marine pollution, it remains uncertain how far a coastal state may stretch the provision to cover maritime safety and navigational measures. See notes 13–15 and accompanying text.
171. For the latest proposal by the United States, see Proposed framework for non-mandatory guidelines, DE 56/24 (9 December 2011).
172. DE Sub-Committee, supra note 142 at para 24.6.
173. Ibid at para 24.5.
175. AMSA, supra note 9 at 7.
Comments on Chapter 3: Environmental perspective

Thomas L. Laughlin

This chapter summarizes the work of several organizations led by the International Union for Conservation of Nature (IUCN), the Natural Resources Defense Council (NRDC) and, more recently, the University of Alaska, Fairbanks. It explores options for mitigating the possible negative effects of shipping in the Bering Strait region. The views expressed are my own.

In November 2010, IUCN and NRDC, in cooperation with the Center for Marine Biodiversity and Conservation at the Scripps Institution of Oceanography, University of California, San Diego, convened a workshop to identify Ecologically and Biologically Significant Areas (EBSAs) of the Arctic marine environment. The workshop included thirty-four scientists and indigenous people’s representatives with expertise in Arctic marine ecosystems and their components. Workshop participants were asked to apply the seven criteria developed pursuant to the Convention on Biological Diversity (CBD) to the Arctic region to identify these areas. The criteria are uniqueness, life history importance, importance to endangered/threatened species, vulnerable/fragile/slow recovery areas, areas of high productivity, areas of high diversity; and “naturalness.” The importance of an area for subsistence or cultural heritage was also considered.

The workshop product is depicted in three broad geographical areas:

(1) Pacific: North Bering/Chukchi/Beaufort/East Siberian Seas;
(2) Northwest Atlantic: Labrador/Hudson Bay/Baffin Bay/Canadian Arctic; and
(3) Northeast Atlantic: Greenland Sea/Barents Sea/Kara Sea/Laptev Sea.

The focus of this chapter is on a subset of EBSAs in the Pacific, the first of these areas. The EBSA map developed by the workshop for this region is shown in Figure 3.4.
It is clear from this map that this region of the Arctic contains broad swaths of biologically and/or ecologically significant areas. In considering this picture, workshop participants concluded that it would be useful to further refine the map to identify those areas that meet most or all of the CBD criteria or which meet one or more of them at a global level of significance. The term “super EBSA” was coined to describe these areas. The map showing super EBSAs of the Arctic is shown in Figure 3.5.

These two maps show that, while the size of the area covered is significantly reduced when applying the higher “super” EBSA standard, the Bering Strait region remains almost completely identified as a super EBSA, indicating that it is one of the very most productive regions of the Arctic.

Ships transiting the Arctic and all other traffic supporting industrial development in the Beaufort and Chukchi Seas must pass through this area. We know that this traffic is expanding, but it is already considerable today. A recent map prepared by the Marine Arctic Exchange of Alaska (Figure 3.6) shows traffic through the region for the period May 1, 2010 to October 26, 2010. Based on Automatic Identification Systems
(AIS) data from the Marine Arctic Exchange vessel tracking system, there were approximately 240 transits of the Bering Strait by commercial vessels in 2010.

About half of these were domestic vessels (tugs, barges, fishing boats and landing craft). Twenty percent of these were cargo vessels calling on the Red Dog Mine and three percent were tankers, with the balance being passenger vessels, icebreakers, and research ships.²

**NAME WORKSHOP**

In light of current and projected ship traffic in the super EBSAs of the Bering Strait region, a workshop was convened in Nome, Alaska from June 26-28, 2012. The workshop was organized by IUCN, NRDC and the University of Alaska, Fairbanks. Over thirty individuals participated, including scientists, those working in government, in non-governmental sectors, and people from indigenous communities. The meeting focused on identifying options for the protection of three super EBSAs: St. Lawrence Island, the Bering Strait, and Wrangel Island.
The workshop identified four broad categories of activity in which actions would be fruitful, including: communications and outreach, protected areas, US-Russia bilateral opportunities, and development of a globally applicable polar code.

**Communications/outreach**

The meeting considered a wide range of communication and outreach options. The first set of activities involved gathering information regarding which communications technologies are currently working well in the region. Such information will allow communications systems to be built on the most robust available alternatives. At the same time, expert information would be sought on what technologies are available, including identification of existing “purpose-dedicated” systems (e.g. those established in support of oil development). Development of this information base could be supplemented by an experimental demonstration project applying one or more communications techniques, followed by a regional “lessons learned” workshop. In combination, these actions will enable local decisions about the creation of multi-function communications approaches.

Another form of communication supported by meeting participants
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was the development of a set of maps showing subsistence use of the Bering Strait marine region. Efforts are currently under way to produce these maps for the US side of the Strait. Once such maps are developed, and supplemented by similar maps within Russian territory, they should be provided to local, regional and national governments. These governments could then develop a set of voluntary measures to protect critical areas from the possible negative effects of shipping, based on the maps. One important advantage of voluntary measures is that they may be developed far more quickly than mandatory regulations. Moreover, they lend themselves more readily to bilateral agreement between the two Bering Strait states. Once developed, these measures would be shared with shippers operating in the region via appropriate government agencies (for example, in the US, the US Coast Guard).

Protected Areas

Several protected areas options were considered at the meeting. Of these options, the one that had the greatest attraction for the meeting participants was the Particularly Sensitive Sea Areas (PSSA) designation by the International Maritime Organization. The advantages of the PSSA designation include global recognition, as well as the ability to create measures under a PSSA designation which take into account subsistence use. Major disadvantages of the PSSA approach are the degree of effort and length of time such designation requires. In this regard, since a PSSA proposal must be based on a risk assessment, it was thought that a useful first step would to be to proceed with an initial assessment as soon as possible.

Bilateral U.S./Russia Opportunities

Participants stressed the importance of bilateral approaches to actions in the Bering Strait, in particular due to the transboundary cultural ties of the indigenous people living in the area. Two areas were thought to be promising with respect to reinvigorating bilateral discussions. The first, mentioned above, was the development of voluntary measures for regional shippers, based on information developed on subsistence use. If such measures were to be supported by both governments, the impact is likely to be significant, even if the measures are voluntary in nature.

A second area of bilateral discussion might focus on the possible development of a bilateral PSSA proposal to the IMO. A constructive exploratory step in this regard would be the conduct of a preliminary transboundary risk assessment in the Bering Strait region.
Polar Code

Workshop participants recognized the importance of the development of a mandatory polar code by the IMO. Slow progress in this regard lent support to the early development of a set of voluntary measures which might be agreed and promulgated in the interim and which may continue as supplemental to the content of an IMO product.

Possible Actions by North Pacific States

While this paper reports on a range of mitigation ideas applicable to the Bering Strait region, it is appropriate in the context of this meeting to consider what steps might be taken by North Pacific States to ensure that Arctic marine transportation is conducted in a safe and environmentally sound manner.

I suggest the following:

- Strongly support development and adoption of a mandatory polar code in the International Maritime Organization;
- Support designation of protected areas through international instruments, for example, the Convention on Biological Diversity; The World Heritage Convention, and the IMO;
- Contribute to the installation of search and rescue and navigation devices;
- Provide scientific information and share data;
- Contribute knowledge on both the science and management of Large Marine Ecosystems like the Yellow Sea; and
- Explore appropriate cost-sharing arrangement to fund ice breaking vessels with fire fighting and spill response capacity (adapted from A Shipping Solution for the Arctic Ocean; Simon Lisiecki, Arctic Imperative Summit, Girdwood, Alaska, June 21, 2011).

Notes

1. The full report of this meeting may be found at: http://data.iucn.org/btw-wpd/edocs/Rep-2011-001.pdf.
2. Source: Ed Page, personal communication
Comments on Chapter 3: Inuit perspective

Udloriak Hanson

I will confine myself to some broad observations from an Inuit perspective. I should underline that my perspectives are those of a Canadian Inuit. Undoubtedly, an Inuit from other parts of the circum-polar world would draw on similar, but subtly different, life experiences. My appreciation of the depth of expertise contributing to this discussion prompts my first point: Inuit are participating in debates about the current and future legal and political regimes governing Arctic marine areas at a clear disadvantage—namely, our limited expertise in the wide range of technical areas in question. International law, ship design, marine navigation, oil and gas drilling, geology, the interpretation of weather related and other baseline environmental data, spill avoidance and clean-up engineering are areas in which we do not, and cannot realistically hope at any time in the foreseeable future, to be able to compete with the kind of expertise that the governments of Arctic states, and even heavily interested non-Arctic states possess. We cannot afford to invest in building up and sustaining in-house or otherwise ready-to-reach expertise.

For that matter, many multinational resource development companies have, and will continue to have, access to human and financial resources that are beyond our grasp. Inuit do not fool ourselves, nor do we try to fool others about such reality. It would, however, be a serious error for others to conclude that the very real limitations of our technical knowledge base are reasons to ignore or underplay the central importance of Inuit opinions and priorities surrounding the Arctic area. Bigger is not always better and more information does not always translate into better quality decision making. The limited technical capacity of organizations representing circumpolar Indigenous Peoples impose additional legal, political, and moral responsibilities on states undertaking activities in the Arctic. As they go about their collective and separate activities they must do so in ways that invite a high level of indigenous participation.

Sometimes ensuring this participation requires states to provide direct, timely, and significant financial and other resources to representative indigenous organizations so that states can be better informed and can ultimately speak for Indigenous Peoples in international arenas with confidence. There is, of course, an important line between offering help and seeking to buy support. That is a line that must not be crossed. Like state governments, international Arctic bodies, and international bodies with mandates that include the Arctic institutions, should, ex-
licitly and energetically, pursue creative partnership with Indigenous Peoples. The Arctic Council is an example of how this can be done. In June of 2012, the Norwegian Foreign Minister made the following comments about the Council:

“Various political arenas of cooperation address issues related to the Arctic. Circumpolar and regional cooperation is well developed and steadily increasing. The Arctic Council is the most important forum in this respect. The indigenous peoples of the High North have been given their rightful place as permanent participants. Indigenous peoples’ traditional knowledge and skills are important, based as they are on a unique ability to live and work in the Arctic.”

(emphasis added)

Other forms of multiparty international partnerships with Indigenous Peoples should be explored. The same applies to domestic Arctic initiatives. For example, in Canada our previous national president of Inuit Tapiriit Kanatami raised the possibility of a joint Government of Canada/Inuit of Canada authority to manage the expected increase of ship traffic in the Canadian waters of the Northwest Passage, drawing both on the precedent of the Canada/United States St. Lawrence Seaway Authority, and on the partnership approach that is at the heart of the constitutionally protected treaties between Inuit and the Canadian Crown. The gap in technical capacity between indigenous organizations and state actors, whether operating on their own or through state-sanctioned international bodies such as the International Maritime Organization means that consultative exercises with Indigenous Peoples must be more than just shallow talk. The circulation of complex materials to indigenous peoples as part of a kind of scatter-gun, one-size-fits-all approach to communications with anyone and everyone is seldom helpful. International law underscores that indigenous peoples are not mere stakeholders to be lumped in with other stakeholders.

A preferable approach recognizes that consultation requirements with indigenous peoples must be carried out in a way that allows for a genuine and reciprocal exchange of assumptions, outlooks, and objectives. The principles set out in the United Nations Declaration on the Rights of Indigenous Peoples are relevant reference points, including the primacy of “free, prior and informed consent.” In Canadian Constitutional law, consultation with Indigenous Peoples must be in search of accommodation, not talk for the sake of talk. That is as it should be. Procedural opportunities do not mean very much in the absence of a willingness to give proper attention and weight to proposals for substantive change. In the pursuit of new approaches to international col-
Collaboration in the Arctic, including such things as the contents of an Arctic shipping code, it will be important to consider not just how such approaches can minimize or avoid altogether negative impacts on Indigenous Peoples. It will also be important to consider how such approaches can actively advance indigenous rights, interests, and well-being. These positive, proactive dimensions should be built squarely and centrally into interactions in the Arctic between Indigenous Peoples and states, and between Indigenous Peoples and state-sanctioned international bodies.

For example, at the end of the day, when looking at a final version of an Arctic shipping code, it will be important to ask the following questions:

- Was this proposed code developed in such a way as to not just allow, but to facilitate, indigenous participation?
- Does this proposed code accommodate indigenous rights and interests and promote indigenous well-being? How does it do so?
- How can objectives in this regard be met and measures be reliably implemented? Could this proposed code have gone further? and,
- Does this proposed code have the confidence and support of Indigenous Peoples?

Appropriate recognition of the Arctic as the homeland of Indigenous Peoples does not necessitate strained processes or awkward relations. The reality is quite to the contrary. In comparing statements by Arctic leaders, both indigenous and non-indigenous, there is reason to be optimistic that, with goodwill, hard work, and some imagination—things never to be taken for granted, of course—there can be a high level of convergence of indigenous and State goals.

Returning to the June 2012 speech by the Norwegian foreign minister, we read the following about the Government of Norway’s “vision for the Arctic region”:

“In the Government’s white paper on the High North from November 2011, our vision of the Arctic is summed up as follows:

1. Safeguarding peace and security;
2. Ensuring an integrated, ecosystem-based management regime and sustainable use of resources;
3. Strengthening international cooperation;
4. Strengthening the basis for value creation.

In other words, we want to make use of the opportunities that are
opening up while at the same time managing the risks involved peacefully, sustainably, and responsibly.”

One would hope that principles such as these would have wide understanding and support. Inuit from the circumpolar region have made a conscious effort to relay to the international community, in a constructive and transparent way, the fundamental principles that should govern resource development in Inuit Nunaat, the lands and waters that make up the Inuit homeland in Greenland, Canada, Alaska, and Chukotka. Governance of resource development extends, of course, not just to the issues surrounding the creation and administration of rights of access and exploitation of natural resources. Governance also extends to all the ancillary activities necessary to support such exploitation, including Arctic shipping, environmental standards and measures, and the creation and maintenance of the wider networks of infrastructure and community development that must figure prominently in determining the location, pace, and management of development in Inuit Nunaat. Inuit have communicated our views in a variety of ways and venues. An important Inuit communications mechanism has been the 2011 document entitled, A Circumpolar Inuit Declaration on Resource Development Principles in Inuit Nunaat.

This Declaration followed logically and consistently from the companion 2009 document entitled, A Circumpolar Inuit Declaration on Sovereignty in the Arctic.

I would urge all of those who are working on Arctic issues, whether in highly technical areas, or broad legal, political, and policy issues, to make themselves familiar with the context and contents of this Resource Development Declaration. I will not repeat the detailed points in the Declaration but I will point out the various headings that speak directly to our conference’s focus. They include:

- 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.

Inuit leaders have not pushed Arctic and other states to provide formal endorsement of this Declaration or its companion Declaration on
Sovereignty. Inuit do, however, invite all those with relevant jurisdic-
tional and other responsibilities to acknowledge the value of this
Declaration as a careful, balanced, and equitable contribution to the
building up of a positive international order in the Arctic, and to look
to this Declaration as an appropriate benchmark of contemporary Inuit
positions and expectations.

Comments on Chapter 3: Japanese Perspective

Toshiyuki Kano

The Northern Sea Route (NSR) has been discussed from many points
of view. The shipping route that links Europe and Asia could reduce
the distance cargo must travel by forty percent of the traditional route
through Suez Canal. Environment measures prepared by the
International Maritime Organization (IMO) are under consideration to
be applied to existing rules. Arctic sea ice is predicted to decrease
sharply by 2030, making it possible for vessels to navigate the route
during the winter season with icebreaker support. This possibility also
leads to reduced fuel consumption as well as reduced greenhouse gas
emission for ships passing through the route.

CLOSE THE GAPS

It is clear that the Arctic Sea environment is vulnerable. The current
IMO rules are based on international research and monitoring of the
viability of species in the NSR area. The outcomes of a great number
of research and monitoring activities are stored in the database. The
database provides a convenient tool for the subsequent analysis of NSR
activities, in both the short and long terms. For identifying and taking
protective measures, high quality assessment is useful and important.
The quality of future assessments, however, will rely on the quality of the
baseline data. A data survey is a continuous process and several field
surveys must be carried out each year. Continuous updating is necessary
to keep the database at an acceptable standard. Responsibility for these
data maintenance, research, and monitoring efforts should be shared by
both north Pacific Arctic countries and north Pacific potential users.

If the research and monitoring data are available to stakeholders,
these efforts can also close the knowledge gaps and mitigate substantial
uncertainties and regarding the nature of environmental change, the
geological potential of the Arctic, environmental baseline, and methods for dealing with risks associated with significant industrial activities in the Arctic. Rules related to the Arctic Sea are discussed in the Arctic Council with the eight member countries, Canada, Russia, Denmark, Norway, Sweden Finland, Iceland, and the United States. Marine accidents and rescue operations in the Arctic sea were also discussed and an international rule agreed upon in the Arctic Council. Countries such as China, Japan, and Korea should have a role as countries that contribute to this conversation, because they are strong candidates to be potential users of the Arctic Sea.

ICE-CLASS SHIP'S ENERGY EFFICIENCY

In terms of shipping containerized freight between Northeast Asia and Northwest Europe, the NSR has the apparent distance and time advantage over the route through the Suez Canal. While there is a possibility of crossing the NSR with advanced ice-capable ships, the economic and operational aspects of these routes have not yet been fully explored. Energy efficiency for ice-class ships have unique characteristics compared with conventional ships. The Ship and Ocean Foundation, Japan, organized a one month experimental voyage through the NSR in the summer of 1995 to make a comprehensive survey of safe and efficient ice navigation through the route. A variety of measurements were performed for purpose such as the general evaluation of the voyage, observation of natural conditions, evaluation of satellite ice images, and investigation of ship performance (Yamaguchi 1995).

Figure 3.7 shows a speed-power plot, that is, the variation of the shaft horsepower with the ship speed obtained in the Okhotsk Sea, Bering Sea, and Bering Strait. Almost the same results were obtained in the three areas. The shaft force power was not zero near the zero value of ship speed, since the propeller was rotating and had a slight blade pitch when the propeller blade angle was set at 0%. The maximum speed was 15 knots at a power of 13700 ps. Figure 3.8 shows the principal particulars and general figures of the ship, respectively. The Kandalaksha is a 173 meter-long 14700 dwt multipurpose cargo vessel, belonging to the highest Russian ice class for a cargo vessel, the ULA Class (Yamaguchi 1995).

Figure 3.9 shows the variation of shaft horsepower with ship speed for a different level of ice concentration in the decayed multi-year ice of the East Siberia Sea. The shaft horse power became larger as the ice concentration exceeds 5. The maximum shaft horse power was 13,000 ps for the ice concentration of 8-10 (Yamaguchi 1995).
Figure 3.7. Power Speed Test Results in Open Water

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length O.A.</td>
<td>173.0 m</td>
</tr>
<tr>
<td>Length B.P.</td>
<td>159.0 m</td>
</tr>
<tr>
<td>Breadth molded</td>
<td>24.0 m</td>
</tr>
<tr>
<td>Depth molded</td>
<td>15.2 m</td>
</tr>
<tr>
<td>Draft, summer loadline</td>
<td>10.5 m</td>
</tr>
<tr>
<td>Draft, Arctic subdivision loadline</td>
<td>9.0 m</td>
</tr>
<tr>
<td>Dead Weight, summer loadline</td>
<td>19442 ton</td>
</tr>
<tr>
<td>Dead Weight, Arctic subdivision loadline</td>
<td>14700 ton</td>
</tr>
<tr>
<td>Main Engine</td>
<td>2×Wärtsilä Sulzer 14ZV 40/48</td>
</tr>
<tr>
<td>Engine Output</td>
<td>2×7700 kW (21000 BHP)</td>
</tr>
<tr>
<td>Propeller</td>
<td>1×CPP, 4 blade, Dia.=5.6 m</td>
</tr>
<tr>
<td>Endurance</td>
<td>16,000 SM</td>
</tr>
<tr>
<td>Tank Capacity:</td>
<td></td>
</tr>
<tr>
<td>Heavy Fuel Oil</td>
<td>3740 m³</td>
</tr>
<tr>
<td>Diesel Oil</td>
<td>783 m³</td>
</tr>
<tr>
<td>Lub, Oil</td>
<td>85 m³</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>174 m³</td>
</tr>
<tr>
<td>Fresh Water</td>
<td>501 m³</td>
</tr>
<tr>
<td>Water Ballast</td>
<td>972 m³</td>
</tr>
<tr>
<td>Accommodation</td>
<td>52 persons</td>
</tr>
</tbody>
</table>
Figure 3.8. The principal particulars and general figures

Figure 3.9. Power Speed Test Results in Multi-year Ice of the East Siberian Sea
Figure 3.10 shows the variation of shaft horse power with ship speed for different levels of ice concentration only for decayed first-year ice in the Laptev Sea. The correlation between the shaft horse power and ice concentration is not clearly confirmed. The ship speed and shaft horse power ranges are 4-11 knots and 3,000-6,500 PS, respectively. The maximum shaft horse power is 6,500 PS which is half that in the East Siberian Sea (Yamaguchi 1995).

These results show the energy efficiency in ice-capable ships is inferior to conventional ships, not only in ice operation but also in the open sea. Therefore, while GHG emission decreases over a shortened distance, propulsion performance is inferior to conventional ships and thus emission increases. In light of global environmental issues, the propulsion performance of advanced ice-capable ships in practical use in the NSR should be estimated. Additionally, the total amount of emissions from ships in the NSR and the Suez Canal Route should be estimated and compared. Estimation also directs attention to the environmental impact and final operational capacity cost of each navigation option.
ENVIRONMENTAL SAFETY OF NUCLEAR ICE-BREAKERS

The environmental safety of nuclear ice-breakers in normal and emergency condition is another important consideration (Provdin, Tkachev, and Levin 1994; Semanov 1995). If there are failures in the reactivity systems, primary coolant system, and stranding of icebreaker or ship collision, the implications for nuclear-powered ships must be considered. Emergency-level rises in neutron power, pressure and temperature within primary coolant systems, and reduction or failure of core heat removal are among the possible aftereffects of nuclear propulsion plant and nuclear steam supply system malfunctions.

DEVELOPMENT OF NSR

A shipping route that directly links Europe and Asia would increase shipping in the Russian coastal area. This may dramatically improve Russia’s ability to supply their resources of nickel, copper, coal and oil to the global market. If the LNG large-scaled facility construction plan is implemented, considerable transportation increase in this shipping route would be expected. It is therefore necessary to survey the navigation route accurately. Some Russian ports need to open and provide necessary services with fair price including bunkering and maintenance to improve convenience of transportation for foreign ships. Ports, ice-breakers, and freight ships need to improve interoperability to develop this operating system. Currently, there are many convenient ports like Singapore that provide high quality services to foreign ships at a fair price on the route through the Suez Canal. The advantage for NSR in this regard should be verified compared to the Suez Canal Route.

SAFETY NAVIGATION SUPPORT INFORMATION SYSTEM

Professor H. Yamaguchi of Tokyo University mentioned (Yamaguchi 1995) a future ice navigation system that could monitor navigation in NSR and provide information on ice floes and safe routes in the Arctic Sea (Figure 3.11). Such a system could allow could help ship avoid accidents at sea and make a contribution to safe navigation that in turn leads to environmental conservation as the number of spills and disasters is curtailed. Current satellite radar can provide information on ice properties as well as the extent of ice. If we can obtain accurate ice information and have access to tools for predicting the future ice con-
dition precisely, we can select the optimum route for a particular ship whose capabilities are known. Also, the rapidly advancing shipbuilding technology will soon enable the design and construction of an optimum ship if we can estimate the ice conditions to which she will be subjected. Close cooperation between shipbuilders, operators and cargo owners is required to realize such a system. Because a ship must be independent to some extent, each ship should have a subsystem to monitor its vicinity and immediate conditions in order to sail independently in the case of emergency and to complement the whole system. Such a system contributes to the avoidance of accidents and prevents pollution from ships. In addition, information on radiation in normal and emergency conditions may be included in the monitoring system in the case of the nuclear ice-breakers supporting international shipping.

Notes

1. PS is Metric Horsepower.
The IMO and Arctic marine environmental protection

References


Comments on Chapter 3: Korean perspective

Hyun-Kyo Seo

In response to Professor David VanderZwaag’s informative offering on Arctic marine protections, I wish to briefly present several related issues from the Korean perspective. The Korean Ministry of Land, Transport and Maritime Affairs (MLTM) is participating in an online Intercessional Contact Group (ICG) led by Norway regarding the Polar Code. MLTM in turn facilitates meetings of a group of domestic experts including members of the Korea Register of Shipping, Korea Polar Research Institute (KOPRI), and members of industry, in particular ship-building companies, to deal with issues raised by the online ICG. When I participated in the domestic expert meeting in July, 2012, it was clear that the government and industry jointly prioritize the sustainability of the polar region and are together trying to review the draft polar code with the goal of fortifying the protection of the polar environment and ensuring safety as international efforts are undertaken there (Arctic Council, ATCM). Korea’s world class ship building industry is at the forefront of cutting edge environmentally friendly techniques and fully supports the government’s position in the discussion of the Polar Code.

Korea tries to take international regulations and standards into consideration in operation of its infrastructure. For example, on the regulation of Heavy Fuel Oil, a kind of diesel fuel called Marine Gas Oil (MGO) is in use in Aron, Korea’s icebreaking research vessel and at the Antarctic King Sejong station. The Antarctic Jang Bogo station is designed to use similar oil and to be run at high energy-efficiency, both of which are called for in the final Comprehensive Environmental
Evaluation already approved by the 35th Antarctic Treaty Consultative Meeting in 2012. Araon was also designed to minimize the emission of black carbon and GHG gas (i.e. refrigerant for freezer). In operating Araon, Korea is trying to mitigate ballast water issues and noise during Arctic and Antarctic cruises.

The Arctic environment is abruptly changing as a result of global climate change. With the increase of shipping activities in the Arctic, the frequency of emergencies is expected to rise, accordingly. Search and rescue operations are critical to consider in human life-saving precautions and environmental protection in the Arctic. In the meantime, an agreement which deals with search and rescue of aeronautical and maritime vessels and passengers, was signed at the Arctic Council ministerial meeting in Nuuk, May 12 2011. This agreement was the first international agreement written exclusively for the Arctic region and the first international agreement made by Arctic Council. The Agreement, entitled “Aeronautical and Maritime Search and Rescue in the Arctic” was made in accordance with the 1944 Convention on International Civil Aviation and 1979 International Convention on Maritime Search and Rescue. The Agreement is the beginning of cooperation among the Arctic Council’s eight member countries, and they are now obliged to exchange general information, share information on search and rescue facilities, exchange knowledge of fueling, supply and medical facilities, and details on the training of search and rescue personnel. Korea welcomed the agreement search and rescue operation in the Arctic. Korea, Japan, China, and the European Union are interested in Arctic issues and especially want to join the Arctic Council as the permanent observer states. These nations should support and participate in search and rescue in the Arctic.

Recently, the vessel Araon was involved in search and rescue activities in the Antarctic. Araon rescued thirty-one crewmembers of Sparta, a Russian fishing vessel, trapped in thick sea ice on the Ross Sea during the 2011 Christmas holiday, sacrificing several days of a research cruise to make the rescue. Araon also rescued the crew of the Korean fishing vessel Jungwo-2 on the Ross Sea in January, 2012. As a national operator of Korean polar infrastructure, KOPRI will answer international requests for help in cases of emergency in the Polar Sea, when appropriate.

Korea applied to be an ad-hoc observer of the Arctic Council, and received that status in November, 2008. Since that affiliation was formalized, KOPRI’s staff has participated in the meetings as an expert contingent of national delegates. They attended the Arctic Council ministerial meeting, the Senior Arctic Officials meeting, as well as the Arctic Monitoring and Assessment Programme (AMAP) meeting in
Helsinki in 2009 to support the Ministry of Foreign Affairs and Trade. Korea’s permanent observer status to the Arctic Council will lead KOPRI in the future to participate actively in the various monitoring and research programs led by working groups under the Council. Under the Article 234 of United Nations Law of the Sea Convention (LOSC), Korea joined LOSC in 1996, and a Korean expert, Dr. Yong-Ahn Park, is one of the members of the UN Commission on the Limits of the Continental Shelf. Another Korean expert, Dr. Jin-Hyun Paik is one of the judging members of International Tribunal for the Law of the Sea (ITLOS). Korea tries to respect the positions of the Arctic coastal countries on the issues relevant with Article 234.

For the sake of comprehensive Arctic sustainability, scientific research and relevant monitoring on the Arctic environment and ecosystems should be encouraged and supported, with a preference for research that protects the environment and indigenous people. The Arctic and the Antarctic are the world’s most uncontaminated areas and are especially vulnerable to climate change. In particular, environmental protection is crucial issue because the Arctic area is the homeland of indigenous people. Any decrease of sea ice in the Arctic raises expectations about developing and using the resource because of greater accessibility, but sustainable development is one of the main goals of the Arctic Council and for this reason scientific research and surveys preceded development of the Arctic region. Arctic states and non-Arctic states should work together through research collaboration to ensure environmental protection of the vast Arctic area and scientific research activities to address Arctic environmental issues should be further supported.