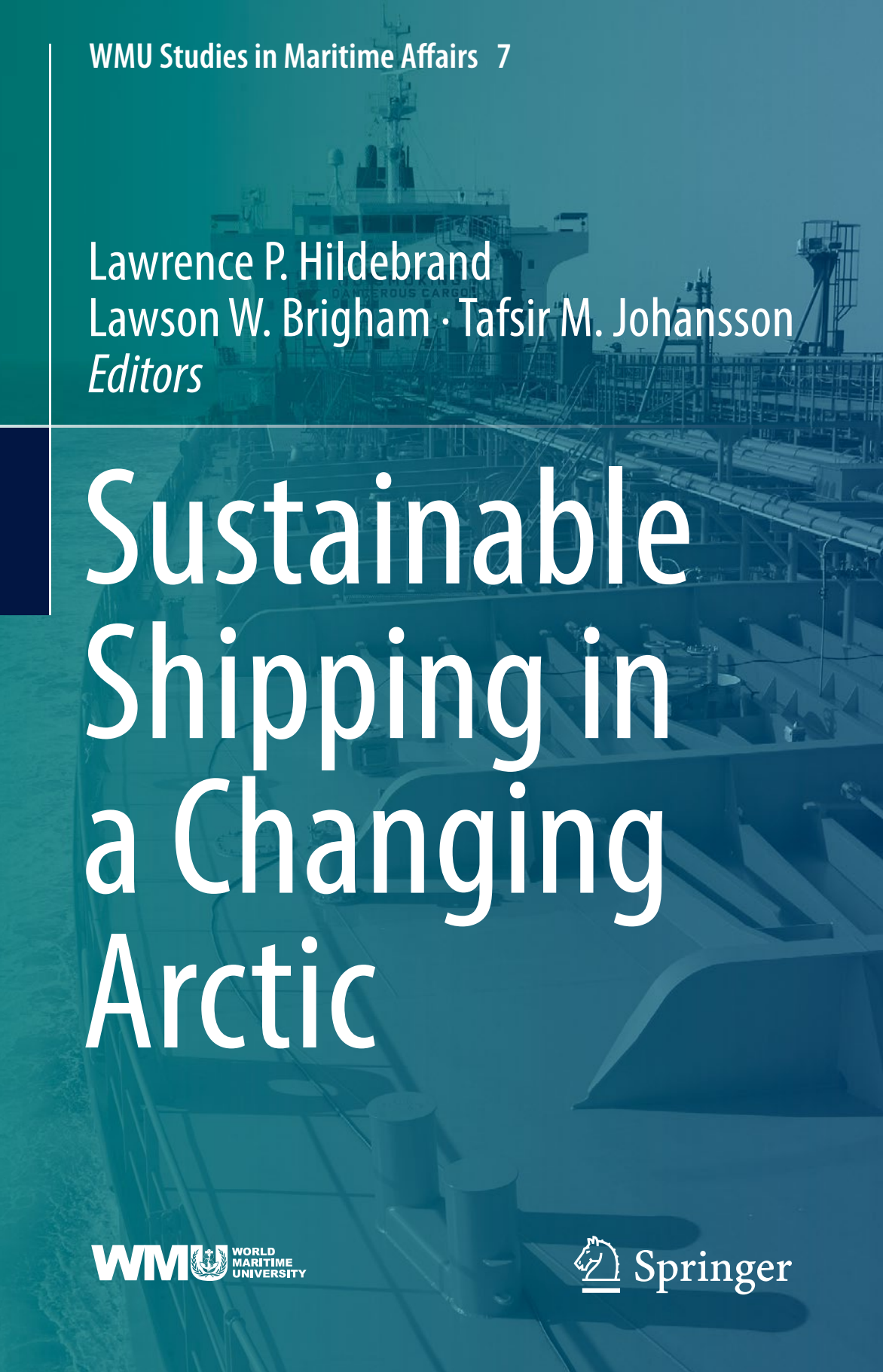
WMU Studies in Maritime Affairs 7

Lawrence P. Hildebrand
Lawson W. Brigham · Tafsir M. Johansson
Editors

Sustainable Shipping in a Changing Arctic



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Sustainable Shipping in a Changing Arctic

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Foreword

As the President of the World Maritime University (WMU), it is my pleasure to introduce the seventh volume of the WMU Studies in Maritime Affairs book series published by Springer, titled *Sustainable Shipping in a Changing Arctic*. This series was launched in 2013 to encourage academics and practitioners from all areas of specialization across the field of maritime affairs to contribute to the expansion of knowledge through publications of the highest quality and market relevance. Previous books in the series include *Farthing on International Shipping* (2013), *Piracy at Sea* (2013), *Maritime Women: Global Leadership* (2015), *Shipping Operations Management* (2017), *Corporate Social Responsibility in the Maritime Industry* (2018), and *Trends and Challenges in Maritime Energy Management* (2018).

With this book series, the WMU aims to further develop capacity and expertise in maritime education and training; maritime law and policy; maritime safety and environmental administration; port management, shipping management, and logistics; maritime energy management; and ocean sustainability, governance, and management. The book series also serves as a platform for promoting and advancing the UN 2030 Agenda for Sustainable Development and the marine-related Sustainable Development Goals, particularly Goal 14 on oceans as well as the interconnected Goals 4 (quality education), 5 (gender equality), 7 (affordable and clean energy), 9 (industry, innovation, and infrastructure), 13 (climate action), and 17 (partnerships).

WMU is a postgraduate maritime university established in 1983 by the International Maritime Organization (IMO), a specialized agency of the United Nations. It aims to further enhance the objectives and goals of IMO and IMO member states around the world. The fundamental objective of the University is to provide the international maritime community, and in particular developing countries, with a centre for advanced maritime and ocean education, research, scholarship, and capacity building and an effective means for the sharing and transfer of technology from developed to developing maritime countries, with a view to promoting the achievement, globally, of the highest practicable standards in matters concerning maritime safety and security, efficiency of international shipping, the prevention and control of marine pollution, including air pollution from ships, and other marine and

related ocean issues. We also facilitate the harmonization, uniform interpretations, and effective implementation of maritime Conventions and related instruments.

This book gives particular emphasis to one such recent instrument, the IMO Polar Code for ships operating in Arctic and Antarctic waters. The Polar Code came into force on 1 January 2017. It marks a historic milestone in the work of the IMO by specifically addressing the importance of protection of the polar environments and going above and beyond those of existing IMO Conventions such as MARPOL, SOLAS, and STCW.

WMU is also a platform for knowledge generation, exchange, and dissemination, through seminars, workshops, and major conferences. Indeed, the genesis of this book was a successful conference, co-convened by WMU, IMO, and the Arctic Council's Protection of the Arctic Marine Environment (PAME) Working Group in Malmö, Sweden, in August 2015, titled *Safe and Sustainable Shipping in a Changing Arctic Environment* (ShipArc2015). This conference brought together leading figures in Arctic climate change, polar shipping, maritime law, environmental protection, and Arctic marine policy.

Sustainable Shipping in a Changing Arctic comes as a response to a profoundly changing Arctic marine environment with expanding marine use. It aspires to become a one-stop read for all interested parties from both the maritime business sector and academia. The chapters are written by world renowned academics and practitioners, all experts in their subject area. The book covers broad areas that focus on safe and sustainable shipping in a changing Arctic, a highly relevant topic that requires integrative knowledge and technical expertise spanning various disciplines.

This edited volume addresses a fundamental gap in the contemporary literature on the maritime Arctic. It offers a vital reference guide for Arctic and non-Arctic states and those with an interest in the Arctic, including the regulatory community, governments, the shipping industry, natural resources industries, and nongovernmental organizations. This volume will also serve as a teaching supplement in academic and professional maritime programmes.

I invite you to read this book and I am confident that you will find it relevant and responsive to your needs to know more about the new maritime Arctic.

World Maritime University, Malmö
Sweden

Cleopatra Doumbia-Henry

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Introduction to the New Maritime Arctic

Lawson W. Brigham and Lawrence P. Hildebrand

Contents

Abstract Fundamental changes continue to reshape the maritime Arctic. Globalization (the linkage of Arctic natural resources to global markets), profound climate change, regional and global geopolitics, and challenges to the Arctic's indigenous people are all drivers of a new era at the top of the world. The Arctic Council's Arctic Marine Shipping Assessment released in 2009 continues to be a key, policy framework of the Arctic states for protection of Arctic people and the marine environment. An International Maritime Organization (IMO) Polar Code ushered in on 1 January 2017 a new era of governance for commercial ships and passenger vessels sailing in polar waters. Current Arctic marine commercial traffic is dominated by destinational voyages related to natural resource development, particularly along Russia's Northern Sea Route. New Arctic marine operations and shipping are emerging, but significant challenges remain including: effective implementation and enforcement

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of the IMO Polar Code; a huge gap in Arctic marine infrastructure (hydrography and charting, communications, emergency response capacity, and more); enhancing the monitoring and surveillance of Arctic waters; the challenge of developing a set of marine protected areas and additional Polar Code measures for the circumpolar region; and, the need for large public and private investments, as well as potential public-private partnerships in the Arctic. Cooperation among the Arctic states, the non-Arctic shipping states, and the global maritime enterprise will be critical to effective protection of Arctic people and the marine environment, and developing sustainable strategies for the region.

Keywords Arctic marine traffic · Infrastructure · Polar Code · Arctic Marine Shipping Assessment · Arctic Council · Marine safety · Environmental protection

1 Introduction

Fundamental changes have come to the maritime Arctic early in the twenty-first century. The Arctic Ocean's sea ice cover is undergoing a profound transformation in extent, thickness and character (witness the transition from multiyear ice to dominant first year ice). The Arctic is becoming more integrated with the global economy through development of its vast natural resources including not only oil and gas, but also a suite of hard minerals such as cooper, nickel, palladium, zinc and more. These economic developments require new marine transportation systems that can operate safely and effectively in ice-covered waters. While the Arctic states have cooperated closely within the Arctic Council since its establishment in 1996, outside geopolitics and the involvement of many non-Arctic states in Arctic affairs have created a far more complex situation than at any time after the Cold War. Also, the process of the delineation of the outer continental shelf in the Arctic Ocean is simultaneously underway as provided for in the United Convention on the Law of the Sea (Article 76 of UNCLOS). The voices of the Arctic indigenous peoples are also being heard more clearly in the Arctic states, the Arctic Council, and international bodies such as the United Nations and the International Maritime Organization (IMO). Within this complex of changes is a continuing global process to establish an integrated system of rules and measures to govern Arctic marine safety and environmental protection. One of the central challenges is to preserve the basic principles of freedom of navigation (established by UNCLOS and customary law) with the rights of the Arctic indigenous people and the overall sustainable development of the region.

An important issue to address is how 'Arctic shipping' should be defined in this volume and within the larger community of Arctic Ocean users, regulators, and stakeholders. A narrow approach would be to focus solely on trans-Arctic voyages, potential shipping routes (although seasonal) across the Arctic Ocean, that have been promoted in the global media. However, most voyages today and those in the future are considered destinational in that a ship enters the Arctic, perhaps delivers and

loads cargoes, and then sails out without transiting between oceans. Most Arctic tourist cruises are also destinational in taking passengers to locations such as Svalbard, Greenland and the Canadian Arctic. A more holistic approach, used in the Arctic Council's Arctic Marine Shipping Assessment (AMSA), is to include all vessels (100 tons or more was chosen in AMSA) that operate in the Arctic and are discharging into Arctic waters and releasing emissions into the lower atmosphere. Recent approaches in the Arctic Council use the more inclusive term 'Arctic marine operations and shipping' which includes all sectors such as fishing and especially offshore development, which normally requires an armada of support vessels around drilling rigs (PAME 2013). The main issue is that approaches need not be constrained by the perceptions and possibilities of trans-Arctic navigation. Using a broad definition such as 'marine operations and shipping' includes all vessels and better represents the future levels of Arctic traffic that can be used to develop measures to protect Arctic people and the marine environment (Brigham 2017).

2 Arctic Marine Shipping Assessment: Policy Framework

The AMSA 2009 Report released by the Arctic Council after approval by the Arctic Ministers (in Tromso, Norway at the Arctic Council Ministerial meeting in April 2009) remains an influential, strategic document. AMSA should be viewed in three key perspectives:

- As a baseline assessment of Arctic marine operations across all sectors using the AMSA database collected from the Arctic states and as an historic snapshot of Arctic marine use early in the twenty-first century.
- As a strategic guide for the Arctic and non-Arctic states, the Arctic indigenous people, the global maritime industry, and a host of actors and stakeholders who have interests in the future of the maritime Arctic.
- As a policy document of the Arctic Council since the AMSA 2009 Report and its recommendations were approved in consensus by the eight Arctic Ministers after a lengthy negotiation process led by the Senior Arctic Officials and Arctic state representatives in the PAME Working Group.

The study report highlighted 96 findings that included such fundamental topics as: UNCLOS being the legal framework for Arctic ocean governance; the IMO being the appropriate international body for the Arctic and non-Arctic states to turn to for issues related to Arctic maritime safety, environmental protection, and security (the report noted all eight Arctic states are active and influential IMO members); as of the release of AMSA in 2009 there were no mandatory IMO safety and protection rules or standards for polar ships, only voluntary guidelines; despite the profound changes in sea ice in recent decades the Arctic Ocean remains ice-covered for much of the year, not ice-free; nearly all current Arctic marine traffic is destinational not trans-Arctic voyaging (the same is true for traffic in 2017); the most significant threat of ships to the Arctic marine environment is the release of oil from accidental or

illegal discharge; the key drivers and uncertainties of future Arctic navigation are Arctic natural resource development (and trade) and the state of governance for ships operating in the Arctic Ocean; a large number of uncertainties influence the future of Arctic marine activities, most significant being global commodity pricing (from the AMSA scenarios creation effort); and, Arctic shipping can have both negative and positive impacts on the social, cultural and economic conditions in coastal communities (from the AMSA Town Hall meetings) (AMSA 2009). All of these findings have significant implications for new regulatory and governance requirements for an increased number of ships operating in polar waters.

The 17 AMSA recommendations negotiated by the Arctic states are included in three, inter-related themes: I. Enhancing Arctic Marine Safety; II. Protecting Arctic People; and, III. Building the Arctic Marine Infrastructure (see Appendix B). Addressing all three themes is critical to achieving enhanced marine safety and environmental protection throughout the Arctic Ocean. Although AMSA did not focus on investment and funding these recommendations, it noted all would require broad international cooperation and likely public-private partnerships. The Arctic marine safety recommendations involved the IMO, particularly a focus on mandatory rules and regulations for ships operating in polar waters and moving beyond voluntary rules. The second set of recommendations considered a range of protection strategies and greater engagement with coastal communities. An important recommendation called for surveys of indigenous marine use, critical information given integrated, multiple use management approaches in the future (one example is ecosystem-based management), and the designation of special Arctic marine areas. Other significant impacts addressed by the AMSA recommendations include: invasive species, oil spills, effects on marine mammal, and air emissions (AMSA 2009).

The third theme of AMSA recommendations focused on the critical importance and lack of marine infrastructure throughout most the Arctic marine environment (AMSA 2009). The Arctic lacks a host of infrastructure that is central to marine safety and environmental protection including: hydrographic data and adequate charting; environmental monitoring and forecasting (sea ice, weather and icebergs); SAR capacity; environmental response capacity; ship monitoring and tracking systems (situational awareness which is reviewed extensively in this volume); salvage; deep water ports and port facilities; aids to navigation; adequate communications; and, more. The Arctic states in AMSA recognized that each marine infrastructure need will require significant and committed long-term funding. Public-private partnerships could be established for joint funding of ports, ship monitoring and surveillance systems, and communications systems.

In summary AMSA remains for the Arctic states and Arctic Council a key, framework policy document. Status reports for implementation of the AMSA recommendations have been issued by PAME and the Council at Ministerial meetings in Nuuk (2011), Kiruna (2013), Iqaluit (2015) and Fairbanks (2017). AMSA is important to this volume as many of its recommendations speak to the sustainability of Arctic marine operations and shipping and the need for a holistic, integrated approach to marine safety and environmental protection.

3 Forces of Change

The most visible driver of Arctic change and the one that garners the most global attention is the rapid retreat of sea ice at the top of the world. Perhaps it is also the most misunderstood factor with regard to the possibility for increased shipping. Clearly there is greater marine access throughout much of the Arctic Ocean due to the relentless decrease in sea ice extent and thickness observed in all seasons. However, it is critical to note from a marine transportation perspective that the Arctic Ocean remains fully or partially ice-covered for much of the autumn, winter and spring and only in summer will there potentially be long periods of ice-free conditions. It is not that marine transportation cannot flourish in these ice-covered conditions, it is that ice class commercial ships (one of seven Polar Classes, see Appendix G) will likely be required for most Arctic marine operations, once the IMO Polar Code comes fully into force on 1 January 2018 for ships built prior to 2017 (on 1 January 2017 all newly built ships have already come under the Polar Code). Quantifying this new Arctic marine access from Global Climate Model sea ice simulations of the future, and determining the lengths of the ice navigation seasons (using Polar Class ship capabilities) are two of the current research challenges that can provide key strategic information for planning Arctic marine transportation systems.

Globalization of the Arctic—the linkages of Arctic natural resources to global markets—was identified in the AMSA scenarios creation effort as the primary driver of the need for marine transportation systems in the Arctic Ocean (AMSA 2009). Arctic natural resource developments driven by global commodities prices remain a paramount factor influencing Arctic marine operations and levels of vessel traffic. For example, this factor is driving increases in traffic along the Eurasian Arctic and Russia's Northern Sea Route especially to the new liquified natural gas (LNG) terminal at Sabetta on the Yamal Peninsula. Also, offshore hydrocarbon development in the Norwegian Arctic in the Barents Sea requires significant marine support activity to exploratory drilling. A second major factor indicated in the AMSA scenarios work is the governance of Arctic marine activity described as the degree of stability of international rules and standards for marine use within the Arctic Ocean and for the global oceans. Implied by governance is the need for a stable, effective operating system of legal and regulatory structures; UNLOS provides the over-arching legal framework for the Arctic Ocean and the IMO Polar Code is a new governance regime for commercial ships in polar waters. Recent treaties negotiated by the Arctic states addressing Arctic Oil Spill Preparedness and Response, and Arctic Search and Rescue (See Appendices C and D), add to the web of emerging Arctic Ocean governance required in the twenty-first century. Future issues such as the designation of marine protected areas, new emissions controls (including black carbon), the use of heavy fuel oil, and further measures for control of discharges and evasive species, will set a more sustainable path for Arctic marine use.

Increases in Arctic marine traffic are of great concern to the Arctic indigenous people especially those who live in coastal communities. The voices and rights of

these indigenous people, who have lived in the Arctic for millennia and used Arctic waters as a critical part of their survival, are being heard more clearly by the Arctic states, the Arctic Council (where they have representatives and delegations as Permanent Participants), and international forums such as the UN and IMO. The Arctic states have the challenges of protecting their Arctic (indigenous) citizens during this period of historic changes in the region, and providing avenues of economic stability, while at the same time following strategies for sustainable development in their northern regions. In summary the 'new' maritime Arctic mandates that governments and industry foster greater communication and involvement of the Arctic indigenous people in decision-making to respond to their range of concerns and interests with regard to Arctic maritime affairs.

4 Current Arctic Marine Traffic and Key Routes

The map in Fig. 1 presents the general geography of the eight Arctic states and the key marine routes early in the twenty-first century. Notable are the two historic major waterways: the Northwest Passage (NWP), a set of routes through the straits of the Canadian Arctic Archipelago that link Baffin Bay and the Atlantic with Bering Strait and the Pacific; and, Russia's Northern Sea Route (NSR), a set of routes (defined in Russian Federation law) between Kara Gate at the southern tip of Zemlya to Bering Strait. All of the Russian routes are incorporated in the exclusive economic zone out to 200 nautical miles including the waters of the Barents Sea where there is significant Arctic marine traffic (but not part of the NSR). The map also indicates additional marine routes around both Greenlandic coasts, into Hudson Bay, around Alaska, to Svalbard and in the Barents Sea.

The NSR is the one waterway that is showing significant increases in destinational traffic mostly to the Yamal Peninsula where Russia is developing an LNG terminal at Sabetta (on the western side of the Ob Gulf). A second key port complex is Novy Port, an oil export terminal 190 miles south of Sabetta also on the western shore of the Ob Gulf. Year-round navigation to both ports can be achieved with icebreaker escort. A fleet of fifteen icebreaking LNG carriers, ships of 300-meter length and that can carry 170,000 m^3 of liquefied gas, will call at Sabetta and carry LNG out of the Russian Arctic to global markets. These LNG carriers can operate independently without icebreaker support in modest ice conditions, and sail year-round westbound on the NSR to Russian and European ports. During the summer navigation season (3–4 months) the same ships will sail eastbound along the NSR to Bering Strait and into the Pacific to Asian markets. The first ship of this class, named *Christophe de Margarie*, underwent successful ice trails in March 2017 and made an historic passage from Hammerfest, Norway to Korea carrying LNG in summer 2017. On 8 December 2017 the LNG facility at Sabetta was opened by President Putin and the *Christophe de Margarie* loaded its first LNG cargo there initiating a new connection to global markets via the NSR (Staalesen 2017).

Fig. 1 Arctic Ocean marine routes. Source: L.W. Brigham, University of Alaska Fairbanks

It is also important to note that Arctic ship traffic has been maintained since 1979 from Dudinka, port city on the Yenisey River to Murmansk. This port links Norilsk, the industrial mining complex (world's largest producer of nickel and palladium) to the NSR and global markets. The marine transportation system consists of five, icebreaking carriers that do not normally require icebreaker escort. All of the aforementioned voyages are destinational. Full trans-Arctic voyages along the NSR have been less in number; during the 2011–2016 navigation season a modest 23 ships annually made a summer voyage across the full length of the NSR (Brigham 2016).

The NWP has experienced a modest growth of vessels making a full voyage from Atlantic to Pacific. However, only 290 vessels have made a complete voyage through the Northwest Passage (Pacific to Atlantic or vice versa) in its history from 1906 by the Norwegian Roald Amundsen in *Gjoa* to the end of 2017 (Headland

2017). During the past decade the vast majority of vessels making a full NWP passage have been private yachts and adventurers. During the 2017 navigation season 33 vessels made a complete NWP voyage; there were six notable voyages: an ice-capable commercial carrier, the *Atlanticborg*, carrying a cargo of aluminum from China to Quebec; the ice-strengthened cruise ship Bremen; the cruise ship *Crystal Serenity* with 2000 passengers; the Finnish icebreaker *Nordica*; the U.S. Coast Guard buoy tender *Maple*; and the Chinese icebreaking research vessel *Xue Long* (Headland 2017). However, this accounting of the (small) number of full NWP voyages does not reflect the majority of ship traffic in the Canadian Arctic. Most of the vessels in the region are sailing on destinational voyages primarily supporting Arctic communities and northern mines (for the export of bulk cargo) during the summer navigation season.

The Russian maritime Arctic and the offshore waters of Arctic Norway are the two regions which will likely witness increasing marine traffic in the decades ahead. The future of the North American maritime Arctic remains less certain and will plausibly experience increased traffic with rising global commodities prices. Arctic marine tourism may increase using smaller, polar expeditionary ships in summer.

5 New IMO Polar Code

The IMO International Code for Ships Operating in Polar Waters (Polar Code) is covered comprehensively in this volume. The importance and seminal nature of this new governance regime for polar waters cannot be over-stated. At its core the Code addresses marine safety and environmental protection issues for ships operating in cold, remote waters where maritime infrastructure is usually non-existent or very limited. However, the Polar Code is not a new IMO convention, but is a set of amendments to three IMO established instruments: the International Convention for the Safety of Life at Sea (SOLAS); the International Convention for the Prevention of Pollution from Ships (MARPOL); and, the International Convention on Standards of Training, Certification and Watchkeeping for Mariners (STCW). The central goal of the new Code is to create a uniform and nondiscriminatory set of rules and regulations for polar marine operators (Brigham 2017). The Code also includes a set of unified requirements seven Polar Class ships developed by the International Association of Classification Societies (see Appendix G for the Polar Class ship categories).

The Polar Code establishes binding or mandatory international standards for new and existing commercial carriers and passenger ships (500 tons or more) operating in Arctic and Antarctic waters. The Code covers a range of safety and protection issues: ship structural standards; required safety equipment; training and experience standards for the ship's officers and crew; and, environmental rules regarding oil, noxious liquids, sewage, and garbage. All of the maritime states, both flag and port states, have the challenge of implementing and enforcing the many elements of the Polar Code. The ship classification societies and marine insurance industry

have key roles in evaluating the future risks of ships operating in polar waters and implementing these new uniform, international standards. The flag states will need to develop a process for issuance of the mandated Polar Certificate and foster the development of the ship-specific Polar Water Operational Manual which is now required for ships voyaging in polar waters.

The IMO Polar Code is only the beginning of a long process to further protect polar waters in an era of increasing polar marine operations. The IMO Polar Code is not comprehensive in that it does not in its initial version address such issues as black carbon, heavy fuel (in Arctic waters), ballast water discharges, an IMO emissions control area for the Arctic, and perhaps designation as a Particularly Sensitive Sea Area (PSSA). These issues will surely be addressed by IMO in the years ahead. During the 30th IMO Assembly in late 2017, a Polar Code 'Second Phase' was discussed which would address the issue of fishing vessels and smaller ships (under 500 tons and not covered by SOLAS) being included under the Code's requirements (IMO 2016).

6 Chapter Themes and Issues

This volume is focused on a broad set of challenges and issues related to sustainable shipping in a future Arctic, a region experiencing extraordinary change. The new IMO Polar Code provides a critical governance framework for polar operations of commercial ships and is comprehensively reviewed in the early chapters by IMO experts and academic scholars. Arctic ship monitoring and tracking is a fundamental element of infrastructure to provide effective enforcement of the Polar Code and other measures of safety and environmental protection. Tracking of Arctic ships by AIS is also a measure of prevention and enhanced safety as indicated in the chapters that provide a review of the latest uses of this technology to obtain a better understanding of real-time Arctic marine traffic patterns. Key chapters on Arctic Governance review the important legal implications of marine insurance and Arctic shipping, a look at the governance of biodiversity in the central Arctic Ocean, and how non-Arctic states view governance in their national Arctic strategies.

Effective measures of marine protection and emergency response capacities in the Arctic environment are critical requirements. Identifying potential marine protected areas (MPAs) and developing integrated strategies for Arctic oil spill response, especially in the remote central Arctic Ocean, are addressed in two comprehensive chapters. A review of the interactions of marine traffic and coastal communities of the Bering Strait region is a valuable chapter in that it presents the very real impacts increasing marine operations can have on local communities. Marine training (for example, ice navigation and emergency response) and capacity building are significant needs throughout the Arctic. Select requirements are covered in a set of chapters that includes a review of an industry research program on Arctic oil spill response. Sustainable Arctic business practices for offshore oil and gas in ice-covered waters are presented in a key review focusing on issues of resource

allocation and operational management challenges. In summary, the chapters together represent a diversity of maritime challenges and issues and highlight the complexity of responses to greater use of Arctic waters and coastal environments.

7 Challenges and the Future

One of the interesting developments in Arctic affairs is that the response to increased marine operations and shipping in the Arctic has driven greater international cooperation among the Arctic states (in the Arctic Council) and within the IMO and other relevant bodies (Brigham 2011). The binding agreements of the Arctic states on Arctic search and rescue (2011) (Appendix D), and Arctic oil spill preparedness and response (2013) (Appendix C) indicate a strong willingness to reach consensus on practical maritime issues of near-term importance. The Arctic Council's AMSA represents a key policy framework and strategic guide that outlines the way forward by a unified group of Arctic states in protecting Arctic people and the marine environment. AMSA also showed the complexity of the drivers of future Arctic navigation in its set of plausible scenarios for the future (AMSA 2009). For the IMO, the marine insurance industry, and the global shipping enterprise, the Polar Code represents a new regulatory regime for polar waters and importantly, a set of uniform, non-discriminatory standards. However, the Polar Code presents a host of policy and practical challenges in its implementation as well as enforcement by the flag and port states. While the Polar Code is a seminal advance in governance of polar waters, the continued gap in maritime infrastructure (in hydrography and charting, aids to navigation, communications, salvage, port facilities, and more) hinders robust Arctic development (World Economic Forum 2014).

The current and future governance and regulatory instruments in the Arctic will require a continued close relationship between the Arctic Council and IMO, and consistent communication and involvement of the Arctic indigenous peoples. Information and data sharing among the Arctic states, indigenous groups, the maritime industry and all stakeholders must become the norm to achieve a greater understanding of the Arctic environment increasingly under profound change and stress. One of the key challenges will be for this diverse community of players to develop a more common understanding of what 'sustainable development' means in the context of increasing maritime use of the Arctic Ocean. The chapters in this volume will serve to highlight these challenges and portray issues in how sustainability can be reckoned with increasing use while embracing effective protection of Arctic peoples and the marine environment.

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Part I
The Polar Code and Beyond

The International Code for Ships Operating in Polar Waters (Polar Code)

Heike Deggim

Contents

Abstract The International Code for Ships Operating in Polar Waters, better known by its short name "Polar Code", was adopted by the International Maritime Organization (IMO) in 2014/2015. The Code became effective on 1 January 2017 upon entry into force of the associated amendments making it mandatory under both the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL). The Polar Code

The views expressed herein are those of the author and do not necessarily reflect the views of the International Maritime Organization.

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marks a historic milestone in the Organization's work to protect ships and people aboard them, both seafarers and passengers, in the harsh and vulnerable environment of the waters surrounding the two poles, and at the same time protecting those environments. This chapter gives an overview of the requirements of the Code with regard to maritime safety and marine environment protection, also addressing its place in the existing global framework regulating international shipping. Associated training and certification requirements for officers and crew serving on ships operating in polar waters, as have been included in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), are also described. The chapter finally examines what more can be done to ensure the safety of polar shipping, taking into account on-going discussions at IMO.

Keywords Polar Code · Regulatory framework · SOLAS · MARPOL · Heavy fuel oil

1 Introduction

Trends and forecasts indicate that polar shipping will grow in volume and diversity over the coming years. Commercial shipping and tourism are increasing. So-called eco-tourists are drawn by the breath-taking beauty of the polar landscapes, the chance to encounter some unique wildlife, and the sheer majesty of glaciers and icebergs. For ships carrying commercial cargo, northern sea routes offer the chance to considerably reduce journey distances between Europe and the Far East and thereby save on fuel, workforce and other operational costs. Also, the opportunities presented by the energy and mineral resources located in the areas around the poles are both impossible to ignore and another source of increased maritime traffic.

The challenges these developments bring need to be met without compromising either safety of life at sea or the sustainability of the polar environments. It cannot be denied that economic development and increasing commercial activity in the polar regions are controversial topics. There is an understandable and instinctive reaction, shared by many, against opening up two of the world's last remaining wilderness areas to exploitation. But the reality is that we cannot turn back a rising tide. The fact is that commercial activity and economic development in the polar areas are increasing, and increasing rapidly. The real issue is not whether this is a good thing; it is how to meet these challenges without compromising either safety of life at sea or the sustainability of the polar environments.

IMO's role is to ensure that the ships, and the people on them, which do operate in Arctic and Antarctic waters are safe and that their impact on the environment is minimal. The safety of ships operating in the harsh, remote and vulnerable polar areas and the protection of the sensitive environments around the two poles has always been a matter of concern for IMO and measures that specifically address shipping operations in those regions have been in place for several years.

However, with more and more ships navigating in polar waters, IMO has moved to address international concern about the protection of the polar environment and the safety of seafarers and passengers with the introduction of the mandatory Polar Code, for ships operating in Arctic and Antarctic waters. It entered into force on 1 January 2017 and it is the single most important initiative to establish an appropriate international regulatory framework for polar shipping. It is particularly important to keep in mind that the Polar Code requirements, which were specifically tailored for the polar environments, go above and beyond those of existing IMO conventions such as MARPOL and SOLAS. All the extensive safety and environmental regulations included in these and other IMO conventions are applicable globally and will still apply to shipping in polar waters. However, the Polar Code adds an additional layer on top, specifically for ships operating in these areas.

Operating ships in polar waters presents unique challenges. Poor weather conditions and the relative lack of good charts, communication systems and other navigational aids can pose serious problems. If accidents do occur, the remoteness of the areas makes rescue or clean-up operations difficult and costly. Extreme cold may reduce the effectiveness of numerous components of the ship, including deck machinery and emergency equipment. Ice can impose additional loads on the hull and propulsion system. To address these issues, the Polar Code sets out mandatory standards that cover the full range of design, construction, equipment, operational, training and environmental protection matters that apply to ships operating in the waters surrounding the two poles.

The Polar Code represents a major achievement in IMO's work to promote safe and sustainable shipping in all regions of the world, including the most challenging and difficult, and provides a strong regulatory framework aimed at minimizing the negative impact of shipping operations on the sensitive polar regions. The development and adoption of the Code has been achieved with the full participation, in the relevant IMO technical bodies, of not just the IMO Member States but also international organizations in consultative status, representing the shipping and shipbuilding industries, environmental interest groups, equipment manufacturers, seafarers' training providers and those which make up the maritime infrastructure, such as port and harbour authorities, pilots and hydrographers.

2 International Regulatory Framework for Shipping in Polar Waters

The United Nations Convention on the Law of the Sea (UNCLOS), which sets out the legal framework governing the rights and responsibilities of States in their use of ocean space, contains special provisions for ice-covered areas in Article 234. It confirms that "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 limit of the exclusive economic zone".

IMO, as a specialized agency of the United Nations, is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented.

Polar shipping always had a place in the work of IMO. The SOLAS Convention includes special requirements relating to shipping in polar waters in chapter V (Safety of navigation), concerning the collection of meteorological data, the Ice Patrol Service in the North Atlantic, ice information and danger messages. The 2008 Intact Stability Code, mandatory under SOLAS, contains a chapter dedicated to icing considerations. Under MARPOL Annexes I and V, the Antarctic is designated as a special area, prohibiting any discharge into the sea of oil or oily mixtures from any ship and principally the disposal into the sea of all plastics and other garbage.

While specially developed guidelines addressing international polar shipping had been in place since 2002, the IMO membership agreed in 2010 that the time had come to develop a legally binding instrument in order to provide a more comprehensive set of requirements to deal with the increased interests and traffic in the polar regions as well as the unique safety, operational, environmental and search and rescue concerns peculiar to these areas.

3 International Code for Ships Operating in Polar Waters (Polar Code)

3.1 Background

IMO's work to address the challenges posed by the increase in commercial shipping and tourism in polar waters goes back to the early 2000s. *Guidelines for ships operating in Arctic ice-covered waters* (MSC/Circ.1056) were first issued in 2002. IMO then received a request from the Antarctic Treaty Consultative Meeting (ATCM) to extend the Guidelines to also cover ships operating in the Antarctic. The need for this extension was particularly emphasized by a much-published accident happening in November 2007: the sinking of the cruise ship **MV Explorer** off King George Island, Antarctica, resulting in her crew and passengers drifting for 5 h in open-top lifeboats in sub-zero temperatures before being rescued, luckily with no casualties other than the ship herself. The outcome could easily have been very different.

Further work revising the Guidelines followed and in 2009 the IMO Assembly adopted the *Guidelines for ships operating in polar waters* (resolution A.1024(26)) which covered both Antarctic and Arctic waters. These non-mandatory Guidelines set out additional provisions, beyond existing requirements of the SOLAS and MARPOL Conventions, deemed necessary to ensure appropriate standards of maritime safety and marine pollution prevention for ships operating in polar waters.

Calls for the development of a mandatory Polar Code followed shortly after the adoption of the Guidelines and in 2010 IMO agreed to a proposal from several Member States to develop an internationally binding instrument specifically for polar shipping.

3.2 Status and Structure of the Code

The *International Code for ships operating in polar waters* (Polar Code) was adopted during the 94th session of IMO's Maritime Safety Committee (MSC 94) in November 2014 (Introduction and Parts I-A and II-B concerning safety measures) and the 68th session of the Marine Environment Protection Committee (MEPC 68) in May 2015 (Introduction and Parts II-A and II-B concerning pollution prevention measures), together with associated amendments to SOLAS and MARPOL to make the new Code mandatory under the two conventions. The Code became effective on 1 January 2017, upon entry into force of the aforementioned SOLAS and MARPOL amendments.

When adopting the Code, MSC and MEPC agreed that amendments to the Introduction of the Code, mandatory and applicable to both Parts, shall be adopted by both Committees in consultation with each other, whereas amendments to Parts I-A and I-B will be adopted by the MSC only and amendments to Parts II-A and II-B by the MEPC only. While parts I-A (Safety measures) and II-A (Pollution prevention measures) are mandatory under SOLAS and MARPOL, respectively, parts I-B (Additional guidance regarding the provisions of the Introduction and Part I-A) and II-B (Additional guidance regarding the provisions of the Introduction and Part II-A) are of a recommendatory nature. A consolidated text of the Code[1] has been prepared and will be maintained by the IMO Secretariat.

Each chapter in the Code principally set out goals, functional requirements and regulations. The chapters address general issues (definitions, survey and certification, etc.); the Polar Water Operational Manual (PWOM); ship structure; stability and subdivision; watertight and weather-tight integrity; machinery installations; fire safety/protection; life-saving appliances and arrangements; safety of navigation; communication; voyage planning; manning and training; prevention of pollution by oil; control of pollution by noxious liquid substances; prevention of pollution by sewage from ships; and prevention of pollution by discharge of garbage from ships. Appended to the Code are the Form of Certificate for ships operating in polar waters (Polar Ship Certificate) including the Record of Equipment and a Model table of contents for the PWOM.

[1] http://www.imo.org/en/MediaCentre/HotTopics/polar/Documents/POLAR%20CODE%20TEXT%20AS%20ADOPTED.pdf.

3.3 Objectives of the Code

The Polar Code supplements existing IMO instruments in order to enhance the safety of ships' operations and mitigate their impact on the people and the environment in the remote, vulnerable and potentially harsh polar waters. The goal of the Code is to provide for safe ship operation and the protection of the polar environment by addressing risks present in polar waters and not adequately addressed by other IMO instruments. Consequently, the Code takes a risk-based approach in determining the scope of regulations and adopts a holistic approach in reducing identified risks. It applies as a whole to both Arctic and Antarctic, taking into account the legal and geographical differences between the two areas.

The Code should ensure that ships operating in the Arctic and Antarctic regions comply with a globally agreed set of standards, which aim to ensure high levels of safety and environmental protection, both in the event of an incident and during routine operations.

3.4 General Requirements

General requirements of the Polar Code applicable to both Parts I and II are contained in the Introduction to the Code which contains the sections Goal; Definitions; Sources of hazards; and Structure of the Code.

Of particular importance, since requirements applicable to the categories differ, are the definitions of Category A, B and C ships (Introduction, paragraphs 2.1 to 2.3) as follows:

Category A ship means a ship designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions.

Category B ship means a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions.

Category C ship means a ship designed to operate in open water or in ice conditions less severe than those included in categories A and B.

Ice strengthening is required, in accordance with the polar class assigned, for ships of categories A and B, but not for category C.

3.5 Maritime Safety Related Requirements

The safety measures in Part I-A of the Polar Code apply to new ships constructed on or after 1 January 2017. Ships constructed before 1 January 2017 will be required to meet the relevant requirements of the Code by their first intermediate or renewal survey, whichever occurs first, on or after 1 January 2018.

Part I-A consists of 12 chapters the contents of which are briefly described in the following:

Chapter 1—General

Definitions and requirements concerning survey and certification (every ship to which the Code applies shall carry a valid Polar Ship Certificate), performance standards (Polar Service Temperature (PST) shall be specified) and operational assessment (procedures or operational limitations are to be established).

Chapter 2—Polar Water Operational Manual (PWOM)

Requirements to provide the owner, operator, master and crew with sufficient information regarding the ship's operational capabilities and limitations in order to support their decision-making process.

Chapter 3—Ship structure

Requirements to provide that the material and scantlings of the structure retain their structural integrity based on global and local response due to environmental loads and conditions.

Chapter 4—Subdivision and stability

Requirements to ensure adequate subdivision and stability in both intact and damaged conditions.

Chapter 5—Watertight and weathertight integrity

Requirements to provide measures to maintain watertight and weathertight integrity.

Chapter 6—Machinery installations

Requirements to ensure that machinery installations are capable of delivering the required functionality necessary for safe operation of ships.

Chapter 7—Fire safety/protection

Requirements to ensure that fire safety systems and appliances are effective and operable, and that means of escape remain available so that persons on board can safely and swiftly escape to the lifeboat and liferaft embarkation deck under the expected environmental conditions.

Chapter 8—Life-saving appliances and arrangements

Requirements to provide for safe escape, evacuation and survival.

Chapter 9—Safety of navigation

Requirements to provide for safe navigation.

Chapter 10—Communication

Requirements to provide for effective communication for ships and survival craft during normal operation and in emergency situations.

Chapter 11—Voyage planning

Requirements to ensure that the Company, master and crew are provided with sufficient information to enable operations to be conducted with due consideration to safety of ship and persons on board and, as appropriate, environmental protection.

Chapter 12—Manning and training

Requirements to ensure that ships operating in polar waters are appropriately manned by adequately qualified, trained and experienced personnel.

Additional non-mandatory guidance is contained in Part I-B and concerns the determination of the Mean Daily Low Temperature (MDLT); limitations for operation in ice; the assessment required in Part I-A, section 1.5, for operational limitations and procedures to be included in the Polar Ship Certificate; performance standards; contents of the PWOM; navigation with icebreaker assistance; development of contingency plans; equivalent ice class; personal and group survival equipment; radars and charts; limitations of communication systems in high latitude; operation of multiple alerting and communication devices in the event of an incident; location and communication equipment to be carried by rescue boats and survival craft; and operations in areas with marine mammals or of cultural heritage and significance (Fig. 1).

3.6 Marine Environmental Related Requirements

The pollution prevention measures in Part II-A of the Polar Code are largely operational, relating mainly to discharge requirements, and apply to all ships, both new and existing, in line with the application requirements of MARPOL. While the Code contains requirements additional to those provided by MARPOL Annexes I, II, IV and V, it was felt that there was no need to introduce additional requirements with regard to Annex III (Regulations for the prevention of pollution by harmful substances carried by sea in packaged form) and Annex VI (Regulations for the prevention of air pollution from ships) which were considered to be sufficiently comprehensive to include polar shipping.

Part II-A consists of 5 chapters, the contents of which are briefly described in the following:

Chapter 1—Prevention of pollution by oil

Prohibits any discharge into the sea of oil or oily mixtures from any ship in Arctic waters (already prohibited in Antarctic waters by regulation 15.4 of MARPOL Annex I) and stipulates that all cargo tanks constructed and utilized to carry oil and all oil residue (sludge) tanks and oily bilge water holding tanks shall be separated from the outer shell by a distance of not less than 0.76 m.

Chapter 2—Control of pollution by noxious liquid substances in bulk

Prohibits any discharge into the sea of noxious liquid substances (NLS), or mixtures containing such substances, in Arctic waters (already prohibited in Antarctic waters by regulation 14.8.2 of MARPOL Annex II).

Chapter 3—Prevention of pollution by harmful substances carried by sea in packaged form

Intentionally left blank in the Code. Requirements of MARPOL Annex III apply.

Chapter 4—Prevention of pollution by sewage from ships

Prohibits discharges of sewage within polar waters except when performed in accordance with MARPOL Annex IV, subject to additional specific requirements as set out in the chapter.