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Jiayu Bai

Aldo Chircop

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Chapter 14

The Regulation of Heavy Fuel Oil in Arctic Shipping: Interests, Measures, and Impacts



Jiayu Bai and Aldo Chircop

Abstract Since the International Maritime Organization's (IMO) ban on the use and carriage for use of heavy fuel oil (HFO) for ships operating in Antarctic waters came into effect in 2011, the international community has been engaged in a discourse on whether to adopt a similar standard for ships operating in Arctic waters. The issues are complex as, in addition to reducing the environmental risks posed by HFOs, there are economic and social consequences, including dependence on such fuels by Indigenous peoples. The discourse has involved the IMO, the Arctic Council, industry associations, environmental nongovernmental organizations, and Indigenous peoples. The issue was first raised during the development of the Polar Code and is considered unfinished business of the Code. This chapter discusses the nature of the problem and the challenges to explore a possible regulatory strategy. The chapter will consider the issue in the larger context of the public and private maritime law conventions to consider how an HFO regulatory strategy complements and remains consistent with other elements of maritime regulation.

Keywords Arctic Council · Civil liability · Heavy fuel oil (HFO) regulation · International Maritime Organization · MARPOL · Polar Code · Regulation implementation · Regulatory strategy · Stakeholders' interests

J. Bai (✉)

School of Law, Ocean University of China, Qingdao, China
e-mail: gracefulgl@hotmail.com

A. Chircop

Marine & Environmental Law Institute, Schulich School of Law, Dalhousie University,
Halifax, NS, Canada
e-mail: aldo.chircop@dal.ca

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14.1 Introduction

Anthropogenic activities have accelerated the speed of global warming and increased sea ice melting in polar areas. Reports from the Intergovernmental Panel on Climate Change and an Arctic Council working group, the Arctic Monitoring and Assessment Programme, have noted that the Arctic Ocean may become ice-free during the summer season by mid-century (IPCC 2013, 2019; AMAP 2012). While, on the one hand, climate change is having fundamental adverse impacts on polar environments, on the other hand it may provide opportunities for destination and transit shipping in the Arctic. Shipping economics and natural resources exploitation are drivers for the increase in Arctic shipping (Lasserre et al. 2016). There are findings indicating that the total distance travelled by all vessels in Canada's Arctic tripled between 1990 and 2015 (Dawson et al. 2018). On the Northern Sea Route, the volume of cargo transported increased more than fourfold between 2013 and 2018 (Astapovich 2018). The potential increase of volume of maritime traffic in the Arctic has raised the issue of specific concern in this chapter, namely, the use and carriage for use of heavy fuel oil (HFO) and carriage as bulk cargo. The burning of HFO emits black carbon, sulphur oxides, nitrogen oxides, and greenhouse gases (GHGs), which could aggravate global warming. Black carbon is considered the second largest contributor to climate warming after carbon dioxide (Bond et al. 2013). Further, HFO spills could cause far-reaching harm to the Arctic environment (AMSA 2009).

Regulation 43 of MARPOL Annex I has banned the carriage of HFO as cargo, ballast, or carriage and use as fuel in the Antarctic since 2011 (MARPOL). However, there is no similar ban in the Arctic. Unlike in the Antarctic, Arctic shipping has a wider range of rights holders and stakeholders, littoral Arctic states (including sub-national levels of government), user states, Indigenous peoples, and diverse nongovernmental organizations (NGOs). There are many complex issues to be balanced with shipping, including respect and protection of Indigenous peoples and the very sensitive environment that is warming at twice the global rate. These factors make the regulation of HFO in Arctic shipping much more complicated than Antarctic shipping, and, not surprisingly, the proposed ban of HFOs in polar shipping is not uniformly supported at the International Maritime Organization (IMO).

On 1 January 2017, the International Code for Ships Operating in Polar Waters (Polar Code) entered into force following tacit acceptance in 2014 and 2015 of amendments to the International Convention for the Safety of Life at Sea and MARPOL (Polar Code 2014/2015). Separate amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers entered into force on 1 July 2018 (IMO 2016a). The only reference to HFOs in the Polar Code is with respect to a recommendation in Part II-B encouraging ships to apply Regulation 43 of MARPOL Annex I when operating in Arctic waters (Polar Code 2014/2015). This means that the hazard posed by HFOs has not yet been resolved.

From a civil liability perspective, the International Convention on Civil Liability for Oil Pollution Damage (CLC 1969) and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund Convention) (FUND 1992) cover pollution damage in the territorial sea and

exclusive economic zone (EEZ) from a spill from HFO carried as cargo. In addition, the International Convention on Civil Liability for Bunker Oil Pollution Damage (Bunkers Convention) covers pollution damage from HFO fuel spills, but again within zones of national jurisdiction (Bunkers Convention 2001). A vessel registered in a CLC state carrying more than 2000 tons of HFO as bulk cargo must carry a certificate of insurance cover or financial security. The Bunkers Convention requires ships over 1000 gross tonnage to maintain insurance or other financial security to cover the liability of the registered owner for pollution damage caused by HFO used or carried as fuel. The CLC provides the shipowner with limitation of liability. Where the claims exceed that limit, the Fund Convention applies, but again to a ceiling, to address losses not covered by the CLC. The shipowners' limit of liability under the Convention on Limitation of Liability for Maritime Claims also applies (LLMC 1976). This regime does not cover all potential damages. Spills on the high seas are not covered by the CLC, Fund and Bunkers regimes. The funds available are limited and might not cover all economic losses and environmental clean-up costs, let alone reverse what would likely be irreversible damage to the vulnerable and fragile Arctic environment. Furthermore, spill costs in Arctic conditions are highly uncertain, because, compared to other sea areas, there is no data and earlier studies on spill costs for use in IMO decision-making may not apply (Kontovas et al. 2010).

Given the threat posed by HFOs in Arctic shipping and the limitations of the civil liability regimes to recover losses, it is arguable that the protection of the Arctic from this threat requires proactive measures. This chapter explores what, how, and when proactive measures, most especially regulation, could be designed and applied to address the hazard posed by HFOs in Arctic shipping. It analyses the related interests, feasible measures, and corresponding impacts.

14.2 The HFO Work of the Arctic Council

14.2.1 *The Generative Role of the Arctic Council*

The effects of HFO in Arctic shipping were first realized by the Arctic Council, which is the most influential regional governance body for the region. Established by the Ottawa Declaration in 1996 as a political body to promote cooperation, the Arctic Council has no authority to adopt legally binding instruments (Arctic Council 1996). However, the Council has the capacity to identify emerging issues, frame them for further consideration of policy-makers, and formulate the issues as matters of policy priority. Oran Young categorized this function of Arctic Council as a “generative” role, which means that it mainly helps shape the decisions but not make decisions itself (Young 2016). It plays this role through scientific research via six working groups and subsidiary task forces and expert groups. The working groups produce cutting-edge environmental, ecological, and social assessments.

The Working Group on the Protection of Arctic Marine Environment (PAME) and Sustainable Development Working Group (SDWG) are the most relevant for the HFO ban. PAME released the Arctic Marine Shipping Assessment (AMSA) in 2009, and the report is considered the biggest contribution to the cooperative approach to enhancing Arctic marine safety, protecting Arctic people and the environment, and building Arctic marine infrastructure (AMSA 2009; Basaran 2017). AMSA provided a comprehensive assessment of Arctic shipping risks and supported the negotiation of the Polar Code under the auspices of the IMO. AMSA mentioned HFOs, but left the issue for future consideration. Thereafter, the PAME commissioned four multi-phase reports associated with the use and carriage of HFO as fuel in Arctic shipping from 2011 to 2016 (DNV 2011, 2013a, b; PAME 2016; Henaug 2016).

14.2.2 Findings of the Arctic Council Reports

Phase I of the PAME report relied upon the satellite-based automatic identification system (AIS) data provided by the Norwegian Coastal Administration for the period from August to November 2010 (DNV 2011). Det Norske Veritas Petroleum Services offered the fuel sample data to identify vessels most likely to use HFO and Arctic ports where HFO bunkering operations occur. Based on these data, Phase I identified risks associated with both use and carriage of HFOs in the Arctic, after which mitigation strategies were proposed. Phase I found that although fishing vessels, followed by service vessels, community support vessels, and passenger vessels, accounted for the greatest percentage of vessels navigating within the Arctic region, the typical vessels using HFO as fuel mainly were larger cargo, tanker, and passenger ships. The report concluded that the most severe threat from HFO is oil spills in ice-covered waters; therefore, prevention measures should mitigate the risks posed by HFO, and distillate oil was suggested as a substitute oil. The report predicted that along with the increase of global commercial transits in the Arctic and petroleum exploration, the number of larger cargo and tanker vessels using HFO as fuel will also increase.

Phase II of the PAME report collected AIS data for 2012, through which vessel composition, geographical distribution, sailed distances, and operating hours throughout the year were identified (DNV 2013a). In view of the data, the report found that larger ocean-going vessels relied on HFO and other vessels were more likely to use distillate fuels. Two risk control methods were emphasized, speed reductions and area-based vessel management such as vessel restrictions during certain times of year, establishment of traffic channels, and designation of areas to be avoided. The Phase II(b) report focused on the areas of Bering Sea south and beyond the geographical area of the Polar Code and analysed AIS data from August 2012 to August 2013 (DNV 2013b). The report found that grounding of tankers could result in the greatest risk of accidental oil spills occurrence likelihood, also a finding of Phase II.

Phase III(a) of the PAME report analysed the shipping incidents encompassing HFOs and other fuels in the Arctic and near-Arctic marine environment between 1970 and 2014 (PAME 2016). It found that the majority of incidents occurred in near-Arctic waters and outside the geographical area of the Polar Code. The report identified the relevant factors to assess the damage caused by HFOs and other oil, namely the properties of HFOs, characteristics of the Arctic ecosystem and its inhabitants, and the nature of the clean-up and remediation process. Phase III(b) of the report further compared the rate of engine or fuel system failures for ships using HFO and the rate of similar failures for ships using other fuel types in similar Arctic conditions (Henaug 2016). With respect to engines, the key risk factors identified related to the disruption of fuel supply, quality, and switchover.

PAME also made progress on four other HFO projects under its 2017–2019 work plan (PAME n.d., 3). The projects continued research on mitigation of risks associated with the use and carriage of HFO in Arctic shipping. Currently, PAME is collaborating with SDWG in a project to assess the use of HFO in Indigenous communities (Phase IVb). The project will build an integrated knowledge base in consideration of Indigenous Arctic communities and help achieve UN Sustainable Development Goal 14 to conserve and sustainably use the oceans, seas, and marine resources. Indigenous peoples' interests are driving the discourse on HFO usage in Arctic shipping as well as marine environment protection concerns. In summary, the PAME reports influenced the Arctic states' understanding about HFO regulatory arrangements and were reflected in their proposals at the IMO (IMO 2018a).

14.3 The HFO Work of the IMO

14.3.1 *The Relationship Between the Work of the IMO and the Arctic Council*

Under the United Nations Convention on the Law of the Sea Convention (UNCLOS), the IMO is the “competent international organization” to make “generally accepted international rules and standards” for safety, security, and environment protection in international shipping (DOALOS 1996). The IMO's regulatory mandate complements the Arctic Council's knowledge generation work. Central Arctic Ocean coastal states acknowledged the significance of cooperation with the IMO in the Ilulissat Declaration (Arctic Ocean Governing Conference 2008). Subsequently, AMSA stressed the necessity of cooperation between Arctic Council states and the IMO in order to strengthen, harmonize, and regularly update international standards for vessels operating in the Arctic (AMSA 2009). The cooperative relationship between the IMO and Arctic Council can be expected to be consolidated after IMO was granted observer status at the Arctic Council in 2019. The policy shaping function of the Arctic Council provides a valuable input into the IMO's exercise of its regulatory mandate with respect to Arctic shipping. For instance, AMSA helped

inform the need for mandatory standards for polar shipping and provided valuable background information during the negotiations of the Polar Code. Similarly, whereas the Arctic Council provided background information on HFOs in Arctic shipping, the IMO provided the negotiation platform (the Marine Environment Protection Committee or MEPC) for HFO regulation in Arctic shipping.

14.3.2 MEPC Deliberations on HFO Regulation

The discussion of HFO regulation in Arctic shipping at the IMO can be divided into three stages. These are (1) the period from the development of the Polar Code until its adoption, (2) the period following adoption and until the Polar Code came into effect, and (3) the period since the date of effectivity. During the first stage in 2010, there was debate on whether to ban the use and carriage of HFO in the Arctic at the former IMO Sub-Committee on Ship Design and Equipment (DE) (IMO 2010). Thereafter, in 2013, some NGOs submitted a proposal to the DE concerning HFO use by vessels in Arctic waters and further supported the inclusion of a provision in the draft Polar Code banning the use of HFO on ships operating in Arctic waters (IMO 2013a).¹ In that same year, MEPC 65 referred the document for consideration and advice, although the majority of delegations felt that it was premature to regulate the use of HFO on ships operating in Arctic waters (IMO 2013b).

During the second stage, which encompasses MEPC 69 and 70, several Arctic states and NGOs mooted the necessity to regulate HFO use by vessels in Arctic waters.² At MEPC 69, the NGOs' proposal analysed the significant hazards that HFO use could pose to the Arctic marine environment and invited the reassessment of current IMO measures to reduce the increasing risk of HFO use in Arctic waters (IMO 2016b). At MEPC 70, the NGOs submitted a proposal (MEPC 70/17/4) concerning heavy fuel oil use by vessels in Arctic waters (IMO 2016c) that contained extracts from PAME work on a strategy to address the use of HFOs, carriage of bunkers and as ballast and weighed the threats of HFO use to the food security of coastal Indigenous communities (IMO 2016d). The Russian Federation also submitted a commentary on MEPC 70/17/4 and expressed the view that a clear, balanced, and science-based approach was necessary instead of relying on assumptions and proposed prevention and mitigation measures (IMO 2016e). Canada and the United States also submitted a commentary on MEPC 70/17/4 that emphasized the necessity of further work on the regulation of HFO use in the Arctic and called for collaboration with other interested member states and observers through the IMO

¹At DE 57, the NGOs submitting the proposal about HFO use by vessels in Arctic waters, as discussed at DE 54 (IMO 2010), included the Friends of the Earth International (FOEI), Clean Shipping Coalition (CSC), International Fund for Animal Welfare (IFAW), World Wide Fund for Nature (WWF), and Pacific Environment.

²The NGOs that submitted proposals about HFO use by vessels in Arctic waters at MEPC 69 and 70 are the same as those making a proposal at DE 54 except IFAW.

(IMO 2016f). During the second stage, MEPC 69 and 70 recognized the necessity of continuing work on the HFO use in Arctic waters (IMO 2016g, 2016h).

During the third stage since 2017, several Arctic states and observer organizations have submitted proposals to MEPC concerning measures to reduce the risks of use and carriage of HFOs in the Arctic. The emerging HFO regulatory strategy has gained clarity. At MEPC 71, Canada, Finland, Germany, Iceland, the Netherlands, Norway, and the United States proposed a new output for HFO measures with the consideration of economic impacts of the measures (IMO 2017a). As they had at MEPC 69 and 70, a group of NGOs highlighted the future increase in the volume of Arctic shipping and compared the cost of the alternative fuels, including distillate and liquefied natural gas (LNG), which could offer an economically viable short-term solution (IMO 2017b). They also observed that the prohibition of any petroleum-based fuel oil would offer the greatest long-term protection from the environmental and economic risks of HFO spills and black carbon emissions (IMO 2017c). The Russian Federation felt that information in the NGO proposal could be used as the basis to ban HFO on ships and affirmed that it would instead focus on mitigation measures to prevent spills and other negative impacts (IMO 2017d). MEPC 71 agreed to include a work item on the development of measures to reduce risks of use and carriage of HFO as fuel by ships in Arctic waters proposed by Canada and other states on the 2018–2019 Committee agenda while tasking the Sub-Committee on Pollution Prevention and Response (PPR) to complete the work, and invited further concrete proposals (IMO 2017e).

MEPC 72 was a turning point for the discussion since a group of Arctic and non-Arctic states (Finland, Iceland, Norway, Sweden, the United States, together with Germany, the Netherlands, and New Zealand) jointly proposed a mandatory ban on HFO use as fuel in Arctic shipping and urged MEPC to consider an appropriate timeline (IMO 2018b). In light of the implementation of a global sulphur limit of 0.50% by 2020 (IMO 2016h), it was recommended that the HFO ban commence by the end of 2021, which would encourage switching to marine distillate fuels. While Canada and Marshall Islands felt the objectives of the ban were consistent with their desire to protect the Arctic, they argued that the impacts on Arctic communities and economics should be taken into account when developing HFO measures (IMO 2018c). NGOs supported the mandatory ban and further sought clarity in the definition of HFO and the geographical area of the ban (IMO 2018d, 2018e).³ The Russian Federation proposed several measures, other than a ban on HFO use as fuel, including navigational measures, ship operational measures, infrastructure and communication, emergency preparedness and early detection of oil spills, and training (IMO 2018f). It viewed the ban as significantly impacting maritime trade and negatively affecting the balance between economic development and environmental protection (IMO 2018g). In summary, MEPC 72 approved PPR's continued work to develop a

³At MEPC 72, CSC, FOEI, Greenpeace, Pacific Environment and WWF submitted the proposal to ban HFO use and carriage as fuel by ships in Arctic waters. The Cruise Lines International Association submitted the comments on the proposal to ban HFO use and carriage as fuel by ships in Arctic waters.

definition of HFO taking into account Regulation 43 of MARPOL Annex 1, prepare guidelines on mitigation measures to reduce risks identified by the Russian Federation, and develop a ban on HFO for use and carriage as fuel by ships in Arctic waters within a rational timeline and premised on an impact assessment (IMO 2018h). MEPC was advised to develop an appropriate impact assessment methodology to enable the PPR to proceed with this work.

There were several new proposals introduced at MEPC 73. Canada and the Russian Federation jointly submitted the report of the informal correspondence group on the determination of an appropriate impact assessment methodology, especially with respect to impacts of an HFO ban on Arctic communities and economies (IMO 2018i). The United States proposed a cost-benefit methodology to determine impacts on Arctic communities and industries (IMO 2018j). In commenting on the Canadian and Russian proposal, Finland proposed a five-step approach for further consideration (IMO 2018k). France further suggested considering the impact of the ban on HFOs carried as cargo in addition to bunker use. In searching for consensus, MEPC 73 instructed PPR to finalize the impact assessment methodology on the basis of the suggestions made by Canada, the Russian Federation, and Finland (IMO 2018l).

PPR 6 established a working group to report on the HFO issues and develop a working definition of HFO. What emerged was a much narrower definition than the one about the HFO ban in the Antarctic in Regulation 43 of MARPOL Annex I. PPR defined HFO as follows: “Heavy fuel oil means fuel oils having a density at 15°C higher than 900 kg/m³ or a kinematic viscosity at 50 °C higher than 180 m²/s” (IMO 2019, para. 12.26). PPR 6 also agreed with the working group’s suggestion to introduce the ban in MARPOL Annex I (IMO 2019, para. 12.30f). This represented a big step forward for HFO regulation in Arctic shipping.

14.3.3 The Interests Underscoring the Debate

There are various interests at play in MEPC during HFO deliberations. All state and non-state actors found consensus on the potential hazards posed by HFO use as fuel in Arctic shipping, but there was significantly less agreement on risk mitigation measures because of the complicated interests involved.

First, the NGOs are the primary and prominent driving force promoting the development of mitigation measures for HFOs in Arctic shipping. Their central concern is the importance of environment protection in the Arctic and the imperative on a ban on HFO use or carriage as fuel in those waters. They also point out the potential economic risks resulting from HFO use as fuel in Arctic shipping.

Second, some non-Arctic states, such as France, contributed to the development of mitigation methodologies and even recommended extending consideration to HFO use and carriage as fuel and as cargo, thus appearing to support the environment protection concerns espoused by NGOs. However, these non-Arctic states constitute a small number of actors, while other non-Arctic stakeholders with major

shipping interests, such as China, Japan, and Korea, did not clarify their positions on the use of HFO in Arctic shipping. Undoubtedly, the ban of HFO use and carriage as fuel will increase the cost of Arctic shipping. However, if the global cap on sulphur emissions in 2020 is also considered, the influence of the ban on HFO on key shipping stakeholders may need further detailed analysis (Bai and Wang 2019).

Third, Arctic states other than the Arctic coastal states support the ban on HFO use and carriage as fuel by ships in Arctic waters. Such agreement among them is not surprising if the PAME work is considered, also bearing in mind the central theme to protect the Arctic environment and promote sustainable development. Moreover, some of those Arctic states, such as Finland and Sweden, are both member states of the European Union and may share the similar strong environmental mission as the European Union. Sweden and Finland both made environmental protection a priority theme during their two-year chairmanship beginning in 2011 and 2017, respectively (Arctic Council 2011, 2017).

Fourth, among the Arctic states, Canada and the Russian Federation, as the states with the longest coastlines, may be impacted the most by an HFO use ban. An HFO use ban would be beneficial from environment protection and public health perspectives, but at the same time a ban might decrease the attractiveness of new shipping routes, thus affecting local economic development. In the case of Indigenous peoples, a key concern for Canada, the ban might adversely affect the resupply of northern communities by sealift and potentially increase the cost of living. Canada drew attention to these concerns in the analysis on the impact of an HFO ban (IMO 2018m).

The Russian Federation, concerned about the possible impact on northern development and the benefits to national shipowners and refining industries, underlined the need for balance between economic development and environmental protection (IMO 2018n). Although the Russian Federation opposed the mandatory ban of HFO use in the Polar Code during its negotiation, in 2018 Russian President Vladimir Putin and Finnish President Sauli Niinistö issued a joint statement on the need to move to cleaner ships' fuel, such as LNG, in the Arctic (The Maritime Executive 2018). Taking all the interests into consideration, a step-by-step responsive regulatory strategy is necessary to respond to the identified risks of HFOs in Arctic shipping.

14.4 The IMO Regulatory Strategy

14.4.1 *The Rule-Making Strategies for HFO in Arctic Shipping*

As mentioned above, the IMO has regulatory authority relating to the protection of the marine environment from vessel source pollution and maritime safety. Historically, the IMO adopted rules and standards using a prescriptive approach, which is to specify precisely the standard or conduct respected by the regulatee and which flag states

applied to their ships (Chircop 2017). Goal-based standards (GBS) were developed and approved by the Maritime Safety Committee in the form of official guidelines at its 89th session (IMO 2011) and revised at its 95th session (IMO 2015a). For the application of GBS, the IMO only states what is intended to be achieved and leaves the goals to be achieved by various methods (Bai 2015). Regarding the regulatory strategies under the IMO on HFO use in Arctic shipping, the prescriptive approach and GBS could form a staged approach, informed by the principles of necessity, consistency, proportionality, fit for purpose, resilience, and clarity.⁴

14.4.2 Short-Term Measures

At PPR 6 it was clear that there was no absolute guarantee about the exact approval time of an HFO ban for Arctic shipping. The scope and application of the ban will be likely clear and definite before 2021 and could be phased in before 2023 as called for by the Clean Arctic Alliance at PPR 6 (HFO-Free Arctic 2019). Thus, interim and proportionate measures may be necessary to mitigate the potential threats posed by HFOs.

The most severe threat posed by HFOs in Arctic shipping is an oil spill. Navigational and operational measures could help reduce the risks associated with vessel source oil pollution. The available measures at the IMO include ship routing measures (including areas to be avoided) and particularly sensitive sea areas (PSSAs). For instance, IMO has approved the Bering Strait and Bering Sea ship routing measures proposed by the United States and the Russian Federation, which has six two-way routes and six precautionary areas taking effect 1 December 2018 (IMO 2018o). These measures are the first approved ship routing measures in Polar Code waters by IMO and could play a precautionary role to mitigate the risks caused by an HFO spill from Arctic shipping by promoting greater maritime safety. In addition, under Article 211(6) of UNCLOS, Arctic states may seek IMO assistance in adopting a special mandatory measure with respect to HFOs in Arctic shipping (UNCLOS 1982).

A PSSA designation is also an option. However, in practice PSSAs cover particular areas and even large areas such as EEZs, but it is unlikely that all Arctic waters covered by the Polar Code could be encompassed by such a measure. Rather, this area-based management tool is useful for particular areas in the Arctic, for example where there are endangered species and very sensitive habitats. Only one criterion from clusters of ecological, social-culture-economic, and scientific-education criteria needs to be satisfied to meet the threshold for PSSA designation. A PSSA is useful where the appropriate measure adopted under it helps address the risk of pollution from HFOs (IMO 2015b). In the case of the Western European

⁴The prescriptive principles for drafting IMO instruments are required to be considered by the IMO Resolution A.1103(29), entitled as Principles to be Considered when Drafting IMO Instruments.

Waters PSSA, the only measure adopted was mandatory reporting for tankers before entering EEZs. This could be a useful measure in Arctic waters to enable coastal state authorities to track the movements of such vessels.

The establishment of emission control areas (ECA) in the Arctic may help control vessel source pollution, such as sulphur and nitrogen emissions caused by the use of HFO as fuel. The detailed regulations of emissions from vessels are discussed in Chap. 13 of this volume.

14.4.3 Medium-Term Measures

Short-term measures are provisional as they are only applicable to specific risks in particular areas until an HFO ban is eventually adopted. Permanent and unified rules for the entire Arctic region are necessary to prevent pollution from HFOs used as fuel in Arctic shipping. An HFO ban seems the simplest and most effective approach to reduce the risks from the use and carriage of HFO as bunkers. As reflected in discussions at MEPC and PPR, and at the time of writing, a ban on the use and carriage of HFO as fuel in Arctic shipping is supported by most stakeholders (with concerns expressed by the Russian Federation and Canada) on the premise of the consideration of its impacts on, including but not limited to, Indigenous peoples and economic development.

If MARPOL Annex I is considered the most appropriate option to introduce the ban on HFO in Arctic shipping, the ban would come into effect following the adoption of an amendment to the Annex accepted “by two thirds of the Parties, the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world’s merchant fleet” (MARPOL 1973/78, art 16(2)(f)(ii)–(iii)). However, there has been no consensus on possible amendment options through MARPOL Annex I. There may be three possible approaches to amend MARPOL Annex I to ban HFO in Arctic shipping. The first approach is to extend the application of Regulation 43 of MARPOL Annex I to both Arctic and Antarctic waters. The second approach is to add a new regulation in Chapter 9 of MARPOL Annex I that is only applicable to the ban on the HFO use and carriage as fuel for ships’ operations in the Arctic. The third approach is to add another chapter under MARPOL Annex I to prohibit the use and carriage of HFO as fuel in the Arctic. After a ban on HFO in Arctic shipping is included in MARPOL Annex I, the Polar Code could be updated subsequently, if needed, which would mean that the use and carriage of HFO as fuel in areas covered by the Polar Code would be restricted accordingly.

Since the construction and equipment of most vessels currently are designed for the use of HFO as fuel, a staged application, such as a one- to two-year grace period, could be applied when a ban is adopted. The Polar Code included similar arrangements for safety and training requirements. After a certain period, the ban could be applied to all ships, with the exception of vessels engaged in securing the safety of vessels or in search and rescue operations as stipulated in Regulation 43 of MARPOL Annex I.

14.4.4 Long-Term Measures

Does an HFO ban under the MARPOL Annex I and embodied in the Polar Code resolve all the risks posed by HFOs in Arctic shipping? The short answer is no. First, the carriage of HFO as cargo poses even greater risks than the carriage of HFO as fuel due to the volume of HFO in the tanker holds. However, the ban under MARPOL Annex I only relates to HFO as fuel in Arctic shipping. Second, the PAME Phase III(a) report indicated that the majority of incidents happened near the Arctic, but not in the area covered by the Polar Code (PAME 2016). The HFO spill risk outside the Polar Code area is much higher than within those waters. Hence the ban under MARPOL Annex I applicable only to the Polar Code area cannot prevent an HFO spill beyond that area. Third, the substitute for HFO as fuel in Arctic shipping mainly includes distillate fuel and LNG, which still cause GHG emissions and accelerate sea ice melting. IMO has adopted its GHG reduction strategy to encourage the development and provision of zero-carbon or fossil-free fuels in the shipping sector in order to realize decarbonization in the long term (IMO 2018p). The medium-term measures suggested for HFOs in Arctic shipping may not decrease GHG emissions, or contribute to decarbonization. Obviously, additional measures are necessary to completely resolve the issues caused by the use of HFOs in Arctic shipping. Existing measures such as routing and reporting measures and any PSSA designated near the Arctic would reduce the risks of an HFO spill as cargo and fuel beyond the limits of application of the Polar Code (Polar Code area). The designation of ECAs in and near the Arctic could decrease the emission of GHGs and black carbon. Bio-fuels, ammonia, hydrogen fuel cells and electric batteries could help realize the decarbonization challenge and get to the root of the problems brought about by HFOs in Arctic shipping.

14.5 Assessment of the Impacts of the Regulatory Strategies for HFOs in Arctic Shipping

The response to the risks posed by HFOs cannot be accomplished with one stroke, and it is insufficient to only assess the impact on the ban of HFOs. A comprehensive assessment of the environmental, economic, and social impacts of the regulatory strategies as a whole is necessary before the final decision on HFO regulation is made.

14.5.1 Environment Impacts

When the environmental impacts of an HFO regulatory strategy for Arctic shipping are considered, the prevention principle and the precaution principle might be considered as the prominent criteria. The prevention principle emphasizes the

obligation of states to prevent damage to the environment in general. The precaution principle stresses the precautionary approach where there are threats of serious or irreversible damage but there remains lack of full scientific certainty. In light of the environmental impacts of the HFO regulatory strategies discussed above, the short-term strategy focuses on the protection of the environment per se and adopts remedial measures to mitigate the effects of hazards brought by the use of HFO in the Arctic. The medium-term strategy highlights the precautionary approach and takes measures anticipated to minimize the generation of the risks no matter whether it is based on a true hypothesis. The long-term strategy implements a more progressive mixed measure that applies the precautionary approach in the fragile Arctic and preventive measures near the Arctic.

14.5.2 Economic Impacts

When economic impacts of the regulatory strategies on HFO in Arctic shipping are analysed, cost-benefit criteria should be applied to assess whether the benefits would satisfy the costs brought by the ban (Abbasov et al. 2018). Limited data are available for considering the economic impacts of the short-term regulatory strategy and long-term regulatory strategy. Thus, the discussion here will focus on the economic impacts of the medium-term regulatory strategy based on impact assessment reports submitted to IMO.

The additional costs for shipowners (e.g., per ship costs differentiated by ship type), the potential impact on consumer prices, and the clean-up costs that could be saved in case of an oil spill should be considered. First, because the global cap on sulphur emissions will come into effect in 2020, ships could meet the standards if they choose to use low-sulphur heavy fuel oil. The ban on HFO would increase the cost associated with the switch to distillate fuels. Under such a scenario, there would be additional costs for the medium- and long-term regulatory strategy.

Second, commercial cargo vessels would be affected more than cruise ships by an HFO ban in the Arctic (Bannon 2018). Vessels that seasonally sail in the Polar Code area would be influenced more than international vessels, because a higher volume of the fuel would need to be switched. Under such a scenario, there could be negative economic impact on the local communities in the Arctic with the medium- and long-term regulatory strategies because of their reliance on the sea-lift supply.

Third, the increased cost for shipping non-perishable food items to communities in the Arctic would be relatively small (Nelissen and Tol 2018, 24). So there would be a slight difference for consumer prices between the short-term and medium-term strategies. However, if the ban not only included the use and carriage of HFO as fuel, but also the carriage of HFO as cargo, the price of supplying oil in the Arctic would be heavily influenced, which means the long-term regulatory strategy has the most impact on local communities and oil companies in the Arctic.

Fourth, the ban on the use and carriage of HFO as fuel and cargo would significantly reduce the associated risks and clean-up costs of an oil spill of ban-compliant fuel, although a study shows that there is no direct causation linkage between the prevention of an oil spill and the HFO ban (Government of Greenland 2018). Thus, there would be more benefits under the medium- and long-term regulatory strategies with the lowering of the possibility of an oil spill.

14.5.3 Social Impacts

The social impacts of the regulatory strategies for HFO in Arctic shipping mainly refer to the influence on local communities in the Arctic. The HFO ban is a double-edged sword for local communities. On the one hand, a ban would protect the environment, which could be affected by the increasing transits by a large volume of commercial vessels; on the other hand, a ban would potentially increase the cost to resupply local communities and reduce the attraction of foreign investment in oil exploitation in the Arctic, particularly in the Russian Federation. In other words, the ban on HFO use and carriage as fuel would benefit the local communities and secure the marine food chain, but it could increase the cost of living for local communities, although this would be minimal, as indicated by the study mentioned above. The ban on HFO carriage as cargo would impact foreign investment opportunities in those states that have significant oil resources. Therefore, the medium- and long-term regulatory strategies could safeguard local communities, but at the same time pose other challenges.

14.6 Conclusion

The hazards brought by HFOs in Arctic shipping urges their regulation. Initially considered and discussed by NGOs and Arctic states through the platform of the Arctic Council, HFO use and carriage as fuel has been discussed for a few years at IMO diplomatic conferences. Before a mandatory ban is adopted under MARPOL Annex I, various regulatory strategies offer a valuable reference to considering the impacts on various interests. From the perspective of a short-term regulatory strategy, the existing fragmented regulations could provide an expedient arrangement to minimize the damage resulting from the potential hazards posed by HFOs in the Arctic. From the perspective of a medium-term regulatory strategy, the holistic HFO ban as fuel under MARPOL Annex I applies a precautionary approach that could cover the Polar Code area, but still has some limitations on the efficient control of the threats posed by HFOs beyond the current IMO regulatory regime. From the perspective of a long-term regulatory strategy, the progressive decarbonization goal approach in the Polar Code area could maximally protect the vulnerable Arctic

environment, especially together with the establishment of ECAs and PSSAs in and near the Arctic.

These regulatory strategies reflect various environmental, economic, and social impacts. The ultimate goal is environmental protection, but flexible measures are needed to deal with existing vessels and the specific needs of Indigenous peoples. Successful realization of the HFO regulatory strategies relies on good implementation and coordination among flag states, coastal states, and port states. Through such staged regulatory strategies, the Arctic will be conserved and sustainably used for the interests of Indigenous peoples and all the other stakeholders.

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