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Maritime Shipping on the Northern Sea Route: Need for Greater Emphasis on Mutual Cooperation and a Non-Negotiable Safety Culture. Part II*

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Abstract. The opening of the Northern Sea route (NSR) due to the melting of the Arctic sea ice ushers in many opportunities. The International Maritime Organization has introduced several regulations for shipping and the training of seafarers. The Northern Sea Route has several challenges with respect to the infrastructure and the harsh weather conditions. The recent incident onboard the Viking Sky cruise liner was a reminder of such challenges. The Norwegian authorities responded admirably, and the Search and Rescue operation was conducted with the necessary coordinated effort in the shortest possible time. Other incidents along the NSR and increasing ship casualties in the Arctic region which have been analyzed with reference to the adequacy of existing regulations. The author's opinion is that these incidents bring out a need to examine the adequacy of the Polar code, infrastructure along the NSR and the current state of Search and Rescue (SAR). From a practical point of view the Norwegian experience would be of interest to all Arctic states and the IMO. The evolution of the Polar Code and the challenges in implementation are discussed. The article puts forth several recommendations for improving cooperation and safety with the aim of making the NSR a viable alternative route. This article can be used for educational purposes at universities. It is relevant for civil servants, shipping authorities, search and rescue authorities and researchers involved in developing the Arctic sea routes and specifically the Northern Sea route.
Keywords: *Arctic, Arctic routes, Arctic sea ice cover, The Northern sea route (NSR), Russia, Search and Rescue (SAR), vessel traffic patterns, cooperation.*

"All passengers and crew are safe…Throughout all of this; our first priority was for the safety and wellbeing of our passengers and our crew…We would like to thank the Norwegian emergency services for their support and skill displayed in managing the situation in very challenging weather conditions" [1].
(Statement by the company Viking Cruises)

The Polar Code

The sinking of the MS Explorer, with the stranding of some 154 passengers and crew in waters off the Antarctic Peninsula in 2007, prompted the IMO to transform earlier voluntary guidelines related to shipping in the polar regions into a mandatory instrument [21, Grant G.S., p. 190]. The Arctic states reached a consensus that a mandatory Polar code was required based upon the

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[1] See: Simon Calder, Viking Sky: Why Things Went Wrong, What Happened and What's Next, 24 March 2019. URL: https://www.independent.co.uk/travel/news-and-advice/viking-sky-what-happened-storm-norway-emergency-evacuation-coast-a8837371.html (accessed 31.03.2019).

recommendations of the Arctic Council's Arctic Marine Shipping Assessment released in 2009 [14, Brigham L., p. 179]. The IMO's mandatory Polar Code to improve shipping safety in the Arctic and Antarctica was adopted by the IMO's Marine Safety Committee (MSC) in November 2014 [22, Yamada H., p. 185]. Resolution MEPC.265(68), adopting the text of amendments to MARPOL that make the environment-related provisions of the Polar Code mandatory was adopted by the IMO's Marine Environmental Protection Committee (MEPC) in May 2015 [21, Grant G.S., p. 190]. The aim is to provide for safe ship operation and the protection of the polar environment by addressing risks present in polar waters and not adequately mitigated by other instruments. The IMO adopted the International Code for Ships Operating in Polar Waters (Polar Code) and related amendments to make it mandatory under both the International Convention for the Safety of Life at Sea (SOLAS), 1974 and the International Convention for the Prevention of Pollution from Ships (MARPOL), 1973 as modified by the Protocol of 1978 and amendments issued by the IMO from time to time [23, IMO, pp. 1-6]. The IMO Polar Code entered into force on January 01, 2017. This marked a historic landmark in the Organisation's work to protect ships and people aboard them, both seafarers and passengers, in the harsh environment of the waters surrounding the two poles. The Polar Code is intended to cover the full range of shipping-related matters relevant to navigation in waters surrounding the two poles – ship design, construction and equipment; operational and training concerns; search and rescue; and, equally important, the protection of the unique environment and eco-systems of the polar regions. The Polar Code includes mandatory measures covering safety part (part I-A) and pollution prevention (part II-A) and recommendatory provisions for both (parts I-B and II-B) [23, IMO, p. 7]. The responsibility for enforcement rests primarily with the flag states, and in certain circumstances to the port states [14, Brigham L., p. 181].

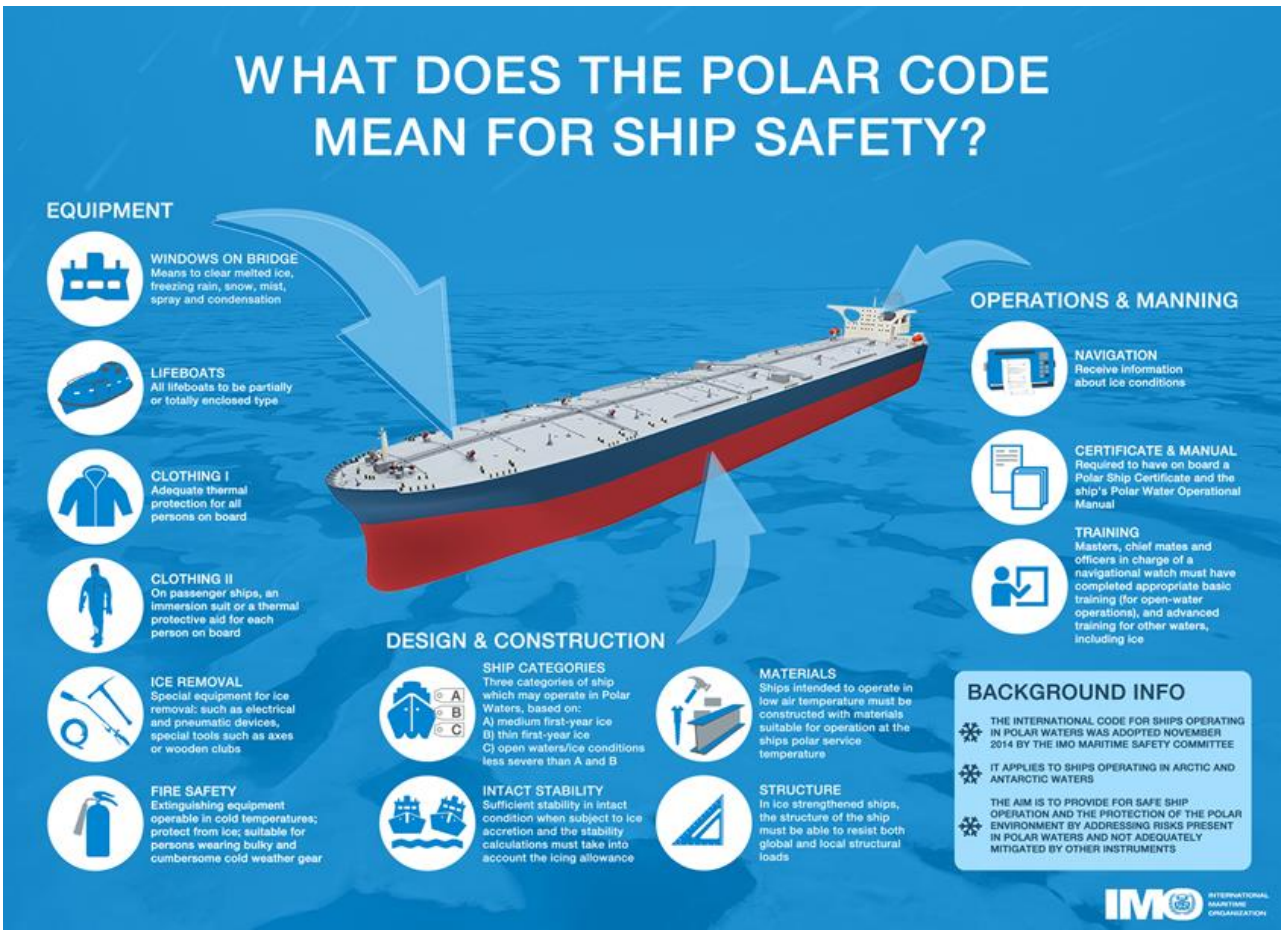

Fig. 1. What does the Polar Code mean for Ship Safety[2].

The Polar Code covers the full range of design, construction, equipment, operational, training, search and rescue and environmental protection matters relevant to ships operating in the inhospitable waters surrounding the two poles[3]. The salient aspects of the Polar Code for ship safety relating to design and construction are: "Three categories of ships may operate in polar waters based on (a) medium first-year ice, (b) thin first-year ice and (c) open water or ice conditions less severe than (a) and (b). There must be sufficient stability in intact condition when subject to ice accretion and the stability calculations must consider the icing allowance. In ice strengthened ships, the structure of the ship must be able to resist both global and local structural loads. Ships intended to operate in low air temperatures must be constructed with materials suitable for operation at the ships polar service temperature"[4].

For example, a fleet of six Arc7 shuttle tankers were built by Samsung Heavy Industries, Busan, Korea to comply with the Polar Code. These are operated under Russian flag and used to maintain year-round operation of the Arctic Gate Project, which is dedicated to developing Norvoportovskoye, an oil and gas condensate field that is one of the largest fields in the Yamal

[2]What does the Polar Code mean for Ship Safety? January 2017. URL: http://www.imo.org/en/MediaCentre/HotTopics/polar/Documents/Polar%20Code%20Ship%20Safety%20-%20Infographic_RUSSIAN.pdf#search=POlar%20Code (accessed 31.03.2019).
[3] Ibid.
[4] Ibid.

peninsula and it is important for strategic development of the NSR. The experience indicated that if the ice conditions are relatively favourable (ice thickness 1.2 m), ice tankers of Arc6 and Arc7 class can be used with virtually no icebreaker assistance. At the International Scientific Round table conference: "Logistics in the Arctic: problems of international cooperation" held in Saint Petersburg in November 2019, whilst presenting the case study researchers stated that these transportation schemes were not accepted 10-15 years ago [24, Ogarcov S., Kozmenko S.,Teslya A. pp. 6-7]. The other main argument against involving the tanker fleet is that it is of utmost importance to preserve the environment and eliminating oil spills in sea waters is complex under ice conditions. Due to the unstable ice situation and rapid transfer of ice by the currents and winds, navigation along the NSR requires the usage of not only icebreaker assistance but also transport and cargo vessels of Arctic class [8, Tianming G., Erokhin V., p. 7]. In the opinion of the author, more extensive trials would need to be carried out to validate the proposal put forth by the authors at the above mentioned conference as ice conditions cannot be always predicted with certainty and also due to the sensitive nature of the pristine Arctic environment. In addition, there has been an exponential increase in the number of ship casualties related to machinery failure (Table 1). The number of cases (124) in the period 2015-2017 was almost equal to the number of machinery failures (125) in the period 2005-2014[5].

The Polar Code for ship safety also states that ships are required to have onboard a Polar Ship Certificate and the ship's Polar Water Operational Manual [14, IMO, p. 7]. If the ship sails in polar waters the port-state officials could make a request to the Captain to inspect the vessel's Polar Ship Certificate. Similarly, the maritime law enforcement officials could scrutinize the Polar Water Operational Manual and examine the ship and the crew's readiness to respond to an emergency event in polar waters [14, Brigham L., pp. 181-182]. A port state may detain a vessel that does not meet the relevant standard [21, Grant G.S, p. 195]. While it is understood that the NSRA does require the Polar Ship Certificate, it is not known whether the Arctic states have instituted mechanisms to examine compliance with the latter provision of the Polar Code. For instance, there are environmental standards have been laid down for the machinery compartments of the ship in regulation 6.3.1.1 to meet the functional requirements in Chapter 6.2. However, according to one viewpoint the adoption of goal based standards as in the regulation 6.3.1.1 while supposed to meet objective standards leave discretion to ship-owners and operators how to meet the requirements [21, Grant G.S, pp. 197-198]. This could also pose enforcement challenges to flag and port states that seek to act against non-compliant ships. In future, due to the warming of the Arctic ships may not make any port call and therefore it would call upon port-state procedures to be adjusted to carry out checks prior to and after an Arctic voyage. This type of operation will put more onus on Flag states and their recognized organizations to exercise effective oversight and

[5]Arctic Circle Waters-All Casualties including Total Losses 2005–2017, Allianz Global Corporate & Specialty, Safety and Shipping Review 2015–2018.

ensure strict compliance with the Polar code. Arctic states may need to consider integrating a Polar Code inspection regime into existing port-state control MOU's such as the Paris and Tokyo agreements [21, Grant G.S, p. 198].

Russia carried out an amendment to its Federal shipping code, which stated that shipping of oil, natural gas (including LNG), gas condensate and coal, which is extracted on Russian territory, including on the Russian shelf, and loaded on board vessels along the Northern Sea Route, must proceed under Russian flag. From January 2019, the Russian government also requires that all new vessels operated by Russian companies in the Russian Arctic must be constructed at Russian shipyards [5, Tianming G., Erokhin V., p. 14]. However, there is a loophole in the new law, which enables several key stakeholders to continue their already ongoing shipping operations with foreign-registered vessels[6]. The law states that the companies which before 1 February 2018 have entered into contract agreements over the use of foreign-flag vessels will be allowed to continue operations. This mainly pertains to the use by Novatek of foreign flagged carriers[7]. Currently, Yamal LNG is served by seven gas tankers, but only one of them sails under the Russian flag. The remaining six are owned by Canadian Teekay, Greek Dynagas, and Japanese Mitsui [5, Tianming G., Erokhin V., p. 14]. However, according to Western sources this measure is not meant to ensure greater regulation but to promote growth of the domestic Russian shipbuilding industry primarily in the Far East, at the Zvezda shipbuilding yard in Bolshoi Kamen[8]. Danish ship-owners expressed their regret over this protectionist step by Russia and stated that they might take this up with the EU[9]. However, there is nothing novel about the Russian initiative to protect their shipping industry. As per United States Cargo Preference laws and regulations, *"a shipper/supplier cannot ship the US flag portion of preference cargo on a foreign-flagged vessel, regardless of whether the bill of lading is issued by a foreign-flag carrier or a U.S.-flag ocean carrier. A shipper/supplier must ship the US flag portion of preference cargo via a U.S.-flag vessel and receive the U.S.-flag carrier's master ocean bill of lading"*[10]. The issue of relevance is that Flag states must be able to regulate shipping and this will only be possible if they permit only shipping of Arctic flagged states or carriers of certain other states who are willing to comply with the provisions of the Polar Code.

[6] Staalesen A. Russian Legislators Ban Foreign Shipments of Oil and Natural Gas and Coal along the NSR. 26 December 2017. URL: https://thebarentsobserver.com/en/arctic/2017/12/russian-legislators-ban-foreign-shipments-oil-natural-gas-and-coal-along-northern-sea (accessed 18.05.2018).

[7] Ibid.

[8] Staalesen A. Putin Nationalizes Arctic Petroleum Shipments. 17 November 2017. URL: https://thebarentsobserver.com/en/industry-and-energy/2017/11/putin-nationalizes-arctic-petroleum-shipments (accessed 18.05.2018).

[9] Pico S. Shipowners Prepared to Bring Russian Shipping Law Before the EU. 12 February 2018. URL: https://shippingwatch.com/carriers/article10300617.ece (accessed 18.05.2018).

[10] United States Department of Transportation. Cargo Preference FAQs. 2020. URL: https://www.maritime.dot.gov/ports/cargo-preference/frequently-asked-questions-faqs-cargo-preference (accessed 12.04.2020).

Regarding training it highlights that masters, chief mates, and officers in charge of a navigational watch must have completed appropriate basic training (for open-water operations) and advanced training for other waters, including ice[11]. Experts have also noted the limited availability of qualified polar mariners in the global maritime workforce. International cooperation may be necessary to close the wide gap in availability of crew and training facilities [14, Brigham L., p. 180]. However, while laying down more stringent norms and more extensive training it does not change the periodicity of surveys for polar ships or certification training for seafarers. The human dimension of operating in polar waters is the most critical element of the Polar Code [14, Brigham L., p. 180].

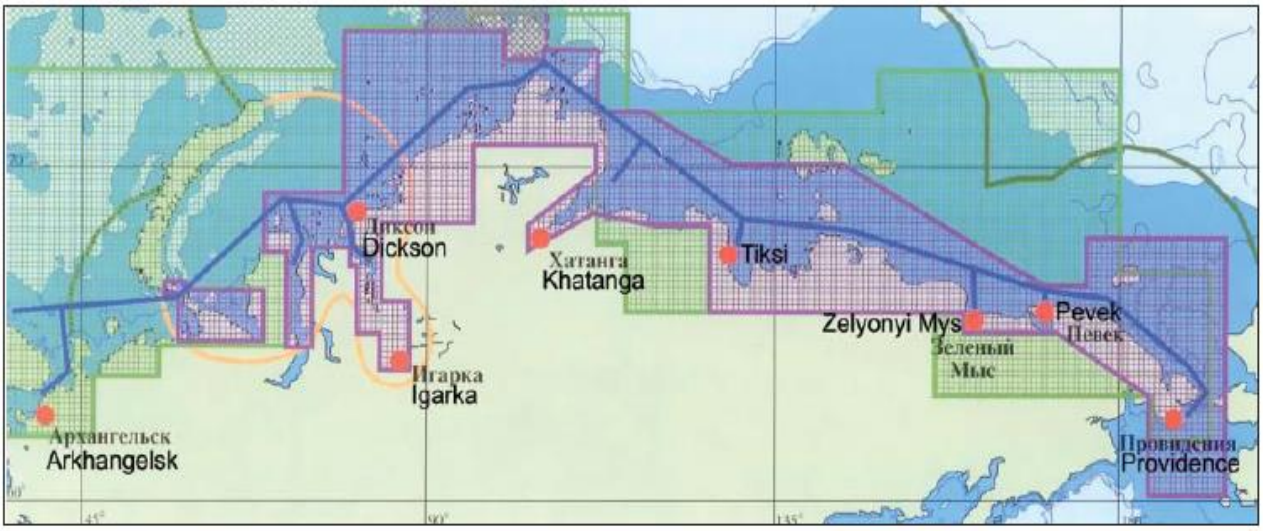

Fig.2. Coverage by electronic navigational charts [9, ABS, p. 19].

However, the IMO Polar Code, while focusing on ship safety and marine environmental protection, does not address any fundamental needs for search and rescue and emergency response. The code does specify many requirements including information pertaining to safety of navigation, ports, hydrography, aids to navigation, availability of electronic charts, communications, salvage, and shore-side pumping facilities, among other issues [14, Brigham L., p. 183]. The persistence of risk and uncertainty during sailing along the NSR includes the scarcity of port facilities and navigation aids, the inaccuracy of nautical charts, and isolation [25, Lasserre F., pp. 509-521]. While differing on the availability of charts and electronic charts which he considered adequate for transit another researcher brought out another issue of concern which is the non-availability of guide to route planning, charts and publications in the English language from the Russian authorities [26, Pastusiak T., p. 70]. See table 1 below for detailed list of coverage of charts and ENCs.

[11] Ibid.

Table 1

Availability of Charts and Electronic Charts (ENC) for the NSR [26, Pastusiak T., p. 67]

Narrow passage	The largest scale of charts of the selected producer covering the area (in parentheses the reference number of the map)			
	UKHO Paper charts	UNIO Paper charts	ICENC → PRIMAR ENC (*.000)	UNIO ENC (*.000)
Yugorskiy Shar Strait Novaya Zemlya, Barents Sea – Kara Sea	1:90,000 (2967)	1:25,000 (18316 western, narrow part), 1:50 000 (15030 eastern, larger part)	1:180,000 (RU3OPNJ9)	1:25,000 (CP5OSNT0 18316 western, narrow part), 1:200,000 (CP3OSNS0 eastern, larger part)
Kara Gates Strait Novaya Zemlya, Barents Sea – Kara Sea	1:90,000 (2967)	1:100,000 (13314 whole), 1:50,000 (15315, 15317), 1:25,000 (18314, 18315)	1:180,000 (RU3P0NJ9 whole), 1:45,000 (RU4P1NL0, RU4P1NI0 northern part)	1:90,000 (CP30SNQ0)
Matochkin Shar Strait Novaya Zemlya, Barents Sea – Kara Sea	1:350,000 (3182)	1:500,000 (11116, 11126)	1:700,000 (RU2P8MH9)	1:500,000 (CP2P5NE0, CP2P6LT8)
North of Novaya Zemlya	1:350,000 (3182)	1:100,000 (13215)	1:700,000 (RU2P8MH9)	1:90,000 (CP3PK0G0)
Vilkitski Strait Severnaya Zemlya, Kara Sea – Laptev Sea	No coverage	1:100,000 (13400, 14314, 14315, 14316)	1:180,000 (RU3PMS90, RU3PLR00)	1:90,000 (CP3PNS80 partly), 1:200,000 (CP3PMS90, CP3PLR00 other part)
Shokalski Strait Severnaya Zemlya, Kara Sea – Laptev Sea	No coverage	1:50,000 (16366, 16367, 16368, 16343), 1:100,000 (14318 eastern approach), 1:200,000 (12338 western approach)	1:180,000 (RU3PORG0)	1:45,000 (CP4PQRS0, CP$PPRP0)
North of Severnaya Zemlya	No coverage	1:200,000 (12336, 12337)	1:180,000 (RU3Q0QQ0, RU3Q0RE0)	1:200,000 (CP3Q0QQ0)
Laptev Strait New-Siberian Islands, Laptev Sea – East-Siberian Sea	No coverage	1:100,000 (13430, 13455)	1:180,000 (RU3P7VS0, RU3P6W90)	1:200,000 (CP3P7VS0)
Sannikov Strait New-Siberian Islands, Laptev Sea – East-Siberian Sea	No coverage	1:100,000 (13432, 13448)	1:180,000 (RU3PCV80, RU3PBVP0)	1:200,000 (CP3PBVP0)
North of New-Siberian Islands	No coverage	1:200,000 (12415, 12416, 12417, 13418, 12419)	1:180,000 (RU3PGV80, RU3PVG0)	1:200,000 (CP3PGVP0)
De Long Strait Wrangel Island, New-Siberian Islands – Chukchi Sea	1:5,000,000 (4521)	1:200,000 (12430, 12431)	1:180,000 (RU3OOZO0, RU3P0OT0)	1:200,000 (CP30RZ60)
North of the Wrangel Island	1:27,000,000 (4002)	1:50,000 (16475, 16476)	1:180,000 (RU3P0ZM0, RU3P0OT0)	1:200,000 (CP300CO0)
Bering Strait Chukchi Sea – Bering Sea	1:1,000,000 (4814)	1:100,000 (14435, 64251)	1:180,000 (RU3OE090)	1:25,000 (CP30E040)

A wide maritime infrastructure gap remains throughout much of the maritime Arctic. Considerable investment in navigation-related infrastructure would be required if trans-Arctic shipping were to become a reality. The development of stable and secure navigation along the NSR is also one of Russia's core interests in the Arctic [27, Zysk K., pp. 104-110]. Only through investment by the Arctic states, interested non-Arctic states such as China, Japan and South Korea, and possibly public-private partnerships may resources be available to fulfill these essential needs in response to increasing Arctic marine operations.

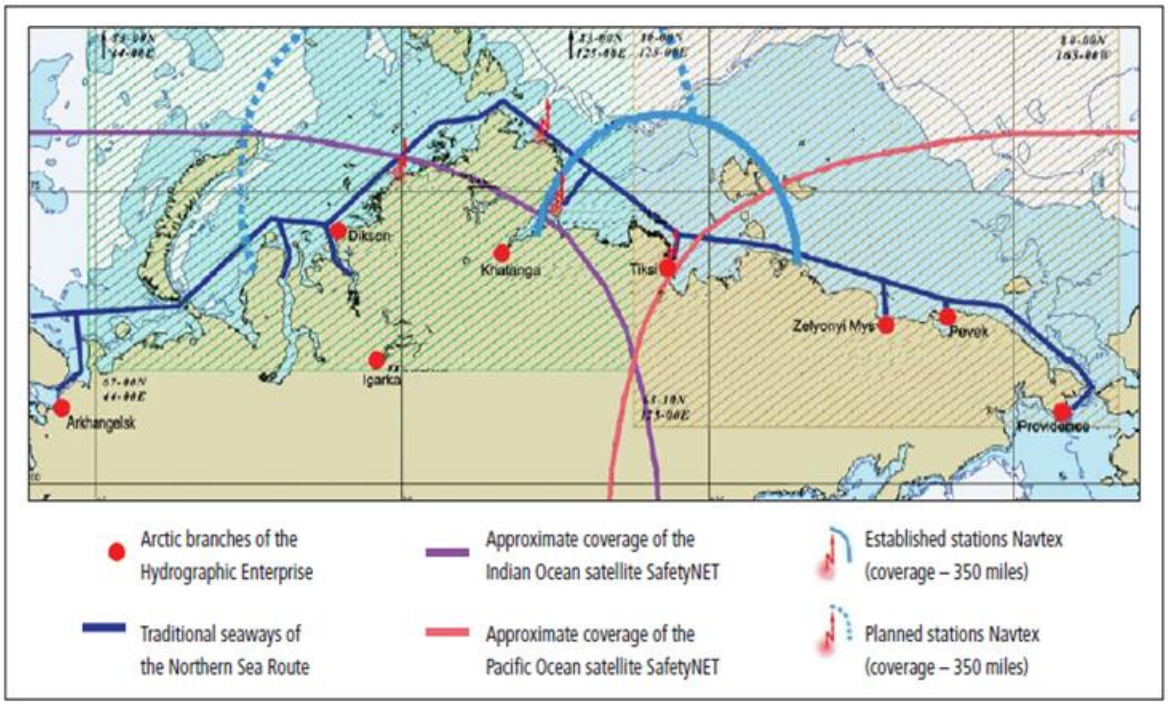

Fig.3. Zones for the reception of information on the safety of navigation in the SafetyNET and NAVTEX systems – gaps in coverage [9, ABS, p. 20].

The Polar Code for ship safety also protects the environment by addressing the unique risks present in polar waters but not covered under other legal instruments. It provides measures in addition to the MARPOL requirements and applies to both ships operating in Arctic and Antarctic waters [23, IMO, pp. 8-9]. It prohibits the discharge into the sea of oil or oily mixtures [23, IMO, pp. 38-39].Double hull and double bottoms are required for all oil tankers including those less than 5,000dwt (Category A/B ships constructed on or after 01 January 2017) [16, IMO, pp. 38]. The Arc7 tankers being used for the Arctic Gate project are equipped with a double hull and an Azipod-type electric podded azimuth of the tankers (allowing the rotation of the propeller 360 degrees relative to the hull) giving them excellent icebreaking capability. The double hull and segregated system of ballast meet all the requirements of MARPOL [24, Ogarcov S., Kozmenko S., Teslya A. pp. 6-7]. Heavy fuel oil is banned in the Antarctic (under MARPOL). Ships are encouraged not to use or carry heavy fuel oil in the Arctic[12]. Ships may also consider using non-toxic biodegradable lubricants or water-based systems in lubricated components outside the underwater hull with direct seawater interfaces[13]. The IMO continued its efforts to adopt a ban of Heavy Fuel Oil (HFO) in the Arctic in 2021 and implement it by 2023, but Russia and Canada which accounted for 56 percent and 6 percent of HFO use in the Arctic remained uncommitted in 2019[14]. Recently, Canada announced its

[12]Arctic Shipping Best Practice Information Forum Launches Public Web Portal.op.cit.
[13] Ibid.
[14] Humpert M. IMO inches forward with Ban on Heavy Fuel Oil in Arctic, 26 February 2019. URL: https://www.highnorthnews.com /en/imo-inches-forward-ban-heavy-fuel-oil-arctic (accessed 27.02.2019).

support to a phased-in approach to the ban on HFO[15]. The draft regulation adopted by the IMO in February 2020, now moves forward for consideration by the Marine Environment Protection Committee in October 2020 (MEPC 76), allows for the continued use of HFO until July 1, 2024. At that point two clauses permit the continued use of HFO for some vessels. Countries can exempt their own vessels within their domestic waters. Furthermore, all double-hulled vessels – ships that have two layers of watertight hull, mainly Russian are also exempt from the ban until the middle of 2029[16].

There are also concerns from a private civil liability perspective in terms of the sufficiency of current international rules to provide for compensation for damage from oil pollution, and in particular what are to be considered as reasonable measures to mitigate and respond to damage in remote areas [28, Chircop A., p. 49]. Regarding sewage the Polar Code states that no discharge of sewage in polar waters is allowed (except under specific conditions). Discharge is only permitted if the ship has an approved sewage treatment plant, and discharges sewage as far as practicable from the nearest land, any fast ice, or areas of specified ice concentration [29, IMO, pp. 40-41]. However, there are no polar-specific rules on the use of antifouling paints and ballast water management practices in the Arctic region, and instead, faith is implicitly placed in the application of general global rules [28, Chircop A., p. 49].

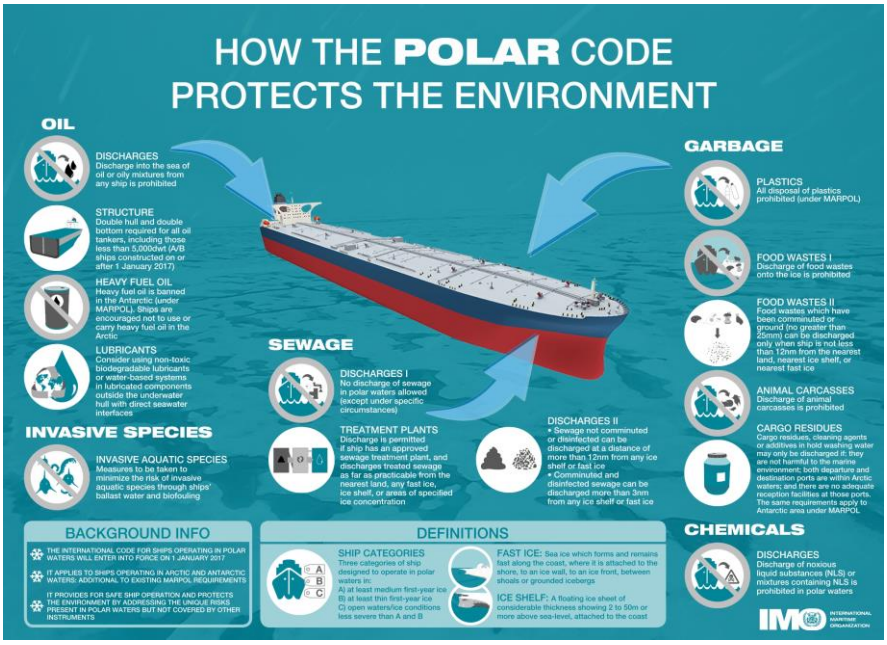

Fig. 4. How the Polar Code Protects the Environment[17]

[15] Maritime Executive, Canada Supports Ban on Heavy Fuel Oil in Arctic, 18 February 2020. URL: https://www.maritime-executive.com /article/Canada-supports-ban -heavy-fuel-oil-in-the-arctic (accessed 20.02.2019).

[16] Humpert M. IMO forward with Ban on Arctic Heavy Fuel Oil but exempts some vessels until 2029, 24 February 2019. URL: https://www.highnorthnews.com /en/imo-inches-forward-ban-heavy-fuel-oil-arctic (accessed 27.02.2019).

[17] How does the Polar Code protect the Environment, November 2014. URL:http://www.imo.org/en/MediaCentre/HotTopics/polar/Documents/How%20the%20Polar%20Code%20protects%20the%20environment%20%28English%20infographic%29.pdf (accessed: 31 March 2019).

Risks and Challenges of Operating Ships in the Arctic Environment

Table 2

Ship Casualties in Arctic Circle Waters, 2005-2017 [18] (ships of 100 gross tons or more)

Type of Casualty	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Machinery damage/ failure	2	3	5	13	14	16	12	13	20	27	46	32	46	249
Wrecked/ Stranded	1	4	10	11	14	9	9	8	10	14	6	11	9	116
Miscellaneous	0	0	5	1	4	4	2	6	5	5	6	4	6	48
Collision	0	0	0	1	4	10	4	4	2	0	5	2	4	36
Fire/explosion	0	0	3	1	2	6	6	1	4	2	4	1	3	33
Contact (e.g. harbour wall)	0	0	1	1	2	4	1	3	6	4	5	1	1	29
Hull Damage	0	1	3	1	6	2	2	1	2	1	1	2	2	24
Foundered (i.e. sunk or submerged)	0	0	1	1	2	0	**3**	1	1	2	0	1	0	12
Labor dispute	0	0	1	1	2	0	3	1	1	2	0	1	0	12
Total	3	8	28	30	47	50	39	37	50	55	71	55	71	544

The Viking Sky near miss and increasing number of ship casualties (Table 2) once again highlights the need to emphasise the key risk factors for vessel safety in the Arctic region, including collisions with ice, being stranded by ice, groundings or other mishaps, a fire on board a vessel, oil spills, collision with other vessels and icing as important risk factors. The risks vary according to the types and levels of activity in different areas of the Arctic. In addition, the operative environment varies greatly in different areas of the region due to ice and weather conditions and varying seasonal conditions. It is evident therefore that the risks are exacerbated and therefore the periodicity of surveys, with special emphasis on hull surveys of the ships for polar certificates and testing of knowledge for seafarers also needs to be more frequent. This is analogous to more periodic checks on a nuclear-powered station vis-à-vis a conventional hydroelectric power station. This is also like the checks on nuclear powered vessels and their crew by the Navies of the United States, Russia, France, United Kingdom, China, and India. In the case of Russia, nuclear and radiation safety inspection is carried out by an independent team of experts deputed by the Ministry of Defence to check the status of equipment and knowledge of crew of nuclear submarines. Thus, the regulator (Russian Ministry of Defence) is independent from the operator (Russian Navy). The Nordic countries and Russia may consider similar measures and restricting the passage of vessels with flags of convenience on the Northern Sea Route in view of their inability to ensure compliance of

[18] Arctic Circle Waters-All Casualties including Total Losses 2005-2017, Allianz Global Corporate & Specialty, Safety and Shipping Review 2015, p.28 and Allianz Global Corporate & Specialty, Safety and Shipping Review 2018, p.29. Quoted in R. Rourke. Changes in the Arctic: Background and Issues for Congress, p.50. Congressional Record Service, 30 March 2020. URL: https://fas.org/sgp/crs/misc/R41153.pdf (accessed 12.04.2020).

these vessels with the IMO's Polar Code. Marine insurers would need to calculate the proper level of risk premium for polar routes, which would require more detailed information about Arctic accidents and incidents in the pas[19].

The key challenges for Arctic search and rescue identified in a 2017 survey carried out the Finish Border Guard, amongst the Arctic Coast Guard Forum, include long distances, severe weather, ice and cold conditions, a poor communications network, lack of infrastructure, and lack of SAR assets in the North[20]. Use of unmanned aerial vehicles for various purposes, including ice monitoring, navigation, geophysical and meteorological surveys, and delivery of cargo to remote areas is still at a nascent stage in the Russian Arctic. Specifically, Russia needs heavy long-range unmanned aerial vehicles which are required for the monitoring of long-distance high-latitude routes of the NSR. In the last decades, emergency preparedness resources in the Arctic have been significantly strengthened through the addition of available vessels and helicopters. However, the response time may still be long and the capacity limited if major incidents occur [30, Marchenko et al, pp. 107-114].

The press release by the Norwegian government on March 23, 2018 admitted that, "*broadband coverage in the High North is poor and unstable*"[21]. The Minister of Trade and Industry Torbjorn Roe Isaksen added, "*Fast stable internet is important to anyone operating in the North, whether in shipping, defence, fisheries or research*"[22]. Consequently, Space Norway AS has been working on a project to have two satellites providing coverage for 24 hours a day in the areas north of 65 degrees N latitude[23]. In addition, the capacity to host patients and provide situational awareness, as well as unsuitable evacuation and survival equipment pose major challenges for SAR in the Arctic. All these observations were also made in the Arctic Council's 'Arctic Marine Shipping Assessment 2009 report referred to earlier.

Focus areas

As per the survey mentioned above, the Search and Rescue [SAR] authorities of the Arctic countries have also recognised a need to further develop advanced information sharing between respective emergency authorities, and other stakeholders involved in SAR operations. In addition, joint training and systematic sharing of lessons learnt and healthcare services also need to be improved to improve SAR capabilities in the region[24]. There is an urgent need for technological ad-

[19] Rourke R. Changes in the Arctic: Background and Issues for Congress, op.cit.
[20] Ikonen E. Improving International Cooperation in Arctic Search and Rescue, 12 December 2017. URL: https://www.thearcticinstitute.org/improving-international-cooperation-arctic-search-rescue/ (accessed 31.03.2019).
[21] Government wants Arctic internet, 23 March 2018. URL: http://armscom.net/news/government_wants_arctic_internet (accessed 31.03.2019).
[22] Quoted in Government of Norway, Government wants Arctic internet, op.cit.
[23] Henry C. Space Norway in final procurement for two highly elliptical orbit satellites, 10 April 2019.URL: https://spacenews.com/space-norway-in-final-procurement-for-two-highly-elliptical-orbit-satellites/ (accessed 15.04.2019).
[24] Ikonen E. Improving International Cooperation in Arctic Search and Rescue, op.cit.

vancements in communications networks, navigation, survival, and rescue equipment. With specific reference to communications in the Arctic, which is a major challenge, there is a need for a proper satellite broadband, satellite automatic identification system (AIS) and other communications infrastructure to support SAR operations. According to Emmi Ikonen, "*Due to the limited time that SAR personnel must travel between countries and scarce financial resources, further studies could be conducted on possibilities for e-learning. Such courses could for example focus on the roles of search and rescue mission coordinator (SMC), on-scene coordinator (OSC), and aircraft coordinator (ACO) in Arctic contexts. Arctic maritime search planning and Arctic joint operations are also relevant topics for common education work*"[25]. However, there is no substitute for realistic SAR exercises in challenging conditions and these need to be held on a more regular basis. The results of a research study conducted in 2018 also suggested that, *"the risk factors, mainly in the 'Safety' and 'Political' domains, exert a far greater negative influence on the propensity to deploy vessels on Arctic routes than the supposed positive influence of 'Economic' factors, particularly as manifest in reduced fuel use and reduced transit time. This implies a certain lack of appetite amongst shipping operators to opt for Arctic shipping as a viable alternative to conventional routes"* [31, Tseng P-H., Cullinane K. pp. 422-438]. The Russian authorities will need to examine this study carefully and factor it in their plans for development of the NSR.

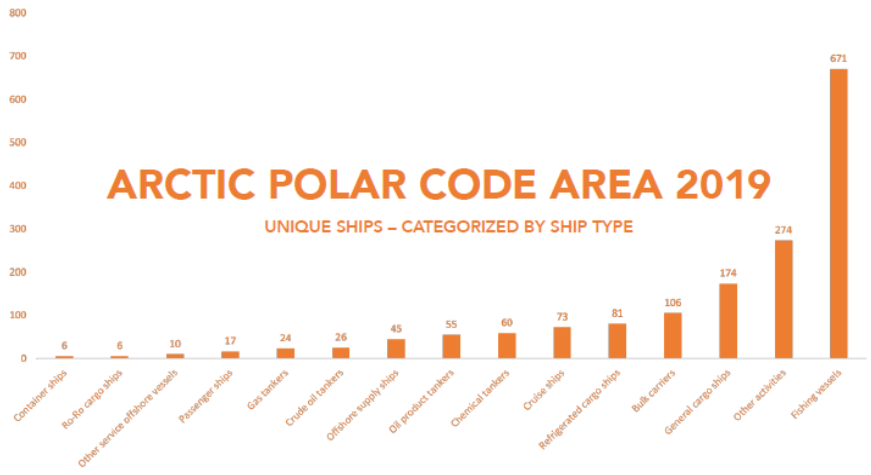

Fig. 5. Unique Ships – Categorized by type which sailed in the Arctic Polar Code Area[26].

On May 15, 2018, the Arctic Council's Arctic Shipping Best Practice Information Forum launched a web portal to assist in the implementation of the International Maritime Organisation's International Code for Ships Operating in Polar Waters (Polar Code)[27]. The purpose of the Arctic Shipping Best Practice Information Forum is to support effective implementation of the Polar Code by making publicly available on a dedicated web portal, information relevant to all those involved in safe and environmentally sound Arctic shipping, including vessels owners/operators, regulators,

[25]Ikonen E. Improving International Cooperation in Arctic Search and Rescue, op.cit.
[26]Protection of Arctic Marine Environment. Arctic Shipping Status Report 2013-2019.
[27]Arctic Shipping Best Practice Information Forum Launches Public Web Portal. 2018. URL: https://www.arctic-council.org /shipping (accessed 16.04.2020).

classification societies, marine insurers, and indigenous and local communities[28]. Regular meetings are envisaged to be held and the proceedings of the meetings conducted in 2017 and 2018 are available onlin[29]. However, the information available online is of a general nature and could be much more detailed. In another significant development, the organisation "*Protection of the Arctic Marine Environment*" (PAME) 's Arctic Ship Traffic Data (ASTD) project was launched in conjunction with the Arctic Council in February 2019 in response to a growing need to collect and distribute accurate, reliable, and up-to-date information on shipping activities in the Arctic[30]. The project seeks to further the work of the shipping database developed in 2005 for the release of the Arctic Marine Shipping Assessment Report (AMSA 2009)[31]. The first report provides information on general Arctic shipping trends between 2013 and 2019 and shows how much Arctic ship traffic has increased[32]. For example, the report shows that during this six-year period, the number of ships entering the Arctic grew by 25%, and the distance sailed by ships in the Arctic increased by 75%[33]. The distance sailed by bulk carriers (food grains, ores, coal, and cement) over the same period increased by 160%[34]. Most of these vessels, i.e. 41%, were fishing ones[35]. The next biggest category of vessels is others which includes icebreakers and research vessels[36]. All Arctic countries need to actively contribute to the Arctic shipping forum best practice and the Arctic shipping database.

Recommendations

Unpredictable ice, wave, and wind conditions, varying routes, high environmental risks, and lack of qualified and experienced staff to facilitate safe sailing in polar waters are just a few security related challenges to the intensification of commercial shipping in the NSR [32, Erokhin V., Gao T, pp. 456-474]. The safety of ships operating in the harsh, remote and vulnerable polar areas and the protection of the pristine environment around the two poles have always been a matter of concern for IMO and many relevant requirements, provisions and recommendations have evolved over the years. Trends and forecasts indicate that polar shipping will grow in volume and possibly diversify in nature over the coming years [5, Tianming G., Erokhin V., p. 2] and these challenges need to be met without compromising either safety of life at sea or the sustainability of the polar environments. Unfortunately, there has been a steady increase in the number of ship casual-

[28] Ibid.
[29] Protection of Arctic Marine Environment. 2019. URL: https://pame.is/document-library/shipping-documents/arctic-shipping-best-practice-information-documents/354-forum-2nd-meeting-summary-report/file (accessed 16.04.2020).
[30] Protection of Arctic Marine Environment. Arctic Shipping Status Report 2013-2019. op.cit.
[31] Protection of Arctic Marine Environment. Arctic Shipping Database. 2020. URL: https://pame.is/index.php/projects/arctic-marine-shipping/astd (accessed 16.04.2020)
[32] Protection of Arctic Marine Environment. Arctic Shipping Status Report 2013-2019. op.cit.
[33] Ibid.
[34] Ibid.
[35] Ibid.
[36] Ibid.

ties (Table 2)[37]. If Russia must achieve its goal of making the NSR a viable safe alternative transport corridor, then it will need to play a pivotal role sometimes sacrificing short term economic interests and its perceived reticence to share information. It will also need establish greater linkages with interested nations, especially the Nordic countries and countries of Northeast Asia in all spheres of development of the NSR. In view of the above, salient recommendations regarding future expansion of the NSR are as follows:

- The Arctic states must ensure that the safety culture which the IMO's Polar Code mandates is adopted by all shipping companies and seafarers as they are primarily responsible in terms of UNCLOS for the safety of shipping in their waters and the Arctic environment. To achieve this, the Arctic or Flag states must ensure that ship-owners and in turn seafarers hold periodic safety stand-down's which discuss case studies of incidents highlighting loss of lives or injuries. The practise of posting safety violations on the NSRA website, Norwegian maritime authority website and by related websites of other Arctic countries needs to be continued. There needs to be strict time window by which the analysis of safety infringements needs to be published. The lessons learnt from the Viking Sky and Boris Vilkistky incidents need to be made available on the respective websites.
- The introduction of the Arctic Shipping Best Practice Information Forum has been a welcome development which needs to be actively supported by all Arctic countries, especially Russia. Yearly meetings need to be conducted and detailed proceedings of the meetings need to be made available online. The website could also reflect comments from independent experts of other countries on incidents along the NSR.
- Arctic states may consider integrating a Polar Code inspection regime into existing port-state control MOU's.
- As a first step more periodic and surprise checks, in addition to those already laid down in the International Convention for the Safety of Life at Sea on the seaworthiness of all ships and knowledge of all seafarers as per Standards for Training Certification and Watchkeeping in Seafarers [STCW] convention, 1995 needs to be initiated by the respective Arctic countries. Russia needs to consider establishing a specialised group of polar mariners under the Ministry of Transport to carry out these checks independent of the operator "Rosatom", like checks which are carried out on Russian nuclear submarines.
- The Nordic countries and Russia may consider restricting the passage of vessels with flags of convenience such as Panama and Cyprus on the Northern Sea Routes. Vessels which hitherto have been given exemption under Russian federal regulations also need to be subject to an inspection regime.
- Flag states could leverage insurance companies to play a significant role in ensuring that ship-owners comply with the Polar Code provisions by establishing specific compliance policies.
- The Arctic states would need to continue to make focused efforts to improving surveillance and domain awareness in the Arctic, including the central Arctic Ocean, reporting systems, including further expansion of the Automatic Identification System (AIS) technology use.
- Russia and all other Arctic countries need to contribute actively to the Arctic Ship Traffic Data (ASTD) project.

[37]Arctic Circle Waters-All Casualties including Total Losses 2005-2017, Allianz Global Corporate & Specialty, Safety and Shipping Review 2015-2018, op.cit.

- Information on the Safety of navigation is presently not available seamlessly throughout the NSR. This is a serious lacuna, which needs to be addressed.
- There is inadequate satellite communication bandwidth available along the Arctic sea routes and in particular the Northern Sea Route. This needs to be addressed to ensure faster communication in case of any crisis.
- The ideal situation for the Arctic countries, or at least the Nordic countries and Russia would be to use a common satellite communication network to obviate time delays and ensure speedy Search and Rescue [SAR] response. This issue needs to be discussed at the Barents Council or other suitable forum.
- Arctic states need to share technology to improve meteorological observations.
- As foreseen by the Arctic Council's Search and Rescue [SAR] agreement there is no alternative to coordinated SAR and all countries need to communicate with each other by the fastest available means of any impending situation or incident.
- Realistic Search and Rescue [SAR] exercises with actual evacuation of personnel from within the Arctic Council and along the respective Arctic sea routes need to be planned by the concerned countries along with their partner countries. Case studies of accidents or incidents or near-miss accidents could be discussed in the table-top exercises. Further, the Nordic countries and Russia could agree on the modalities of having these case studies available on a common SAR website.
- Russia needs to ensure that the GLONASS satellite navigation system provided for commercial purposes meets the requirement of mariners using the Northern Sea Route. A cooperative arrangement with the EU to provide coverage of the Galileo system may also be considered.
- There are limited electronic charts available for the Northern Sea Route and there needs to be a project to prepare these charts at the earliest. Hydrographic surveys also may need to be initiated in case of outdated surveys.
- Russia will need to modernise infrastructure of the ports of the NSR in a time bound manner. This will need partnership with interested countries of the Arctic and East Asia.
- Considering the limited possibility of obtaining this niche technology from the West Russia could collaborate with China for the development of long range unmanned aerial vehicles for the Arctic.
- Russia will also need to develop an environment in which the political and safety factors are given due primacy to meet the concerns of shipping operators. Russia could also leverage the political instability in the Persian Gulf and the Middle East with the countries of Northeast Asia in the future for development of the NSR.
- Russia needs to leverage the intellectual capital available in the interested countries by scheduling periodic conferences or forums at different levels on the development of the NSR where participants from different fields such as the government, maritime authorities, business, environmental groups and academics can express their views, suggestions and concerns. This will immensely contribute to the sustainable development of the NSR.

Conclusion

This route has great potential for connectivity for Russia and North East Asia among others in Asia who would like to use the route in future. Moreover, the advantage to Russia is the development of communications, ports and townships in a neglected region with a vast potential for employment and training of technically competent manpower. The NSR has a vast potential for

the human resource development of Russia and its network of communications and connectivity. This region has considerable economic potential and with due recognition to safety and environmental considerations there are gigantic possibilities for the NSR. However, the cost effectiveness of the project is undoubtedly dependent on the progress of shipping in the NSR.

Consequently, Russia's focus areas with respect to the Arctic region is its strategic interest in promoting the Northern Sea Route as an alternative route for inter-continental shipping particularly to countries of Northeast Asia. However, Russia would need to play a pivotal role in the safety of ships operating in the unforgiving polar areas and sustainable expansion of the NSR by protection of the pristine environment around the Arctic. In this regard the safety of life at sea in the light of increasing ship casualties and the sustainability of the Arctic environment will need to be supported by the governments of Arctic states and the maintenance of a safety culture will need to be accorded a non-negotiable priority by Russia and the Nordic countries. The pace of infrastructure development particularly satellite communication, navigation systems, including electronic charts and hydrographic support and unmanned aerial vehicles to ensure safety of shipping and also, the revitalisation of ports needs to be accelerated if the NSR is to become a viable alternative. Russia will need to closely cooperate with international partners particularly the Nordic countries, China, Japan, and the Republic of Korea to make the NSR dream a reality.

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References

1. Silber G.K., Adams J.D. Vessel Operations in the Arctic, 2015–2017. *Frontiers in Marine Science*, 2019, 6:573, p. 314. DOI: 10.3389/fmars.2019.00573
2. Liu M., Kronbak J. The Potential Economic Viability of Using the Northern Sea Route (NSR) as an Alternative Route between Asia and Europe. *Journal of Transport Geography*, 2010, vol. 18, iss. 3, pp. 434–444.
3. Verny J., Grigentin C. Container Strategy in the Arctic: Cooperation, not Confrontation. *The Polar Record*, 2017, vol. 53, iss. 3, pp. 107–117.
4. *Arctic Shipping Marine Assessment 2009 Report.* Tromso, Arctic Council, 2009, 194 p.
5. Tianming G., Erokhin V. China-Russia Collaboration in Shipping and Marine Engineering as One of the Key Factors of Secure Navigation along the NSR. *The Arctic Yearbook*, Arctic Centre, University of Arctic, 2019, pp. 1–20.
6. *Strategic Assessment of Development for the Arctic.* Lapland, Arctic Centre, University of Lapland, 2014, 143 p.
7. Carmel S.M. The Cold, Hard Realities of Arctic Shipping. *Proceedings*, 2013, vol. 139/7/1, pp. 38–41.
8. Zhang X., *Regional Aspects of the Arctic Ice Silk Road: Case of Heilongjiang Province, China*. Handbook of Research on International Collaboration, Economic Development, and Sustainability in the Arctic, IGI Global, 2019, 703 p.
9. Navigating the Northern Sea Route — Status and Guidance. TX: ABS, Houston, 2016, 28 p.

10. Franckx E., Boone L. New Developments in the Arctic: Protecting the Marine Environment from Increased Shipping. In: M.H. Nordquist, J.N. Moore, A.H.A. Soons, H.S. Kim (Eds.) *The Law of the Sea Convention: US Accession and Globalization*. Leiden, Martinus Nijhoff Publishers, 2012, pp. 190–205.
11. Ostreng W., Eger K.M., Føstad B., Jørgensen-Dahl A., Lothe L., Mejlænder-Larsen M., Wergeland T. Shipping in Arctic Waters: a Comparison of the Northeast, Northwest and Trans Polar Passages. *Springer Science & Business Media*, 2013, 414 p.
12. Kobzeva M. China's Arctic Policy: Present and Future. *The Polar Journal*, 2019, vol. 9, iss. 1, pp. 94–112. DOI: 10.1080/2154896X.2019.1618558
13. Maher P.T., Gelter H., Hillmer-Pegram K., Hovgaard G., Hull J., Jóhannesson G.P., Karlsdóttir A., Rantala O., Pashkevich A. Arctic Tourism: Realities and Possibilities. *The Arctic Yearbook*, Arctic Centre, University of Arctic, 2014, pp. 1–17.
14. Brigham L.W. Perspective — Implementation of the Polar Code. In *The Arctic in World Affairs: A North Pacific Dialogue on the Arctic in the Wider World. 2015 North Pacific Arctic Conference Proceedings*. Ed. by O. Young, J. Kim, Y. Kim. Busan: Korea Maritime Institute; Honolulu: East-West Center, 2015. pp. 175–184.
15. Mayorova V., Grishko D., Chagina V., Khardaminova S. Possibilities of Using Dynamical Local Sinusoids for Short-Term Forecast of Ice Condition in the Kara Gate Strait from Space-Based Radar Imaging. *Herald of the Bauman Moscow State Technical University. Series Natural Sciences, 2013*, pp. 117–128.
16. Sergunin A., Konyshev V. Forging Russia's Arctic Strategy: Actors and Decision-Making. *The Polar Journal*, 2019, vol. 9, iss. 1, pp. 1–20.
17. Teslya A., Gutman S. Forming and Developing a Green Transport Corridor in the Arctic. *IOP Conference Series: Earth and Environmental Science*, 2020, vol. 434, iss. 012011, pp. 1–9.
18. Zagorski A. Perspective — Implementation of the Polar Code. In: *The Arctic in World Affairs: A North Pacific Dialogue on the Arctic in the Wider World. 2015 North Pacific Arctic Conference Proceedings*. Ed. by O. Young, J. Kim, Y. Kim. Busan: Korea Maritime Institute; Honolulu: East-West Center, 2015, pp. 215–234.
19. Nevalainen M., Helle I., Vanhatalo J. Preparing for the Unprecedented — Towards Quantitative Oil Risk Assessment in the Arctic Marine Areas. *Marine Pollution Bulletin*, 2017, vol. 114, iss. 1, pp. 90–101.
20. *Guidelines for Ships Operating in Polar waters.* London, International Maritime Organisation, 2010, 22 p.
21. Grant G.S. Perspective — Implementation of the Polar Code. In *The Arctic in World Affairs: A North Pacific Dialogue on the Arctic in the Wider World. 2015 North Pacific Arctic Conference Proceedings*. Ed. by O. Young, J. Kim, Y. Kim. Busan: Korea Maritime Institute; Honolulu: East-West Center, 2015, pp. 190–205.
22. Yamada H. Perspective — Implementation of the Polar Code. In *The Arctic in World Affairs: A North Pacific Dialogue on the Arctic in the Wider World. 2015 North Pacific Arctic Conference Proceedings*. Ed. by O. Young, J. Kim, Y. Kim. Busan: Korea Maritime Institute; Honolulu: East-West Center, 2015. pp. 185–189.
23. *Polar Code.* London, International Maritime Organisation, 2016, 55 p.
24. Ogarcov S., Kozmenko S., Teslya A. Organising an Oil Transportation System in the Arctic. *IOP Conference Series: Earth and Environmental Science*, 2020, vol. 434, iss. 012011, pp. 1–8.
25. Lasserre F. Arctic Shipping Traffic: More Ships Will Come, but not for Transit. In: T. Bell, T. Brown (Eds.), *From Science to Policy in the Eastern Canadian Arctic*. Quebec City: ArcticNet, 2018, pp. 509–521.
26. Pastusiak T. The Problem of the Availability of Nautical Charts. *Polish Cartographical Review,* 2015, vol. 47, iss. 1, pp. 63–72.
27. Zysk K. Russia's Arctic Strategy: Ambitions and Constraints. *Joint Force Quarterly,* 2010, iss. 57, pp. 104–110.
28. Chircop A. Sustainable Arctic Shipping: Are Current International Rules for Polar Shipping Sufficient? *Journal of Ocean Technology,* 2016, vol. 11, iss. 3, pp. 39–51.

29. *International Convention for the Prevention of Pollution from Ship (MARPOL), 1973.* London, International Maritime Organisation, 2017, 465 p.
30. Marchenko N., Andreassen N., Borch O.J., Kuznetsova S., Ingimundarson V., Jakobsen U. Arctic Shipping and Risks: Emergency Categories and Response Capacities. *International Journal on Marine Navigation and Safety of Sea Transportation,* 2018, iss. 12(1), pp. 107–114.
31. Tseng P-H., Cullinane K. Key Criteria Influencing the Choice of Arctic Shipping: a Fuzzy Analytical Hierarchy Process Model. *Maritime Policy and Management*, 2020, iss. 45:4, pp. 422–438.
32. Erokhin V., Gao T., Zhang X. Arctic Blue Economic Corridor: China's Role in the Development of a New Connectivity Paradigm in the North. *The Arctic Yearbook*, Akureyri, Northern Research Forum, 2018, pp. 456–474.
33. Morgunova M. Why is Exploitation of Arctic Offshore Oil and Natural Gas Resources Ongoing? A Multi-Level Perspective on the Cases of Norway and Russia. *The Polar Journal*, 2020, pp. 1–18. DOI: 10.1080/2154896X.2020.1757823
34. Kozmenko S., Masloboev V.A., Matviishin D.A. Justification of Economic Benefits of Arctic LNG Transportation by Sea. *Journal of Mining Institute*, 2018, vol. 233, iss. 1, pp. 554–560.

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