

PAME II-2019: Agenda 6.3

An Overview of Low-Impact Shipping Corridors and other Shipping Management Schemes in the Circumpolar Arctic

Final Draft

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1. Introduction

As interest and opportunity for shipping activity in the Arctic grows, Arctic States will be challenged to ensure that any increase in activity does not result in damaging environmental effects, and is conducted safely. Moreover, growing awareness of fragile ecosystems, varying maritime conditions and challenges to navigation because of climate change and increasing interest in the Arctic have heightened the need to develop shipping routes that minimize the negative impacts on coastal communities and the marine environment. In tackling this challenge, Arctic States would benefit from sharing best practices on existing and ongoing efforts to provide safe and environmentally sound shipping routes across the circumpolar Arctic.

Building on existing measures for area-based protection adopted by the International Maritime Organization (IMO), the purpose of this report is to present domestic approaches to minimize environmental impacts and ensure safety of arctic shipping, and to stimulate discussions on possible future collaboration and coordination amongst Arctic States, Permanent Participants, Observer States and Organizations.

This report also seeks to incorporate non-governmental perspectives on ways to minimize the environmental impact of increased shipping activity in the Arctic, including Indigenous, academic and industry views.



2. International Framework for Arctic Shipping

There exists an extensive international legal framework governing the use of the world’s seas and oceans, which compliments coastal state domestic frameworks and laws that regulate their maritime zones and internal waters. At its heart is the 1982 United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS entered into force in 1994, and it has been ratified or acceded to by 168 parties, including the majority of Arctic states. UNCLOS contains many of the key concepts and principles relevant to shipping, including “territorial seas”, “innocent passage”, “contiguous zones”, “exclusive economic zones”, “transit passage” and “high seas”. UNCLOS also includes provisions relating to the protection and preservation of the marine environment.

There are numerous other international legal instruments that apply to international shipping. A key international agreement is the *International Convention for the Safety of Life at Sea of 1974* (SOLAS), which came into force in 1980. It has been ratified or acceded to by 164 parties, representing over 99%

of global shipping tonnage. SOLAS and its provisions set international safety standards for the construction, equipment, and operation of merchant ships. In particular, SOLAS authorizes coastal states to adopt, implement and enforce shore-based vessel traffic service (VTS) areas, which range from information exchange with ships to comprehensive management of vessel traffic in a particular area.

Additionally, the *International Convention for the Prevention of Pollution from Ships*, or MARPOL is the main international convention covering prevention of pollution of the marine environment by ships from operational and accidental causes. MARPOL was adopted in 1973 and came into force in October 1983. The Convention includes six technical Annexes. “Special Areas” with strict controls on operational discharges are included in most Annexes. The six MARPOL Annexes are:

- Annex I Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983);
- Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983);
- Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992);
- Annex IV Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003);
- Annex V Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988);
- Annex VI Prevention of Air Pollution from Ships (entered into force 19 May 2005).

Another important international agreement dealing with shipping is the *International Regulations for Preventing Collisions at Sea* (COLREGS), a convention of the IMO. The COLREGS entered into force in 1977 and have since been ratified or acceded to by 159 nations— including the majority of Arctic states. The COLREGS aim is to prevent collisions by ships and ensure navigation safety. COLREGS include provisions relating to maintaining a proper look-out, safe vessel speed, actions to avoid collision, transit through narrow channels and adherence to traffic separation schemes.

The IMO recently achieved a major milestone through the adoption of the *International Code for Ships Operating in Polar Waters* (Polar Code), which came into force in 2017. The Polar Code includes safety provisions, made mandatory through amendments to SOLAS, environmental provisions, made mandatory through amendments to MARPOL, and crew training provision made mandatory through the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers* (STCW).

3. International Maritime Organization Measures for Area-based Protection

The IMO has developed measures to help ensure safe shipping and protect the environment from the negative impacts of shipping, providing a framework and tools for member states to devise ship management schemes, adapted to specific circumstances. IMO-approved measures, both recommendatory and mandatory, include:¹

A **Particularly Sensitive Sea Area (PSSA)** is an area that merits special protection through action by the IMO because of its significance for recognized ecological, socio-economic, or scientific attributes that may be vulnerable to damage by international maritime activities. A PSSA designation is not a stand-alone measure—it can only be achieved in connection with one or more associated protective measures (APM), approved by the IMO. Short of requesting the establishment of a PSSA, member states may pursue these IMO measures independently, which fall into two general categories: Navigation Restrictions and Discharge Restrictions.

Navigation Restrictions

- a. **Ship Routeing Systems:** These are systems of predetermined routes and corollary measures that are recommended for use by, and may be made mandatory for all ships, certain categories of ships or ships carrying certain cargoes when adopted and implemented in accordance with the guidelines and criteria developed by the IMO, and are designed to contribute to the safety of life at sea, safety and efficiency of navigation, and/or protection of the marine environment.

Ship Routeing Systems include:

- **Traffic Separation Scheme:** a routeing measure aimed at the separation of opposing streams of traffic by appropriate means and by the establishment of traffic lanes;
- **Traffic Lane:** an area within defined limits in which one-way traffic is established. Natural obstacles, including those forming separation zones, may constitute a boundary;
- **Separation Zone or Line:** a zone or line separating traffic lanes in which ships are proceeding in opposite or nearly opposite directions; or separating a traffic lane from the adjacent sea area; or separating traffic lanes designated for particular classes of ship proceeding in the same direction;
- **Roundabout:** a separation point or circular separation zone and a circular traffic lane within defined limits;
- **Inshore Traffic Zone:** a designated area between the landward boundary of a traffic separation scheme and the adjacent coast;

¹ For a full overview of these measures, please see the previous PAME report: “PAME (II) 12/4.5/a/IMO measures by USA Norway, Finland, Canada, Russia, Denmark & Sweden”.

- **Recommended Route:** a route of undefined width, for the convenience of ships in transit, which is often marked by centreline buoys;
 - **Deep-water Route:** a route within defined limits which has been accurately surveyed for clearance of sea bottom and submerged articles;
 - **Precautionary Area:** an area within defined limits where ships must navigate with particular caution and within which the direction of flow of traffic may be recommended; and
 - **Area to be Avoided:** an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or by certain classes of ships.
- b. **Ship Reporting Systems (SRS):** These are measures designed to provide coastal States with notice of the presence of all or specified categories of ships within a specific zone of adjacent waters. In general, SRSs increase knowledge of ship movements and can facilitate a timely response to any developing maritime emergency. An SRS will provide for covered ships to report the vessel name, radio call sign, position, course, and speed to a shore-based authority and such authority should have the capability of interaction with such vessels.

Discharge Restrictions

- a. **Special Areas:** MARPOL provides for the designation of particular areas of the ocean as “special areas” and defines them as a sea area where for recognised technical reasons the adoption of special mandatory methods for the prevention of sea pollution by oil, noxious liquid substances, sewage, or garbage, as applicable, is required. Designation of special areas is to be made on the basis of three criteria: (1) oceanographic conditions; (2) ecological conditions; and (3) vessel traffic characteristics. Of particular relevance, the ecological criterion considers whether ecological conditions indicate the need to protect the area from harmful substances in order to preserve its resources, including endangered marine species, areas of high natural productivity, migratory routes for sea birds, and critical habitats for fish stocks.
- b. **Emission Control Areas:** ECAs are areas where the adoption of special mandatory measures for emissions from ships is required to prevent, reduce, and control air pollution from ship emissions as well as adverse impacts on land and sea areas, as well as human health, caused by such emissions.

4. Arctic States - Shipping Oversight

i. Canada

The Canadian Arctic region covers 40 percent of Canada's territory and is home to more than 120,000 inhabitants, of whom more than half are Indigenous. It encompasses several Inuit and Indigenous land claim areas, 53 communities and more than 150,000 kilometres of coast line. The Canadian Arctic region serves as a breeding, feeding, and migratory habitat for numerous species of birds, fish, and marine and terrestrial mammals, some of them endangered. The Arctic region is significantly important to the Inuit for subsistence harvesting and for traditional cultural practices.

Overall, Canadian Arctic vessel traffic has remained fairly steady throughout the last five years. For example, in 2018, 168 individual vessels made 407 voyages in the Canadian Arctic compared to 178 vessels which made 420 voyages in 2017. Vessel activity primarily consists of community resupply, expedition tourism, scientific research and supply and resource movement from onshore mining. Onshore resource development is a primary driver for an increase in levels of shipping, for example from bulk carriers, to supply mine sites and export products such as nickel and iron ore. The recent increase is largely due to activity at the Baffinland Iron Ore Mine and the Port of Milne Inlet.

Overview of existing legislative and regulatory regime

Canada's Arctic shipping regulatory regime is based in part on the foundations established by the law of the sea and international maritime law, including UNCLOS, and the public maritime law framework established by the IMO. The domestic framework, Canada-wide, consists of key legislation such as the *Canada Shipping Act, 2001*; the *Marine Liability Act* and the *Marine Transportation Security Act*.

The *Canada Shipping Act, 2001* is the primary piece of federal legislation applicable to shipping. It applies to all vessels operating in Canadian waters, including Arctic waters, and non-military Canadian vessels worldwide. Provisions from key international conventions to which Canada is a party, such as the SOLAS and the MARPOL, are reflected in the *Canada Shipping Act, 2001*.

The *Arctic Waters Pollution Prevention Act* complements the *Canada Shipping Act 2001*, with a focus on the Canadian Arctic. The Act and associated regulations limits and reduces the risk of accidental spills by *inter alia*, ensuring that ships only navigate in areas that are appropriate for their capabilities, or in certain cases, require an experienced ice navigator onboard. It also sets standards that prohibit the operational discharge of most pollutants and implements a highly precautionary zero-discharge regime.

The *Northern Canada Vessel Traffic Services Zone Regulations* (NORDREG) is a vessel reporting system for ships operating in Canadian waters north of 60°N, as well as in the Hudson Bay, James Bay, Kugmallit Bay and Ungava Bay. The objectives of NORDREG are to enhance the safety of vessels, crew and passengers, and to safeguard the unique and fragile Arctic marine environment. Although NORDREG was originally implemented in 1977 as a voluntary scheme, as of 2010 compliance became mandatory.

Vessels of 300 gross tonnage or more, those vessels engaged in towing or pushing other vessel with combined gross tonnage of 500 gross tonnes or more, and vessels carrying as cargo a pollutant or dangerous good, are subject to mandatory reporting under NORDREG.

In December 2017, the *International Code for Ships Operating in Polar Waters* – also known as the Polar Code – was incorporated into Canadian law through the new *Arctic Shipping Safety and Pollution Prevention Regulations*, marking the most significant changes to Canada’s Arctic shipping regulatory regime in more than 20 years. In addition to incorporating the Polar Code, the regulations also include specific Canadian requirements on assessing ice operational risk, reporting requirements, and ice navigator requirements all designed to ensure that Canada’s Arctic shipping regime continues to be amongst the safest and most environmentally friendly. In general, the primary objectives of the Arctic Shipping Safety and Pollution Prevention Regulations are to introduce new safety and pollution prevention requirements while ensuring existing levels of safety and pollution prevention are maintained (e.g. complete prohibition of most discharges).

In Canada’s Arctic, several Northern Land Claim Agreements and Modern Treaties exist between the Government of Canada and the Inuit and Indigenous peoples of Canada that must also be taken into account in the development of shipping corridors in the North. The reason is that the Government of Canada is responsible for understanding how and when their actions could have an impact on Indigenous rights and treaties. Examples of some existing land claims agreements include:

- Inuvialuit Final Agreement (IFA) (Modern Treaty) 1984
- Nunavut Land Claims Agreement (NLCA) (Modern Treaty) 1993
- Labrador Inuit Land Claims Agreement (LILCA) (Modern Treaty) 2005 / Nunatsiavut Settlement Area
- Nunavik Inuit Land Claims Agreement (NILCA) (Modern Treaty) 2008
- Eeyou Marine Region Land Claims Agreement (Modern Treaty) 2012
- Gwich’in Comprehensive Land Claim Agreement (Modern Treaty) 1992
- Sahtu Dene and Métis Comprehensive Land Claim Agreement (Modern Treaty) 1994
- Tlicho Agreement (Modern Treaty) 2005

New approaches and developments

Northern Low Impact Shipping Corridors - Canada is engaged in marine shipping-related initiatives that contribute to the improvement of Search and Rescue, vessel safety and pollution prevention in the Canadian Arctic. Of note, Canada’s \$1.5 billion Oceans Protection Plan, launched in 2016, is a national strategy to create a world leading marine safety system that provides economic opportunities for Canadians today and protects coastlines for future generations. The Oceans Protection Plan is the largest investment ever made in Canada’s coasts and waterways and includes actions to protect Canada’s Arctic coast, support safe and responsible shipping in Arctic waters, and offer new opportunities for Indigenous and coastal communities.

One of these important actions is the ongoing work with Inuit, Indigenous groups and key stakeholders in the identification and development of Northern Low-Impact Shipping Corridors. A key driver for this initiative was the Joint Arctic Leaders Statement by the United States and Canada in 2016, where both countries committed to working together to establish consistent policies for ships operating in the region and launch processes to identify sustainable shipping lanes throughout their connected Arctic waters, in collaboration with Northern and Indigenous partners.²

The Corridors initiative seeks to minimize the potential cumulative impact of marine transportation on northern ecosystems and communities through the identification of priority areas for service enhancement and investment. The geographic span of the corridors include the three Canadian territories (Yukon, Northwest Territories and Nunavut) and the northern portions of three provinces (Manitoba, Quebec and Newfoundland and Labrador), and are located in Canada's internal waters.

The Corridors will be used as framework to guide future investments to support marine navigation safety in Canada's north. Determining priority locations, necessary protective measures, the appropriate mix of navigational services, infrastructure requirements, and emergency response services required to meet the changing service needs of Northerners and the marine transportation sector will be key to operationalizing the Corridors.

These Corridors will be informed by historic, current and projected traffic patterns, local usage, and the location of breeding grounds for marine and terrestrial mammals and migratory birds, science and Indigenous knowledge, among other factors. Promoting the use of low-impact shipping corridors will involve designing navigational products and services to better support mariners and community resupply efforts with improved charting, increased emergency response and Search and Rescue services, and marine infrastructure. The availability of these products and services is expected to incentivize the use of the low-impact corridors.

A novel element in Canada's approach is the establishment of a collaborative governance framework, inclusive of Inuit and Indigenous partnerships, to define and manage the Corridors. Development of a governance framework for the Low-Impact Shipping Corridors is on-going and expected to continue through to 2022 in partnership with territorial and provincial governments, Inuit and Indigenous groups and stakeholders.

Several non-governmental, private and academic organizations are also contributing to the Government of Canada's thinking and approach to Arctic shipping management, and the Northern-Low Impact Shipping Corridors initiative in particular. Oceans North (a non-profit organization that fosters science and community-based conservation in the Arctic regions of Canada and Greenland) promotes the incorporation of strong protections for ecologically sensitive areas in regulatory and management measures governing Arctic shipping, as well as formal inclusion of the Inuit in Arctic shipping policy

² "United States-Canada Joint Arctic Leaders' Statement," December 20, 2016, available at: <https://pm.gc.ca/en/news/statements/2016/12/20/united-states-canada-joint-arctic-leaders-statement>

creation and implementation. In 2016, Oceans North and the Pew Charitable Trusts outlined an innovative approach to Arctic shipping in the *“The Integrated Arctic Corridors Framework”* paper, which recommended voluntary shipping corridors throughout the Arctic that would avoid fragile marine areas and integrate shipping and ice data to improve safety.³

In the *“Arctic Corridors and Northern Voices: Governing Marine Transportation in the Canadian Arctic”* research report series (2018-2019), University of Ottawa researchers surveyed the views of 14 Inuit communities regarding increased vessel traffic in the Canadian North.⁴ Concerns over underwater noise, shoreline erosion and contamination figured prominently. Concerns raised also centered on impacts on the environment and Inuit way of life and included ice conditions, notably impacts of icebreaking such as habitat destruction leading to food insecurity. There was also an expressed desire for information on vessels entering Northern waters and for enhanced marine infrastructure, search and rescue, and emergency response capacity. The Canadian government is beginning to address some of these concerns by offering Indigenous and coastal communities a more active role in Search and Rescue, emergency and environmental response and waterways management.

In the World Wildlife Fund 2018 report, *“Framework and Tools for Developing a Low-Impact Shipping Corridor in the Arctic Ocean”* they suggest the use of existing international mechanisms to establish low-impact corridors, notably ship routing measures, such as Traffic Separation Schemes and designation of Particularly Sensitive Sea Areas, Areas To Be Avoided and Special Areas, among others. Emphasis was also placed on the need to have adequate implementation capacity, the benefit of international cooperation and the importance of dynamic ocean management principles.

Integrated Ocean Management - The Beaufort Sea Large Ocean Management Area is approximately 1,107,694 km² and is located in the northwestern corner of Canada. Integrated Management in the Beaufort Sea is a collaborative management and planning process that seeks to address large-scale ecosystem and economic development issues through the development and implementation of an integrated ocean management plan. This multi-year, strategic level plan provides long-term direction and a common basis for integrated, ecosystem-based and adaptive management of all marine activities.

The intent of the plan is to consider all users of the Beaufort Sea resources and marine environment, as well as the interactions among human activities and between those activities and the marine environment. It is not intended as an additional layer of regulation but rather as an opportunity for integrating the common goals of the various management partners. The primary forum for stakeholder engagement in the integrated ocean management of the Beaufort Sea is called the Beaufort Sea Partnership (BSP).⁵ The BSP has broad stakeholder representation from 54 different organizations, including federal departments, territorial governments, indigenous organizations, community organizations, NGOs, academia, and industry. The BSP committee is co-chaired by regional Inuit

³ PEW Charitable Trusts, *The Integrated Arctic Corridors Framework*, April 5, 2016, available at: <https://www.pewtrusts.org/en/research-and-analysis/reports/2016/04/the-integrated-arctic-corridors-framework>

⁴ “Arctic Corridors Research”, University of Ottawa, <http://www.arcticcorridors.ca/>.

⁵ More information about the BSP available at: www.beaufortseapartnership.ca

representatives as well as the Department of Fisheries and Oceans Canada. It is also has the potential to be the forum to help advance ship management schemes in the Western Arctic.

Protected Areas in the Canadian Arctic - The Government of Canada is establishing a national network of Marine Protected Areas (MPAs), with the primary goal of providing long-term protection of marine biodiversity, ecosystem function and special nature features. In Canada's Arctic, examples of some of these MPAs include the Tarium Niryutait, Tuvaijuittuq, and Anguniaqvia niqiqyuam (Darnley Bay).

The Government of Canada also has National Marine Conservation Areas (NMCAs), which are established and managed to protect and conserve representative marine areas for the benefit, education and enjoyment of the people of Canada and the world. The purpose of the NMCAs is to achieve ecological sustainability in these areas, create enjoyable experiences for visitors, promote awareness and understanding among Canadian, and provide benefits for Indigenous peoples and coastal communities. The following are some NMCAs that exist in the Arctic Ocean:

- Arctic Basin
- Beaufort Sea
- Arctic Archipelago
- Queen Maud Gulf
- Baffin Island Shelf
- Foxe Basin

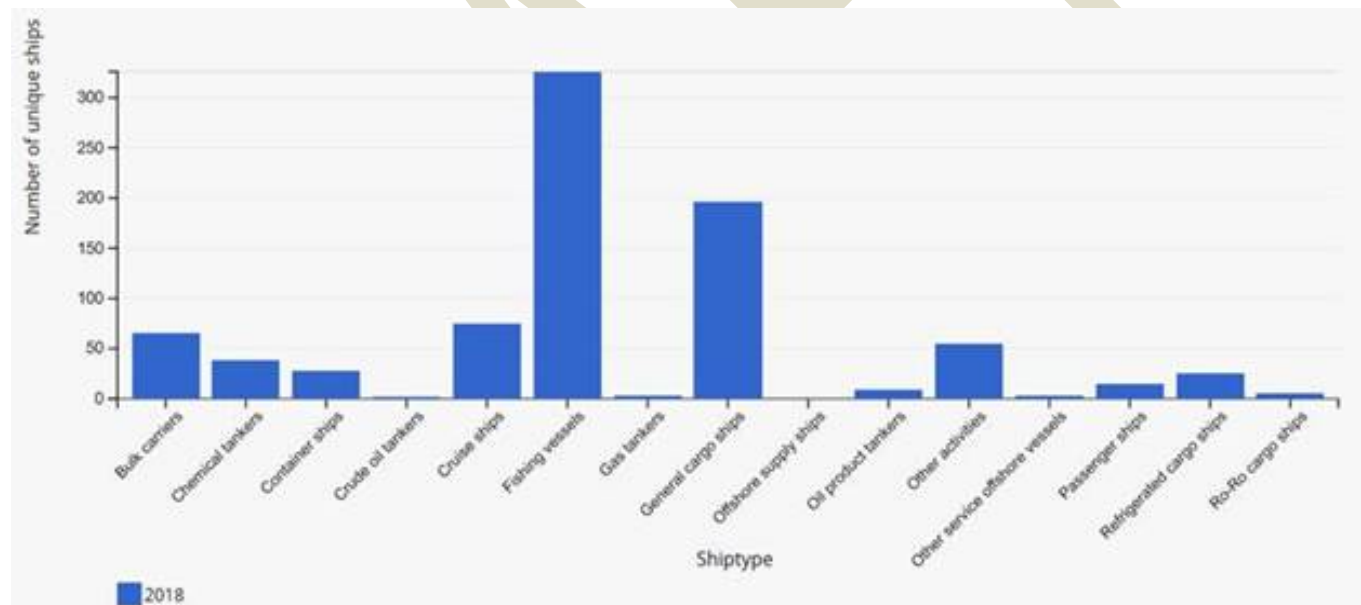
In August 2019, the completion of Tallurutiup Imanga NMCA was announced through an Inuit Impact Benefit Agreement. An Inuit Impact and Benefit Agreement (IIBA) is a formal contract that lays out a project between an Inuit community and a corporate or government project, explains the implications – both negative and positive – and clarifies how the associated Inuit groups will be impacted by the project. The establishment of the Tallurutiup Imanga NMCA is a significant contribution towards Canada's target of protecting 10 percent of its marine and coastal areas by 2020. At approximately 108,000 square kilometres, Tallurutiup Imanga NMCA represents approximately 1.9 percent of this target. Now, nearly 14 per cent of Canada's marine and coastal areas will be protected – exceeding the target of protecting 10 per cent of Canada's marine and coastal areas by 2020.

iii. Iceland

Iceland is located on the margins of the Arctic Circle and the land mass is therefore not strictly within the Arctic area. The Polar Code line lies just north of Iceland. However, the vast Exclusive Economic Zone ranges far north into the Arctic Ocean. Iceland is the second-largest island in Europe and the third-largest in the Atlantic Ocean, with a land area of some 103 thousand square kilometres, a coastline of 6,088 kilometres and a 200-nautical-mile exclusive economic zone (EEZ) extending over 758 thousand square kilometres in the surrounding waters. With only 3 inhabitants per square kilometre, Iceland is one of the least densely populated countries in Europe, with a population of about 340,000 inhabitants.

Iceland enjoys a warmer climate than its northerly location would indicate because a part of the Gulf Stream flows around the southern and western coasts of the country. In the capital, Reykjavík, the average temperature is nearly 13°C in July and just above 0°C in January. Iceland is mostly mountainous and of volcanic origin, with the highest peak reaching 2,110 metres. Lowlands stretch from the coast towards the interior, mainly in the south and the west. The coasts are rocky and of irregular outline, with numerous fjords and inlets, except for the south, where there are sandy beaches with no natural harbours. Iceland has abundant natural resources. These include the fishing grounds around the island, within and outside the country’s 200-mile EEZ.

A total of 846 ships sailed in the Icelandic EEZ in the reference year 2018. Many of them sailed in the EEZ multiple times. These ships can be categorized in 13 ship types (see figure below). Most of them were fishing vessels (326) and general cargo vessels (196), but there were also 90 passenger- and cruise ships and 66 bulk vessels. Furthermore there were 38 chemical tankers and 14 crude oil, gas and oil product tankers. All ships but the smallest ones were counted, e.g. one-man fishing vessels and leisure crafts (under 9 meters).



Overview of existing regime

Iceland has ratified most of the Conventions and instruments adopted by the IMO, including UNCLOS, SOLAS, MARPOL and COLREGS. National legislation includes Act No. 33/2004 on Measures for Prevention of Marine and Coastal Pollution; *Maritime Act* No. 34/1985; Act No. 41/2003 on the Maritime Traffic Service; and Regulation No. 524/2008 on the Delimitation of Shipping Routes, Areas to be Avoided and Mandatory Reporting of Ships off the Southwest Coast of Iceland.

Routeing Measures off South-West Iceland - In November 2007, IMO's Maritime Safety Committee adopted a series of routing measures off the South-West Coast of Iceland to reduce the dangers to shipping in the area. The routeing measures entered into force in July 2008. Iceland proposed these measures to address safety of navigation concerns off the Reykjanes Peninsula and Gardskagi Point and prevent and reduce the risk of pollution or other damage to the marine environment. The measures consist of two Traffic Separation Schemes and two Two-way Routes.⁶

Areas to be Avoided off South-West Iceland - In November 2007, IMO's Maritime Safety Committee adopted three Areas to be Avoided (ATBAs) off the South, Southwest, and Western Coast of Iceland in order to protect fishing and spawning grounds from the threat of pollution. The ATBAs entered into force in July 2008. The easternmost ATBA covers an area from Dyrholaey Lighthouse, around Surtsey Island, to the TSS at Reykjanes Point. The western ATBA surrounds a chain of islets, rocks and banks called Fuglasker, which is demarcated by the inner route through the Húllid Passage and the outer route west of the Fuglasker chain of islets Area. The third ATBA surrounds the shallows of the Sydra-Hraun Bank, located 8NM NE of Gardskagi Point.

TRANSREP Ship Reporting System (SRS) - In November 2007, IMO's Maritime Safety Committee adopted the mandatory TRANSREP Ship Reporting System off of the south-west coast of Iceland in order to contribute to safety of life at sea, safety and efficiency of navigation, and protection of the marine environment as well as to facilitate the movements of vessels and to support oil pollution response operations. The SRS entered into force in May 2008. When entering the demarcated area, ships subject to the SRS are required to make a VHF report to the Icelandic Maritime Traffic Service, located in Reykjavik.

New approaches and developments

Routeing measures in Icelandic waters - A working group was established in June 2019 to explore any possible amendments to the already adopted routeing measures off the Southwest Coast of Iceland. The objective of the work is to simplify the routeing measures and the provisions contained in the legislation in force since there have been complaints from stakeholders as to their complex nature. The working group will develop amendments to the routeing measure schemes, especially the inner and outer routes with size and cargo limitations and the provision on transit permits for ship officers. In addition, the working group will explore whether there is a need for routeing measures in other sea areas around Iceland. Any new routeing measures will be submitted to the IMO for adoption.

The Hornstrandir Nature Reserve is located in the Westfjords and was established in 1975. The total area covers 581 square kilometres (224 square miles) of tundra, cliffs, flowering fields and ice. The nature reserve is managed as an IB area according to IUCN, i.e. a natural area that is undisturbed by significant human activity, free of modern infrastructure and where natural forces and processes

⁶ For more information on IMO measures implemented in Arctic Council States, please see the previous PAME report: PAME (II)/13/4.5(c)/AMSA Recommendation II(D) & AOR 3 by USA, Denmark and Norway ("Report on IMO Established Routeing and Reporting Measures in the Arctic Region").

predominate. In order to protect the vulnerable environment in the Hornstrandir Nature Reserve and ensure the protection of its conservation values, there are now in place special rules for traffic within the nature reserve. The landing of passengers from vessels with 51 passenger or more (passengers and crew) aboard within the nature reserve, as well as vehicles associated therewith, is prohibited except in consultation with the Environment Agency of Iceland. All traffic of vessels closer to the vulnerable seabird habitations than 115 metres is strictly prohibited. In addition, the Environment Agency of Iceland recommends that seafarers do not go closer than 1 km to seabird cliffs.

A consultative group consisting of representatives from the Icelandic Coast Guard, the Icelandic Transport Authority and the Environment Agency on acute pollution outside harbour areas and on places of refuge, was appointed in 2014. The group submitted a national contingency plan on response measures against acute pollution outside harbor areas and Regulation on Places of Refuge for Ships. The plan was revised in 2016 and work is currently under way on revising the measures in light of new guidelines from the European Union and based on recent developments in vessel traffic in Icelandic waters.

In addition, the Coast Guard, the Icelandic Transport Authority and the Environment Agency established a consultative group in December 2018, tasked with proposing guidelines for passenger ships arriving in Iceland and drawing up a plan for further policy and decision-making concerning maritime safety and environmental protection related to the arrival of such ships in Icelandic waters.

Passenger ship tourism in Iceland is developing very rapidly. Passenger ships are known to discover and utilize new landing sites before any investigation has been carried out on safety aspects or the impact of arrival of passenger groups on environmental factors and the vulnerable nature of the areas in question. Consequently, the legislature lags behind in following this trend and often it is difficult to respond to queries as to any restrictions imposed on travel agents.

The Icelandic Coast Guard, the Icelandic Transport Authority and the Environment Agency have proposed that a consultative group and subgroups be established under the auspices of one or more ministries on necessary legislative and/or regulatory amendments concerning the arrival and voyages of passenger ships and vehicles connected to them and the landing of their passengers in remote areas.

iv. Kingdom of Denmark (Greenland)

Greenland is the world's largest island, with more than 44,000 km of coastline. Greenland is per se an indigenous country and home to 57,000 inhabitants. Most of the area in Greenland is covered with ice sheet, with a total area of 1.8 million km² (695,000 square miles). The ice contains 10 percent of the world's reserves of fresh water. Greenland contains a wealth of species of animals that have all adapted to the Arctic climate both on land and in water.

Passenger ships, fishing vessels and community resupply ships account for most of the traffic entering and exiting Greenlandic waters. A growing number of bulk carriers from mining sites in Canada are transiting through the Greenlandic EEZ.

Overview of existing regime

Denmark has ratified key IMO conventions, including UNCLOS, MARPOL and SOLAS. The main domestic legislations relating to the shipping regime include the *Merchant Shipping Act* and the *Act on Safety at Sea*. The provisions of the Polar Code have been enacted through "Order on Notice B from the Danish Maritime Authority". The Greenlandic legislation on marine environment (within three nautical miles from land) and the Danish Marine Environment Act (from three nautical miles to 200 nautical miles) complement the Merchant Shipping Act and the Act on Safety at Sea.

Ship Reporting Systems - There are two mandatory ship reporting systems in Greenland.⁷ One is the GREENPOS system monitored by MRCC Greenland. The GREENPOS system applies to all ships on voyage to and from Greenlandic waters and inside the Greenlandic continental shelf or exclusive economic zone. The ships are to report their position, course, speed and actual weather information every 6th hour. Around 220 ships submitted reports in GREENPOS in 2018. The second is the KYSTKONTROL (coastal control) system monitored by the Greenland coast radio stations. The coastal control system applies to ships engaged in coastal trade between Greenland ports and places of call.

Recommended routes - In the area around Nuuk in Greenland, recommended routes have been established in 2008 to improve safety in the area. The routes cover approaches from the south and the west to the port of Nuuk.

New approaches and developments

Safe Navigation for Greenland – By Order No. 1697 of 11 December 2015⁸ regulations to enhance safety of navigation in Greenland waters have been implemented. Among other things, there are special requirements for ships carrying more than 250 passengers. In particular, such ships are subject to a mandatory pilotage requirement.

⁷ IMO circular on the GREENPOS/COASTAL CONTROL (IMO SN/Circ. 221 of 29 May 2002).

⁸ For more information about national and international orders, regulations and guidelines in Greenland, please see: <https://www.dma.dk/SikkerhedTilSoes/Arktis/SejladsGroenland/Sider/default.aspx>.

v. Norway

Overview of existing regime

Norway is party to key conventions, including SOLAS, MARPOL and UNCLOS. The main domestic legislation relating to marine shipping is the *Norwegian Maritime Code* (Act No. 39 of 1994).

From January 1st, 2016, all ship reporting obligations pursuant to *the Harbour Act* will become available in one common regulation, the “Regulation on vessels' notification obligations under the *Harbour and Fairways Act*.” The new ship reporting regulation will provide an easier overview of ship reporting obligations and which ship reporting obligations are applicable at any given time. The following ship reporting obligations will be included in the new regulation: Notifications of the Shipping Traffic Systems' operations in Norway's Economic Exclusive Zone and Notifications in connection with Barents Ship Reporting Systems' voyages. Vessel Traffic Service measures are accounted through the “Regulations relating to the use of vessel traffic service areas and use of specific waters (Maritime Traffic Regulations)”.

Barents Area Ship Reporting System (Norway and Russian Federation) - In November 2012, the IMO's Maritime Safety Committee adopted the mandatory Barents Area Ship Reporting System (SRS). The SRS entered into force in June of 2013. Norway and Russia proposed the mandatory SRS for the protection of the marine environment, and to facilitate information exchange for search and rescue (SAR) purposes. It is the first IMO approved SRS where all of the reporting requirements can be accomplished by non-verbal means.

Prior to or when entering or departing the SRS operational area, applicable ships—which are those ships 5,000 gross tonnage (GT) and above; all tankers; all ships carrying hazardous cargoes; a vessel towing when the length of the tow exceeds 200 meters; and any ship not under command, restricted in their ability to manoeuvre or having defective navigational aids—must submit a report to the Vardø Vessel Traffic Service (VTS) center or the Murmansk VTS center identifying, among others, the ships name, course, speed, destination, maximum present draught, and class and quantity of hazardous cargo. In turn, these ships may request information from either VTS center about positioning, weather forecast, navigational warnings and other hazards in the ship reporting area. The VTS center can also recommend suitable anchorages or other places of refuge within the operational area.

Routeing Measures from Vardø to Røst - In August of 2006, the IMO's Maritime Safety Committee adopted eight new Traffic Separation Schemes (TSSs) and seven recommended routes connecting the TSSs between Vardø and Røst. The measures, which entered into force in February 2007, were proposed by Norway in order to establish a safe route for sea transport in the region, in particular for the transport of oil from the increased petroleum activity in the Barents region. The measures apply to tankers of all size, including gas and chemical tankers, and ships transporting cargo in excess of 5,000 GT. Ships in transit or on international voyages to or from Norwegian ports are required to travel within the defined limits of the TSSs and will be monitored from the Vardø VTS. The routeing measures reduce both the probability of accidents and the consequences of possible accidents.

New approaches and developments

The Routeing Measures covering South, West and Northern Norway are at the moment in a revision process based on experiences from the years they have been in force (North 2007, South and West 2011). The main focus of this work is to harmonize applicability for the systems in South and West with the system in North.

The Norwegian Coastal Administration is also working with a project where recommended archipelago routes will be available for shipping to download and use in Electronic Chart systems. Pilots with long experience have validated the routes.

After the grounding of the trawler "Northguider" in Svalbard December 2018, the Administration is looking for new technologies and at the same time improvement of equipment and procedures related to the handling of acute pollution in order to be better prepared for the increasing traffic. Norway is improving the terrestrial based AIS coverage of the waters around Svalbard. Currently, the waters around the western part of Svalbard, which sees the most maritime traffic, are covered by terrestrial AIS base stations, and we are in the process of extending coverage to other parts of the archipelago.

A radio broadband system is also under establishment to give better data communication among the state actors (Governor of Svalbard, Coastguard, and Coastal Administration), thus increasing the possibility for good situation awareness related to emergency response and acute pollution combat.

Arctic Navigation Web Application - ArcticWeb is a web based platform for improving the safety of navigation in the Arctic.⁹ The platform is a joint regional project primarily funded by the Nordic Council of Ministers, which has been operational since 2014 and is free to use. ArcticWeb collects and presents relevant information to persons who are navigating the waters of Arctic regions. The key services and tools on ArcticWeb are route sharing, sharing of schedules, ice charts, weather on route, forecasts of wave height and ice accretion, navigational warnings and a search and rescue tool. The main target group is cruise and passenger ships, and as of May 2018, there were approximately 250 active users. The platform was initially led by the Danish Maritime Authority and was transferred to the Norwegian Coastal Administration as of 2018. The Danish Maritime Authority remains a partner and data provider.

vi. Russian Federation

The Arctic Zone of the Russian Federation (AZRF) is the northern extremity of the European and Asian parts of the Russian Federation, located along the coast of the seas of the Arctic Ocean: the Barents,

⁹ See platform's website, <https://arctic.barentswatch.net/>, and https://www.dma.dk/Presse/Nyheder/Sider/ArcticWeb_finds_new_home_in_Norway.aspx for more information.

Kara, Laptev, East Siberian and Chukchi. This is the longest maritime border of Russia (19,724.1 km). The total length of the Russian Arctic coast constitutes 12,200 nautical miles (22,600 km). The area of the land part of the Russian Federation's AZ is 18% of the territory of the Russian Federation - 3.1 million square km. The territory of the continental part of the Russian Arctic is 4.9 million square km. The islands cover an area of 0.2 million square km. The islands in the waters of the seas of the Arctic Ocean also lead to the Arctic zone of Russia: the Novaya Zemlya archipelago (the two largest and many small), 192 islands of the Franz Josef Land archipelago, more than 100 islands of the Solovki archipelago, etc.

Most of the settlements in the Russian Arctic are located on the coast of the Arctic seas or in its immediate vicinity, as well as in the lower reaches of the rivers flowing into the Arctic Ocean. The three largest cities located beyond the Arctic Circle are located in Russia: Murmansk (305,000 inhabitants), Norilsk (180,000 inhabitants) and Vorkuta (85,000 inhabitants).

Overview of existing regime

Many international conventions and instruments are in force, including UNCLOS, SOLAS and MARPOL. The main legislation governing shipping in the Russian Federation is the *Merchant Shipping Code of the Russian Federation* No. 81-FZ (1999). There are also numerous internal legislative acts regulating pollution and maritime pollution. The starting point is the *Federal Law on the Protection of the Environment*, as well as other federal laws followed by government decrees and regulations enacted by the Russian administrative bodies, such as the Ministry of Transport and the Ministry of Natural Resources and Environment.

Northern Sea Route (NSR) - On March 15 2013 the government issued an order to establish the Administration of the Northern Sea Route. The creation of this state institution was one of the measures indicated in the recent Federal Law 132-FZ, which entered into force in January 2013 and provides the foundation for the new regulation of issues relating to the Northern Sea Route. It provides that navigation in this route will include safety requirements and rules for navigation, icebreaker escort, and ice pilotage and radio communications. General organisation and supervision of navigation of the route will be undertaken by the Administration of the Northern Sea Route.

Rules of Navigation in the Water Area of the Northern Sea Route (Rules) dated January 17, 2013, with amendments, establish the order of the organization of navigation, radio communication of ships in the water area of the Northern Sea Route, rules for the icebreaker assistance ice pilotage of ships, provision on the navigational, hydrographic and hydro meteorological support of the navigation of ships along the Northern Sea Route, as well as requirements to ships in relation to the protection of the marine environment. Granting permission for the navigation of ship in the water area of the Northern Sea Route is effected by the NSR Administration on the basis of application of ship owner, representative of ship owner or ship master (hereinafter referred to as application) with the indication of full denomination and (if any) of identification number of the IMO, family name, first name, patronymic (if any) of the applicant, contact phone, fax, e-mail address for a physical person. The application should contain the confirmation that ship owner ensures the compliance of ship with the present Rules prior to the entering of ship into the water area of the Northern Sea Route.

The Northern Sea Route, runs along Russia's Arctic coast and mainly traverses Russia's territorial sea and exclusive economic zone. For almost the whole of its length, the sea route lies beyond the Arctic Circle and is covered with ice for most of the year, but it is nonetheless extensively used for the transport of cargo to the northern parts of Russia (many of these areas being unreachable by land). Over the past few years, international interest in the sea route has increased, since it provides a significantly shorter transit route between the ports of Western Europe and Asia than the route through the Suez Canal.

In the past year, intensive development of the NSR has been carried out. The delivery of socially significant goods to the Arctic ports, autonomous objects and settlements located on the islands and the Arctic coast is conducted through the NSR. At the same time, the implementation of large investment projects began. The construction of factories, seaports and terminals, infrastructure, ensuring the delivery of products of these projects to consumers. The volume of transit traffic in the NSR is gradually increasing. Cargo ships transited NSR in 2017 – 29 (transported cargo - 194364 mt); in 2018- 27 ships (transported cargo – 491300 mt).

From December 2017, year-round shipment of liquefied natural gas (LNG) to gas-carrier vessels from a plant in the settlement of Sabetta, Yamal, began. LNG is transported by Arc7 ice-class tankers, with a deadweight of 97 thousand tons, unparalleled in the world. The ice class of tankers (Arc7) makes it possible to navigate independently in the drifting ice of the southwestern part of the Kara Sea in any ice conditions. In 2018, totally more than 20 million tons of cargo were transported via the NSR, and by 2024, expected that the freight traffic via the NSR will be about 80 million tons.

At present, in the area of the NSR, to ensure the safety of navigation, there is a system of established routes for vessels to be used as part of recommended routes and deep water routes and channels. The priority corridor for the vessels navigating through the Russian Arctic is the NSR routes, the navigation safety of which is ensured, first of all, by the nuclear icebreaking fleet.

Barents Area Ship Reporting System (Norway and Russian Federation) - In November 2012, the IMO's Maritime Safety Committee adopted the mandatory Barents Area Ship Reporting System (SRS). The SRS entered into force in June of 2013. Norway and Russia proposed the mandatory SRS for the protection of the marine environment and to facilitate information exchange for search and rescue (SAR) purposes. It is the first IMO approved SRS where all of the reporting requirements can be accomplished by non-verbal means. This SRS is discussed in further detail under the section dealing with Norway.

When navigating the routes of the NSR, ships must comply with the requirements of the “Navigation Mode in the Barents, White and Kara Seas”, admiralty number 4140, and “Guidelines for Sailing through the Routes of NSR”, issued and kept up to date by the Department of Navigation and Oceanography, admiralty number 4151.

In the Kara Strait, connecting the Barents and Kara Sea (Western Arctic), there is a system for separating the routing of vessels, similar to the systems designed by the IMO Assembly, prescribed by the “Navigation mode in the Barents, White and Kara Seas”, admiralty number 4140.

New approaches and developments

Routeing Measure in the Bering Sea and Bering Strait – The IMO approved a joint proposal by the United States and Russia to establish a new routeing measure across the Bering Sea and the Bering Strait, off the coast of the Chukotskiy Peninsula and Alaska. While the use of routeing measures are not new, its usage in this location is a new approach.

These waters are expected to see increased traffic due to rising economic activity in the Arctic. The newly adopted measure, which came into effect on December 1 2018, specifies six two-way routes and six areas of precaution and aims to improve safety of navigation, reduce the risk of incidents and collisions, and to protect the marine environment as well as local fishing activities. The six two-way routes and six precautionary areas are voluntary for or all ships of 400 gross tonnage and above.

Future Amendments to the Ice-Class Requirements for the Northern Sea Route - On November 2, 2018, the Russian Transport Ministry announced that it plans to undertake a revision of shipping regulations in Arctic waters. In a new normative act, the ministry calls for the introduction of new zones with lower ice-class requirements. Currently, the Arctic sea route is divided into seven parts with different ice-class requirements. The new regulations will diversify those areas.

vii. Sweden

Around 15% of Sweden's total land area lies north of the Arctic Circle, which defines the Swedish Arctic region. This land is sparsely populated. Kiruna, the northernmost and most populated town in the Swedish Arctic, was home to 23,116 inhabitants in December 2017. Around 20,000 Sami live in Sweden. Minimum and maximum normal average temperatures in the area range from -16°C in January to 15°C in July.

Although Sweden has no coast to the Arctic Ocean, Sweden possess leading expertise in ice-breaking and safe shipping in cold conditions, as the Bothnian Bay ices over annually. Additionally, Swedish ice-breakers have a long history of involvement in Polar research. Sweden is able to support increasing commercial shipping in the Arctic, as well as help with monitoring of the marine environment and research. The Swedish Maritime Administration's ice-breaking resources are well suited to Arctic and sub-Arctic waters, and can be used at times when the vessels are not needed for domestic duties.

Overview of existing regime

Sweden is party to UNCLOS, SOLAS and MARPOL. Domestic legislation includes the Maritime Code (1994:1009), the Vessel Safety Act (2003:364) and Ordinance (2003:438), the Act on Measures against Pollution from Vessels (1980:424) and Ordinance (1980:789). There is also a regulation (TSFS 2011:96) concerning ice class developed in cooperation with Finland.

Provisions of the Polar Code have been enacted in national law through the Swedish Transport Agency's regulation TSFS 2018:6. Furthermore, provisions on vessel traffic services are detailed in the Vessel Traffic Ordinance (1986:300) and in the Swedish Transport Agency's regulation TSFS 2009:44.

New approaches and developments

Routeing measures in Kattegat and Skagerrak – While these measures are not geographically located in the Arctic region, they demonstrate effective cooperation between Arctic States. In 2018 IMO's Maritime Safety Committee approved the joint proposal by Denmark and Sweden of new routing measures for ship traffic in Kattegat and Skagerrak. The purpose is to increase safety through several new Traffic Separation Schemes, and divide the traffic into two parallel routes that will make navigation more predictable. The new routes will be in place from 1 July 2020, supported by publication of new editions of charts containing the new routing systems.

viii. United States of America

The U.S. Arctic encompasses some 2,521 miles of shoreline, an international strait adjacent to the Russian Federation, and 647 miles of land border with Canada above the Arctic Circle. The U.S. Exclusive Economic Zone (EEZ) in the Arctic contains approximately 889,000 square miles of ocean.

The official definition adopted by the United States government is described in Section 112 of the Arctic Research and Policy Act of 1984 as "all United States foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian chain."

Much of the US Arctic is frozen for a portion of the year with the navigation season generally lasting from June to October, though the shoulder season has lengthened in recent years. Vessel traffic through the Bering Strait has risen over the past decade, doubling between 2008 and 2018. Based on projections published in 2015, anticipated traffic could approximately double again by 2025. Vessel activity in the US Arctic traditionally included sealift resupply to communities and natural resources development and extraction. Recent upticks in cruise and tourism, research, and expanded economic activity in the Russian Arctic is changing the activity makeup of the region.

Overview of existing regime

The U.S. implements its obligations under MARPOL through domestic law. The U.S. is party to MARPOL Annexes I, II, III, V and VI. The *Act to Prevent Pollution from Ships* (APPS), as amended by the Maritime Pollution Prevention Act of 2008, incorporates Annexes I, II, V and VI into U.S. law while the *Hazardous Material Transportation Act* (HMTA) incorporates Annex III. The U.S. is not a party to Annex IV. Although the U.S. has not ratified Annex IV, the U.S. has equivalent regulations for the treatment and

discharge standards of shipboard sewage – the *Federal Water Pollution Control Act (FWPCA)* as amended by the *Clean Water Act*.

The U.S. is not a party to UNCLOS, but recognizes much of the convention as reflecting customary international law, including the provisions relating to the maritime zones. The U.S. is a party to the SOLAS Convention which is reflected in U.S. laws and regulations, notably the U.S. Shipping Act and the Merchant Marine Act of 1920 / Jones Act.

New approaches and developments

Routeing Measure in the Bering Sea and Bering Strait – The IMO approved a joint proposal by the U.S. and Russia to establish a new routeing measure across the Bering Sea and the Bering Strait, off the coast of the Chukotskiy Peninsula and Alaska. While the use of routeing measures are not new, its usage in this location is a new approach.

These waters are expected to see increased traffic due to rising economic activity in the Arctic. The newly adopted measure, which came into effect on December 1, 2018, specifies six two-way routes and six areas of precaution and aims to improve safety of navigation, reduce the risk of incidents and collisions, and to protect the marine environment and to address concerns of local communities. The six two-way routes and six precautionary areas are voluntary for or all ships of 400 gross tonnage and above. The routeing measures were developed following a multi-year Port Access Route study that was informed by visits to villages in the region, regional government, tribal organizations, subsistence co-management groups (such as the Alaska Eskimo Whaling Commission) as well as input from NGOs, other federal agencies and the general public.

Canada – U.S. Joint Arctic Leaders' Statement - In 2016, the United States and Canada committed to working together to establish consistent policies for ships operating in the region. In the same year, both countries launched the first processes ever to identify sustainable shipping lanes throughout their connected Arctic waters, in collaboration with Northern and Indigenous partners. With this objective, the U.S. Coast Guard is conducting a Port Access Route Study (PARS) in the Beaufort and Chukchi Seas. As part of this study, the U.S. Coast Guard solicits comments in the U.S. Federal Register and conducts outreach with affected tribes and tribal organizations. Results from this analysis may be used to establish vessel routing measures including Traffic Separation Schemes, Recommended Routes, and Areas To Be Avoided.

6. Conclusion

As shipping activity continues to increase across the circumpolar Arctic, there is a growing need for Arctic States to work to minimize the environmental impacts of shipping on fragile northern ecosystems, while ensuring the safety of shipping activities. Through the findings presented in this report, there is common ground among Arctic states in their approaches to manage the challenges of the region.

Certain measures are successfully being implemented to ensure the safety of Arctic shipping while mitigating the negative impacts on the marine environment and coastal communities. This report sought to summarize and share examples of some of the initiatives being put in place by Arctic states to establish safe and environmentally sound shipping routes and other measures to respond and plan for increased shipping in the Arctic, and to also highlight best practices and areas for possible future collaboration and cooperation.

From the summaries included in this report, it can be seen that many Arctic states are using established IMO processes to propose and implement formal measures for area-based protection in the Arctic region. Examples include:

- U.S.-Russia collaboration on the Bering Strait region leading to the establishment of vessel traffic routing measures in 2018.
- Norway-Russia cooperation to establish a mandatory Reporting System in the Barents area in 2013.

Many Arctic states are also pursuing domestic approaches to Arctic shipping management and oversight. Examples of domestic approaches include:

- Canada-U.S. Joint Arctic Leaders' Statement that committed to working together to establish consistent policies for ships operating in the region in collaboration with Indigenous peoples;
- Involvement of Indigenous organizations in the management of Arctic shipping in Canada through the Low-Impact Shipping Corridors Initiative;
- Iceland's management of passenger vessels around the Hornstrandir Nature Reserve and ongoing and proactive efforts to maintain pace with rapid changes in vessel traffic volumes;
- Implementation by the Kingdom of Denmark of special safety requirements for large passenger ships in Greenland;
- The use of technology to create tools and resources for shipping, such as the ArcticWeb Platform maintained by Norway;
- Efforts to amend existing regulations related to Arctic shipping to reflect new contexts, such as Russia's Ice-Class requirements for the Northern Sea Route.

Through these examples, it is clear that there are varying degrees of coordination among Arctic States already taking place. Moving forward, there are opportunities for further collaboration, building on these precedents and drawing from the range of existing shipping routeing measures and other tools, such as the domestic approaches outlined in this report. In general, best practices can be considered to include the sharing of information across jurisdictions and with industry; collaboration among Arctic states, especially between those who share maritime boundaries; establishing ongoing domestic efforts to keep pace with rapid changes in Arctic shipping contexts by updating domestic legislation and regulation (also in line with international frameworks); and the consideration of diverse factors in the development of ship management measures, such as vessel safety, environmental protection and impacts on coastal communities. These multiple tools and approaches are examples of some of the many potential avenues that Arctic states may pursue to address the challenges of Arctic shipping and

managing its environmental impacts, which will be of utmost importance as the region continues to transform and opportunity for increased shipping continues to expand.

Heightened interest and attention from non-governmental actors provide both impetus and valuable insights on the path towards enhanced collaboration and coordination of low-impact shipping corridors across Arctic waters. In particular, the incorporation of environmental and cultural layers into the establishment of shipping routes stand out. Equally important is increased dialogue and collaboration with communities living in the region, particularly with Inuit and Indigenous peoples, to adequately capture environmental concerns, cultural sensitivities and awareness, in addition to other concerns surrounding the adverse impacts of Arctic shipping. This collaboration can assist with the development of shipping guidelines to help minimize the negative impacts of shipping to the Arctic marine environment and the safety of ship personnel through training such as ice formation training.

Looking forward, it is hoped that the Arctic States can continue to work together and build on domestic approaches to minimize the environmental impacts of shipping in the Arctic, and to increase coordination among Arctic States, Permanent Participants, Observer States and Organizations on measures to protect fragile Arctic ecosystems now and for future generations.