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Warming up to Arctic shipping: unique risk management challenges for marine insurers

Dr Pia Rebelo T221, Law School Building [T], City, University of London, Northampton Square, London EC1V 0HB, United Kingdom

Email: Pia.Rebelo.2@city.ac.uk

Mr Cyril Uchenna Amaefule T221, Law School Building [T], City, University of London, Northampton Square, London EC1V 0HB, United Kingdom

Email: Cyril.Amaefule@city.ac.uk

*Lecturer in Commercial Law, Attorney of the High Court of South Africa (non-practicing), Academic Fellow of the Honourable Society of the Middle Temple, FHEA

*Doctoral Candidate in Maritime Law, Barrister and Solicitor of the Supreme Court of Nigeria, Supporting Member of the London Maritime Arbitrators Association

Abstract

Due to diminishing ice shelves in the Arctic, no doubt caused by climate change, previously unnavigable marine spaces are opening up, which in turn may provide new maritime routes. The shipping and maritime industry may capitalise on these routes more in the future as they provide shorter sailing times, and it in turn may assist with increasing oil and gas exploration and extraction in the region. However, increased maritime expansion in the Arctic comes with a number of unique risks and hazards for the insured and insurer. This opinion therefore seeks to discuss the implications of the multitude of risks that are associated with arctic shipping from a marine insurance perspective and in turn to highlight some of the gaps in existing regulatory frameworks. It is argued here that marine insurers do require improved data and risk management methodologies in order to better calculate the premium of a Hull & Machinery (H&M) and a Protection & Indemnity (P&I) insurance policy which are produced for each ship that travels through the Arctic. Until such time as these risks can be adequately assessed, evaluated, and managed by insurers; which of course is extremely difficult, due to the extreme environment, the unpredictability of climate change, a lack of key data, and the complexity of the various scenarios that can unfold in the arctic environment, the actual viability of arctic shipping actually becoming 'normalised' remains in doubt. To date, insurers have paid out more in ship damage that has occurred in the Arctic than they have collected in premiums, which in itself is problematic. This situation may change in the future, if arctic shipping grows, and if it does the insurance market will no doubt, need to respond.

Key words: Arctic, arctic governance, ice-melt, ice-shelves, ice-bergs, glaciology, climate change, maritime shipping, polar shipping, arctic shipping, commercial shipping, ice-class vessels, northern sea route (NSR), Russia, marine insurance, Polar Code, Hull & Machinery (H&M) insurance policy, Protection & Indemnity (P&I) insurance policy, risk, risk evaluation, risk management, insurers, underwriters

Introduction

The Arctic Ocean is a remote complex environment, which is surrounded by Russia, Norway, Finland, Sweden, Canada, the United States of America, Denmark (Greenland) and Iceland. According to scientific data collected by NASA satellites, September arctic sea ice is shrinking at a current rate of 12.2% per decade;¹ while predictions show that the Arctic could experience ice-free summers by 2030 based on medium to high greenhouse gas emissions scenarios.² This is not too far away. Diminishing ice shelves mean that previously unnavigable marine spaces are in turn opening up to increased economic activity, as evidenced by the first-of-its-kind passage of the *Venta Maersk* from Russia's Pacific port of Vladivostok to St Petersburg in 2018 via the Northern Sea Route (NSR).³ Indeed, between 2010 and 2020, it has been reported that arctic shipping along the NSR has increased ten-fold.⁴ New arctic shipping lanes, are likely to result in the speeding up of the production of plans for the exploitation of natural resources,⁵ including fishing, mining, and hydrocarbon exploration.⁶ Whilst it was once uncertain whether offshore oil and gas extraction in the polar region would be widely pursued given the grave climatological and geopolitical implications for sustainable development,⁷ the war

¹ According to NASA's satellite sensors Arctic sea ice reaches its minimum extent each September. Consequently, each September NASA measures the extent of Arctic sea ice. See NASA, 'Arctic Sea Ice Minimum Extent' available at <https://climate.nasa.gov/vital-signs/arctic-sea-ice/> (accessed 4 December 2023). In September 2023 the size of the Arctic sea ice was 4.37 million sq km, whilst in 1980 it was 7.54 million sq km. In September 2012, the extent of sea ice recorded, was the lowest ever at 3.39 million sq km. Scientists are trying to reverse Arctic sea ice loss in order to save for example polar bears. See 'The bold plan to put the Arctic melt on ice' *The Times*, 6 January 2024 p.20. See also A. Vaughan 'Hottest year yet pushed planet close to Paris limit' *The Times*, 10 January 2024, p.15.

² Y. Kim et al, 'Observationally-constrained projections of an ice-free Arctic even under a low emission scenario' (2023) 14 *Nature Communications* 3139 (6 June 2023) available at <https://www.nature.com/articles/s41467-023-38511-8> (accessed 21 December 2023). Others have suggested that the Arctic will be almost completely ice-free in the summer by 2040-2045. See the House of Lords (2023) *House of Lords International Relations and Defence Committee 1st Report of Session 2023-24, Our Friends in the North: UK Strategy Towards the Arctic* HL Paper 8 (House of Lords: London, 2023), p.15. The meaning of the term 'ice-free' varies, depending on the author.

³ S. Jacobsen, 'Maersk Sends First Container Ship through Arctic Route' (Reuters, 24 August 2018) available at www.reuters.com/article/us-arctic-shipping-maersk/maersk-sends-first-container-ship-through-arctic-route-idUSKCN1L91BR/ (accessed 4 December 2023). Jacobsen states the Northern Sea Route (NSR) starts from Murmansk which is close to Russia's border with Norway and runs to the Bering Strait which is close to Alaska. It is currently only possible to use this route for three out of twelve months of the year. This may change over time and depends upon the extent to which the sea ice melts. If this route *does* become commercially viable it would assist with cutting travel time for container ships from Asia to Europe. A permit needs to be obtained from the Russian authorities. In 2023 1,218 vessels (1,163 in 2023) applied for a Northern Sea Permit. Of these 115 (55 in 2022) were issued to foreign countries. See Rosatom 'Historical record of the Northern Sea Route: the cargo volume in 2023 exceeded 36.254 mln.tons' (Rosatom, 2024) available at <https://www.rosatom.ru/en/press-centre/news/historical-record-of-the-northern-sea-route-the-cargo-carriage-volume-in-2023-exceeded-36-254-mln-to/> (accessed 11 January 2024). In 2013 the *Nordic Orion* managed to sail through the North-West Passage (NWP) from Vancouver in Canada to Finland in another landmark voyage. Other Arctic shipping routes that emerge when the Arctic ice thins are the North-East Passage (NEP), and the seasonal Arctic Bridge. The Transpolar Sea Route (TSR) remains hypothetical as ice-free conditions are not yet observed.

⁴ M. Humpert, 'IMO Moves Forward with Ban of Arctic HFO But Exempts Some Vessels Until 2029' (High North News 2020) available at www.highnorthnews.com/en/imo-moves-forward-ban-arctic-hfo-exempts-some-vessels-until-2029 (accessed 12 December 2023).

⁵ P. K. Mukherjee and H. Liu, 'Legal Regime of Marine Insurance in Arctic Shipping: Safety and Environmental Implications' in L. P. Hildebrand et al (eds), *Sustainable Shipping in a Changing Arctic* (Springer International Publishing AG: Switzerland, 2018), 192.

⁶ I. U. Jakobsen and E. Johansen, 'Efforts of the Arctic Council to Protect Sensitive Arctic High Sea Areas from the Impact of Shipping' (2016) *Scandinavian Inst Mar L YB* 1, 7.

⁷ F. Goerlandt and R. Pelot, 'An Exploratory Application of the International Risk Governance Council's Risk Governance Framework to Shipping Risks in the Canadian Arctic' in A. Chircop et al (eds), *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation* (Springer Polar Sciences: Switzerland, 2020) 16.

between Russia and Ukraine has reenergised the appetite for fossil fuels to safeguard the energy security of European states.⁸ Despite the uncertainty surrounding the success of gas and oil exploration licences, it is undeniable that new arctic shipping routes are providing viable connections between major world economies and present attractive options for shorter and more cost-effective voyages.⁹ Vessels can save on operational costs and avoid expensive canal fees, while some vessels may no longer need to circle Cape Town to move from Far West Europe to the East.¹⁰ Although arctic shipping still accounts for a relatively insignificant percentage of maritime trade flows, academic studies addressing ‘risk governance of arctic shipping’ are considering and responding to the fairly recent increased maritime expansion into the polar region.¹¹

In the light of the above, this opinion seeks to first discuss the implications of arctic shipping ‘risks’ from a marine insurance perspective. As part of this it considers two categories of risks, namely: 1) safety risks to shipowners regarding damage to the vessel itself or its cargo (Hull & Machinery risks); and 2) environmental risks posed to the arctic marine environment and third parties (Protection & Indemnity risks). These risks may be set out in a H&M policy and a separate P&I insurance policy respectively which are taken out by the insured/shipowner. The opinion then goes on to analyse the mandatory International Code for Ships Operating in Polar Waters (Polar Code), which, (although currently under revision), came into force on the 1 January 2017.¹² The Polar Code applies to cargo ships weighing more than 500 gross tonnes and all passenger ships, and to ‘arctic waters’ as defined.¹³

The Polar Code deals with a range of shipping matters and the environment, and lists 10 sources of hazards, that may lead to increased risks as they are more likely to occur, or there will be severer

⁸ K. Lundgren, ‘Arctic Oil drilling plans revived in Norway as priorities change’ (Bloomberg, May 2023) available at www.bloomberg.com/news/articles/2023-05-03/arctic-oil-drilling-plans-revived-in-norway-as-priorities-change?leadSource=uverify%20wall (accessed 5 December 2023).

⁹ F. Lasserre et al, ‘Polar seaways? Maritime transport in the Arctic: An analysis of shipowners’ intentions’ (2016) 57 *Journal of Transport Geography* 105–114.

¹⁰ S. Song et al, ‘Adapting to a Foggy Future Along Trans-Arctic Shipping Routes’ (2023) 50 *Geophysical Research Letters*, e2022GL102395. Available at <https://doi.org/10.1029/2022GL102395> (accessed 7 January 2024).

¹¹ See for example Goerlandt and Pelot, above n. 7 at 16-17 (in the context of Canada for example).

¹² International Code for Ships Operating in Polar Waters (Polar Code), (Safety-related provisions) (21 November 2014), IMO Resolution MSC.385 (94), (Environment-related provisions) (15 May 2015), IMO Resolution MEPC.264(68). Available in its entirety in IMO Resolution MEPC 68/21/Add.1 Annex 10, pp. 3-55 available at [https://navigation.gi/Media/637837121481143798/Polar%20Code%20\(MEPC%2068_21_Add.1%20Annex%2019\).pdf](https://navigation.gi/Media/637837121481143798/Polar%20Code%20(MEPC%2068_21_Add.1%20Annex%2019).pdf) (accessed 22 January 2024). (The acronym IMO stands for the International Maritime Organisation, MSC for the IMO’s Marine Safety Committee and MEPC for the IMO’s Marine Environment Protection Committee). The Polar Code is also published by the IMO see, *Polar code: international code for ships operating in polar waters, 2016 edition* (International Maritime Organization: London, 2016). See also the Polar Code, preamble 2 and below n. 13. See also House of Lords, above n. 2. The report says the UK government is currently involved in the process of revising the Polar Code, which if adopted would apply to a wider range of vessels, including cargo ships of less than 500 gross tonnage see para.218, and also p.4, and paras [24] and [222]).

¹³ Polar Code, above n. 12, paragraph 4 and IMO Resolution MEPC 68/21/Add.1 Annex 10, pp. 8-9; Arctic waters are defined in the following two conventions: (1) The International Convention for the Safety of Life at Sea (adopted, 1 November 1974, entered into force 25 May 1980) 1184 UNTS 2 (SOLAS) regulation XIV.1.3; and (2) Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (adopted, 2 November 1973, entered into force 2 October 1983) 1340 UNTS 184 (MARPOL). MARPOL 73, 327 UNTS 3; was modified by the 1978 Protocol MARPOL 78 1340 UNTS 184. MARPOL 78/73 has been further amended over the years. See specifically MARPOL 78/73 Annex 1 regulation 46.2; Annex 11, regulation 21.2; Annex IV, regulation 17.3; and Annex V, regulation 13.2. The definition of Arctic waters in all of the MARPOL Annexes are contained in IMO Resolution MEPC 265(68), which is available at [https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.265\(68\).pdf](https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.265(68).pdf) (accessed 30 January 2024). In this opinion the terms arctic waters and polar waters are used interchangeably.

consequences if they do occur, or both, and that these need to be managed by ship owners.¹⁴ The aim of the Code is to take a risk-based and holistic approach to mitigating the risks of polar shipping to acceptable levels. However, the Polar Code, which also applies to the Antarctic, does not, (even though it has been produced to deal with risks not covered by other instruments), cover every eventuality, and as such, presents problems for marine underwriters. It is suggested here therefore, that both the viability and sustainability of arctic shipping depends upon whether marine insurers are willing to actually mitigate potential hazards, but that this depends on whether they can obtain the relevant data in order to assess the risks identified first. It will clearly take time to gather the relevant data, meaning that it is just too early to know how effective the Polar Code is.¹⁵

Currently, insurers are improvising and carrying out their own assessments. They do not have years' worth of data on accidents, casualties, ship collisions and oil spills in the Arctic. They typically add 40% to the basic premium paid by the insured (which can range from anything between £38,500.00 to £96,200.00 for each ship's journey (as at 2020 prices)). As part of this process, the insurer will also consider the ship's condition, route and proximity to an ice-breaker before deciding the final price.¹⁶ With better data, they would be able to better calculate the premium more accurately. Any cover that is provided by an insurer must therefore be compatible with both national and international law and policies relating to the Arctic, so a lot of factors are taken into consideration before an insurer arrives at a premium price for the ship concerned.

Inherent risks associated with Arctic shipping

As stated in the early case of *The Sadlers Company v Badcock*, insurance is related to *aversio periculi* which underlies the intention of all insurance to avoid any damages or loss that the insured might sustain.¹⁷ Today, marine insurance remains concerned with liability arising from marine losses - i.e. 'the losses incident to the marine adventure'.¹⁸ An identification and analysis of 'maritime perils'/(that is the category of risks ships and cargo face during a marine adventure) is required to calculate the 'premium' of the marine insurance policy, as underwriters will have to estimate the degree of risk a vessel faces taking into account the amount of indemnity that will need to be paid out if that risk materialises.¹⁹ Arctic shipping poses problems for underwriters because there is currently limited empirical data in determining risk assessment parameters.²⁰ The two categories of risks which correspond to H&M and P&I insurance policies, are now discussed in turn.²¹

¹⁴ Polar Code, above n. 12, paragraph 3.1.

¹⁵ House of Lords, above n. 2, p. 58 (opinion of E. Nyborg from the UK Chamber of Shipping). See also S. Prior, *The Circle Magazine*, 4.2022, (World Wildlife Fund Arctic Programme: Sweden, 2022), pp.18-20. In 2022 the WWF conducted research about the experiences of using the Polar Code and identified gaps in it, and in doing so called for more research. Available at <https://indd.adobe.com/view/dcac5ab3-90b8-4393-b426-58f182be0f9b> (accessed 25 January 2024).

¹⁶ M. Rosanes 'Marine insurers navigate uncharted Arctic risks' *Insurance Business*, 29 October 2020 available at <https://www.insurancebusinessmag.com/uk/news/marine/marine-insurers-navigate-uncharted-arctic-risks-237572.aspx> (accessed 11 January 2024).

¹⁷ (1743) 2 Atkyns 554, 556.

¹⁸ Marine Insurance Act 1906 (MIA 1906) s 1.

¹⁹ C. Kingston, 'Marine Insurance in Britain and America, 1720–1844: A Comparative Institutional Analysis' (2007) 67(2) *The Journal of Economic History* 379–409, 383.

²⁰ e.g in the context of health and safety for Canadian seafarers. See Mukherjee and Liu, above n. 5.

²¹ This is consistent with the trend of increased research of maritime risks more generally as the industry is simultaneously tasked with decarbonization targets and the uptake of green technologies. See A. B. Bal et al (eds), *Regulation of Risk: Transport, Trade and Environment in Perspective* (Brill Nijhoff: Boston, 2023).

Hull & Machinery (H&M) policy insurance cover: collisions, navigation, machine malfunction

A H&M insurance policy produced by an insurer is likely to be bespoke according to each type of ship and the purpose of the ship's journey in arctic waters. Some risks will be covered and some will not be covered. Ships face numerous challenges in the Arctic due to the extreme environment. Navigational concerns include uncertain ice conditions, rapidly changing weather, extremely low temperatures, extended periods of darkness, communication failures due to high latitude, remoteness, emergency preparedness, and limited access to salvage services.²² For ships, these challenges can result in structural damage due to ice collisions or ship-to-ship collisions, propulsion loss, diminished manoeuvrability, groundings, capsizing, and loss of ship.²³ Statistics on such risks remain insufficient as ice-free shipping lanes in the Arctic are a recent reality.²⁴ In 2019 however, the Arctic Council's Protection of the Marine Environment (PAME) working group launched a new database called 'Arctic Ship Traffic Data' to record data (including historical data) about arctic shipping voyages, which may be of some use to insurers to some extent.²⁵

However, overall research on polar shipping and H&M insurance risks is just coming into existence. For example, in 2020 a study was started by Baroud and Bennartz at Vanderbilt University which aims to analyse the NSR shipping route and evaluate the economic and environmental trade-offs of it as compared to southern shipping routes, so as to produce a 'risk analysis framework'. Baroud and Bennartz's preliminary simulation shows that the Suez Canal Route (SCR)²⁶ will remain a better option for shipowners until 2050 rather than the potentially new NSR, because of the risk of navigation.²⁷ Other research by Yang et al (2024) highlights that in the context of risk assessment methodologies concerning arctic navigation safety, found that whilst they are useful for decision making processes, they are rarely applied to practical situations, and that risk factors such as 'equipment failure, human error' and other region specific navigational challenges are overlooked, and that these need to be taken into consideration by methodologies in order to make them more robust. There are as noted by the Yang et al, many different types of risk assessment methodologies and approaches that exist which can be used and applied in practice, to assess H&M risks in the Arctic.²⁸

Risk assessment for alleviating accidents in arctic waters was largely championed by the United Nation's International Maritime Organisation (IMO), the Arctic Council, and the Lloyds Register.

²² Arctic Council, Guideline for Arctic Marine Risk Assessment (2020) available at <https://eppr.dnvgl.com/risk/2> (accessed 7 December 2023).

²³ X. Yang et al, 'Review of risk assessment for navigational safety and supported decisions in arctic waters' (2024) 247 *Ocean & Coastal Management* 106931.

²⁴ W. Shyu and J. Ding, 'Key Factors Influencing the Building of Arctic Shipping Routes' (2016) 69(6) *The Journal of Navigation* 1261 – 1277.

²⁵ Arctic Council, Protection of the Arctic Marine Environment (PAME) working group: Arctic Ship Traffic Data (2023) available at <https://www.pame.is/index.php/projects/arctic-marine-shipping/astd> (accessed 11 January 2024).

²⁶ S. Swinford et al, 'Airstrikes on Houthis after strife in Red Sea' *The Times*, 12 January 2024, p.1-2. On the 11th and 22nd January 2024 the USA and the UK launched strikes against Houthi position's in Yemen in order to stop them hi-jacking ships that were using the Suez Canal Route (SCR).

²⁷ Shapiro, M. (2020) 'NSF grant to Baroud, scientists to examine the future of international shipping in the Arctic Ocean' (School of Engineering, Vanderbilt University) available at <https://engineering.vanderbilt.edu/news/2020/nsf-grant-to-baroud-scientists-to-examine-the-future-of-international-shipping-in-the-arctic-ocean/> (accessed 11 January 2024). See further R. Kandel and H. Baroud (2024) 'A data-driven risk assessment of Arctic maritime incidents: Using machine learning to predict incident types and identify risk factors' *Reliability Engineering & System Safety* 243, March 2024, 109779.

²⁸ See X. Yang et al, above, n. 23 at 1.

Lloyds initially reported that there were emerging economic opportunities in the Arctic due to melting ice, yet also identified that there would be significant ‘operational risks’ that would require mitigation through regulation and corporate risk management but noted that they cannot be eliminated entirely.²⁹ In 2017, the IMO attempted to provide a guiding methodology to assess navigational decisions, route adjustment and ice-breaker assistance with its Polar Operational Limitations Assessment Risk Index System (POLARIS) which is referenced in the Polar Code.³⁰ In 2020, the Arctic Council’s Emergency Prevention, Preparedness and Response (EPPR) Working Group published the Guideline for Arctic Marine Risk Assessment, based on the ISO 31000:2018 risk management process to assess the probability of potential accidents.³¹ Despite these developments, there has been a limited amount of research that has been undertaken to date on risk in arctic waters from a marine insurance perspective. The lack of research, clearly affects the extent to which arctic shipping routes are likely to be viable from a navigational and operational perspective.

In addition to the need for further research on operational risks, it is suggested here that data limitations also hinder the development to better understand what operational factors need to be considered in arctic shipping. In this context, the overlooked risk factors that need to be considered include the following: hull structure and material may not be suitable for freezing temperatures, contents of tanks may freeze, valves may block, bows are vulnerable to ice spray, vessel stability could be impaired, engines may not fire, navigational equipment can fail at high latitude, the presence of ice can inhibit the deployment of lifeboats, and firefighting systems may be hindered.³² In a recent systematic study of the general distribution of arctic shipping studies, the lowest ranking research areas include ice (i.e. loading, modelling, conditions), weathering and transport of oil, response and recovery, and evacuation and rescue.³³ As discussed further below, the current POLARIS does not yet adequately address the research shortages in these key areas.

Protection and Indemnity (P&I) insurance policy cover: third party liability in respect of safety and environmental risks

If a shipowner obtains a full H&M insurance policy, they will then be permitted to take out a P&I insurance policy. From the perspective of P&I insurance, arctic shipping poses several problems in respect of crew, pollution incidents, and wreck removal. Given the Arctic’s fragile nature, the greatest threat posed to the arctic environment is oil spillage,³⁴ either because of bunker oil (i.e. which can be any type of fuel oil used by a ship) or oil carried as cargo. Other environmental impacts of arctic shipping extend to ‘black carbon’ emissions (caused by Heavy Fuel Oil (HFO) or surprisingly by ‘very low’ sulphur fuel oil used by ships or by), toxic emissions, habitat destruction, biofouling, noise

²⁹ C. Emmerson, ‘Arctic Opening: Opportunity and Risk in the High North’ (Lloyd’s, London: 2012) available at <https://assets.lloyds.com/assets/pdf-risk-reports-arctic-risk-report-webview/1/pdf-risk-reports-Arctic-Risk-Report-webview.pdf> (accessed 6 December 2023).

³⁰ Guidance on methodologies for assessing operational capabilities and limitations in ice, IMO Doc. MSC.1/Circ.1519 (6 June), Appendix: Polar Operational Limit Assessment Risk Indexing System (POLARIS). See above, Polar Code, n. 12.

³¹ See Arctic Council, above, n. 22.

³² A. A. Hebban et al, ‘The IMO Regulatory Framework for Arctic Shipping: Risk Perspectives and Goal-Based Pathways’ in A. Chircop et al (eds), *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation* (Springer Polar Sciences: Switzerland, 2020) 235.

³³ L. Lu et al, ‘On risk management of shipping system in ice-covered waters: Review, analysis and toolbox based on an eight-year polar project’ (2022) 226 (Part 4) *Ocean Engineering* 113078.

³⁴ J. Bai and A. Chircop, ‘The Regulation of Heavy Fuel Oil in Arctic Shipping: Interests, Measures, and Impacts’ in A. Chircop et al (eds), *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation* (Springer Polar Sciences: Switzerland, 2020) 274.

pollution, and ecosystem disruption.³⁵ If a major environmental incident were to occur, there would also be a very limited capacity to respond timeously and effectively as the entire response capacity would likely need to be transported over vast distances from remote infrastructure. The Arctic Council's EPPR notes that an oil spill in a remote area is 'troublesome' as it would have a significant impact on the marine ecosystem and remote coastal communities.³⁶ These risks persist even though all eight of the Arctic States signed on the 15 May 2013 (in force in 2016) an Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (MOSPA).³⁷ Other associated risks include salvage, wreck removal operations, and liabilities of charterers arising from unsafe ports especially if ice conditions in the Arctic renders an arctic port unsafe. P&I cover thus plays a significant role in the mitigation of these risks.

Increased shipping in the Arctic also has socio-economic impacts on human communities. Disturbances in arctic marine systems can jeopardise traditional hunting and fishing practices, while some coastal communities are growing increasingly concerned about the preservation of natural environments, archaeological sites, and the additional pressure placed on local infrastructure due to the increased presence of other people.³⁸ Increases in emissions and pollution have very real consequences for the human health and food security for these people. Climate litigation has taken a significant rights-based approach over the last decade which has seen classes of persons hold both public and private actors accountable for human rights violations related to climate change.³⁹

For seafarers, the risk of hypothermia and frost bite are severe whilst having to wear thick gloves and clothing can diminish tactile sensitivity and manual dexterity.⁴⁰ There is also an increased risk of accidents and a much higher whole-body vibration factor, made even riskier by extreme darkness or high UV light exposure.⁴¹ Maritime occupations are already associated with high levels of fatality and arctic shipping increases the risk of death substantially.⁴² Whilst the risk of accidents is widely acknowledged, lesser known are the indirect occupational health hazards associated with the long and complex commutes of seafarers to board vessels at faraway ports coupled with the long voyage times

³⁵ L. Joseph et al, 'A techno-economic environmental cost model for Arctic shipping' (2021) 151 Transportation Research Part A 28-51.

³⁶ Arctic Council, 'Preventing and Responding to Oil Spills in the Arctic' (2020) available at <https://oaarchive.arctic-council.org/server/api/core/bitstreams/2138c78b-b1ca-4672-8b1b-cedd75107bb3/content#:~:text=EPPR%20recently%20developed%20a%20series,risk%20and%20impacts%20to%20communities> (accessed 12 December 2023).

³⁷ Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (adopted 15 May 2013, entered in force 25 March 2016) (MOSPA). The document is legally binding and is available at <https://oaarchive.arctic-council.org/items/ee4c9907-7270-41f6-b681-f797fc81659f> (accessed 9 January 2024). See also J. Ford and D. Clark, 'Preparing for the impacts of climate change along Canada's Arctic coast: The importance of search and rescue' (2019) 108 Marine Policy 103662. Ford and Clark argue that even though marine risks in the Arctic are likely to increase Canada is currently failing to meet its international obligations (i.e. as per the United Nations, International Search and Rescue Advisory Group (INSARAG) guidelines (updated 2020) as 90% of incidents rely upon ground searchers/volunteers as opposed to a search and rescue team responding to the incident concerned. See further the 2011 Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic (in force 2013) available at <https://oaarchive.arctic-council.org/items/9c343a3f-cc4b-4e75-bfd3-4b318137f8a2> (9 January 2024).

³⁸ H. Huntington et al, 'Effects of Arctic commercial shipping on environments and communities: context, governance, priorities' (2023) 118 Transportation Research Part D: Transport and Environment 103731.

³⁹ A. Savaresi and J. Setzer, 'Rights-based litigation in the climate emergency: mapping the landscape and new knowledge frontiers' (2022) 13(1) Journal of Human Rights and the Environment 7 – 34.

⁴⁰ D. Shan, 'Mapping the Maritime Occupational Health and Safety Challenges Faced by Canadian Seafarers' in A. Chircop et al (eds), *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation* (Springer Polar Sciences: Switzerland, 2020) 197. See also, Hebbbar et al, above n. 32.

⁴¹ Hebbbar et al, above n. 32.

⁴² Shan, above n. 40 at 192.

containing intensive work and short rest intervals.⁴³ It is often the case that employees are required to keep watch an hour at a time so as to avoid hitting an iceberg. Generally, depending on the State concerned, occupational health and safety regulations are partial, and as such these sorts of risks need to be mitigated by shipowners and insurers.

Another largely ignored operational risk is that of increased emissions stemming from energy intensive arctic shipping. At the Marine Environment Protection Committee (MEPC) 76th meeting in June 2021 (as a result of Estonia et al's document 'MEPC 76/3/5'), the IMO recognised that ice-classed vessels consume more fuel when in ice conditions than when sailing in open waters in the same area; this is due to ice resistance which forces the vessel to reduce operational speeds. As such, the IMO's Carbon Intensity Indicator (CII)⁴⁴ allows for specific treatment for the periods where a ship is sailing in ice conditions. Ships travelling in ice can apply two correction factors for transport work for ice-classed vessels: capacity correction factors and special ones for ice class 1A and 1A Super.⁴⁵ Critics have stated that these correction factors are bad for the environment because the actual carbon emission rate is higher than the reported rate; yet the corrections also allow for shorter routes with overall less fuel consumption.⁴⁶ From a marine insurance perspective, underwriters may want to consider the overall climate risks associated with vessels operating in arctic waters. In particular, fuel efficiency should be factored in the vessel's design, although climate risks in shipping (whether regulatory, reputational, or legal) are still being fully explored within a widening context of regulatory responses, green finance frameworks, and a keen interest in pursuing private actors through climate litigation strategies (e.g. greenwashing claims).⁴⁷

The Polar Code contributions to Arctic risk appraisal

The IMO's Polar Code was adopted to help mitigate the risks to shipowners and the environment.⁴⁸ The Code was necessitated by inter alia, different national and regional regulations governing polar shipping,⁴⁹ and to supplement the already mandatory Conventions.⁵⁰ Prior to its enactment, safety and environmental discharges were dealt with under the International Convention for Safety of Life at Sea (SOLAS);⁵¹ the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW);⁵² and the International Convention for the Prevention of Pollution from Ships 73/78 (MARPOL), respectively.⁵³ The Polar Code amended the SOLAS by the addition of new chapter XIV,

⁴³ Shan, above n. 40 at 197 – 198 (in a Canadian context).

⁴⁴ The Carbon Intensity Indicator (CII) was adopted by the IMO in Resolution MEPC.328(76).

⁴⁵ Resolution MEPC.355(78) 2022 interim Guidelines on correction factors and voyage adjustments for CII calculations (CII Guidelines, G5).

⁴⁶ T. T. Tran et al, 'Route optimization for vessels in ice: Investigating operational implications of the carbon intensity indicator regulation' (2023) 158 Marine Policy 105858.

⁴⁷ P. Rebelo, 'Legal Tools for Overcoming Perceived Risks in Green Shipping' in A. B. Bal et al (eds), *Regulation of Risk: Transport, Trade and Environment in Perspective* (Brill Nijhoff: Boston, 2023).

⁴⁸ Polar Code, above, n.12.

⁴⁹ Hebbbar et al, above n. 32 at 237.

⁵⁰ Polar Code, above, n. 12, preamble 2. See also above, n. 13.

⁵¹ SOLAS, above, n. 13.

⁵² International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (adopted, 7 July 1978, entered into force 28 April 1984) 1361 UNTS 2 (STCW). The STCW Code, supports the regulations contained in the STCW Convention. The STCW Code was adopted by Resolution 2 at the 1995 STCW Conference which took place between the 26 June and 7 July 1995. The full text of the Code (although not the authentic one, which excludes footnotes), can be found in STCW 6/Circ.1, 24 July 1995; Ref A1/V3.02. The STCW Code entered into force on 1 February 1997. The STCW Convention and the STCW Code have been amended numerous times between 1991 and 2018.

⁵³ MARPOL 78/73, above, n. 13.

amended Annexes I, II, IV and V of MARPOL, and Chapter V regulation 4 of the STCW Convention and STCW Code.⁵⁴

The Polar Code is divided into two parts. The first deals with safety issues while the second deals with pollution issues. Both parts are further sub-divided into another two parts: Part I-A, I-B, and Part II-A and II-B. Parts I-A and II-A are mandatory provisions of the Code while parts I-B and II-B are not mandatory, rather they are in the form of additional guidance to supplement the mandatory provisions. The overarching aim of the Code is to make provision for safe ship operation and the protection of the polar environment.⁵⁵ The way to achieve this is by addressing the risks inherent in arctic waters which are listed in it that are not adequately mitigated by other Conventions of the IMO.⁵⁶

Polar Code: safety provisions

Part I-A of the Polar Code deals with two safety issues, both of which concern elements of seaworthiness.⁵⁷ The first relates to the structural aspect of seaworthiness. This includes ship structure, stability, watertight and weathertight integrity, safety equipment, machinery. Noteworthy is the provision of chapter 4 which notes that ships in category A and B which are built on or after 1 January 2017 must have the capacity to withstand flooding from ice-related damage.⁵⁸ With respect to watertight and weathertight integrity, the Code requires that all closing appliances and doors relevant to it must be operable in the polar environment.⁵⁹

The second safety issue addressed in Part I-A of the Polar Code, relates to preparations before the commencement of voyage. It concerns matters of documentation, voyage planning, communication, safety of navigation, and as concerns the crew, manning, and training. The Code introduced what is known as the Polar Ship Certificate which must be carried on board.⁶⁰ The certificate is to be issued by either the administration or by any person or organization recognised by it in accordance with SOLAS regulation XI-1/1.⁶¹ In practice, this would usually be issued by the relevant classification society acting on behalf of the flag state concerned. There is also a Polar Water Operational Manual (PWOM)⁶² which is to be carried on board. A voyage plan is additionally required for all intended voyages which must take into consideration all the likely hazards to be encountered.⁶³

Polar Code: pollution prevention measures in the Arctic

The pollution aspects of the Polar Code have been integrated into MARPOL through a series of amendments. The pollution prevention section of the Code has 5 chapters. These chapters cover issues of pollution by oil, pollution by noxious liquid substances in bulk, pollution by sewage, pollution by harmful substances carried by sea in packaged form, and pollution by garbage from ships.

⁵⁴ A. Chircop, 'Canada and the Polar Code: Balancing Unilateralism and Multilateralism in the Regulation of Arctic Shipping' (2018) 51 Rev BDI 380, 392-93. STCW and STCW Code, above, n. 52.

⁵⁵ Polar Code, above n. 12, introduction 1.

⁵⁶ Ibid.

⁵⁷ It is important to note that more than a third of arctic shipping comprises commercial activities of non-SOLAS (Safety of Life at Sea) vessels including small cargo ships, fishing vessels, and pleasure yachts.

⁵⁸ Polar Code, above n. 12; Chapter 4, paragraph 4.3.2.1.

⁵⁹ Polar Code, above n. 12; Chapter 5, paragraph 5.2.

⁶⁰ Polar Code, above n. 12; Chapter 1, paragraph 1.3.

⁶¹ Polar Code, above n. 12; Chapter 1, paragraph 1.3.4.

⁶² Polar Code, above n. 12; Chapter 2, paragraph 2.3.

⁶³ Polar Code, above n. 12; Chapter 11, paragraph 11.2.

An analysis of the chapters shows that while chapters 1 and 2 applies a ‘zero-tolerance approach’⁶⁴ with respect to pollution by oil and noxious liquid substances in bulk, chapters 4 and 5 do not. Consequently, discharge of sewage within polar waters is permitted when certain requirements are met. Also, discharge of garbage in arctic waters is permitted when performed in accordance with Regulation 4 of MARPOL Annex V and subject to further requirements in the Code. The Code has left out any additional requirements regarding pollution by harmful substances carried by sea in packaged form in chapter 3. According to Bai, the reason for this is so that no greater pollution in arctic waters will be done by ‘packaged harmful substances’ than in normal waters.⁶⁵

Insurance under the Polar Code and persistent concerns for underwriters

Although the Polar Code contains no mandatory provision on marine insurance, it is suggested here that arctic shipping is axiomatic of the field of marine insurance. Given the risks posed by arctic shipping, arctic states like Russia and Canada acting under article 234 of the 1982 United Nations Law of the Sea Convention (LOSC) have mandated that vessels passing through their Arctic exclusive economic zone (EEZ) must be insured.⁶⁶ Marine insurers are in effect the gatekeepers of arctic shipping. Despite the Code having provided a fair idea of arctic shipping risks, due to the lack of empirical data on these risks, marine insurers continue to underwrite arctic risks on a case-by-case basis, without a detailed understanding of the frequency of the risks emerging.⁶⁷ That said, even if marine insurers did have an extensive knowledge base of the risks, insurers would still have to, in any case, tailor an insurance policy according to the ship and the purpose of the ship’s journey as appropriate, but they would be in a far better position to do so and in order to calculate the premium.

From a H&M perspective, the Polar Code provides a uniform approach to risk management by focusing on technical parameters and crew training.⁶⁸ A vessel engaging in arctic shipping must comply with the Code’s structural and other documentation requirements. The Polar Ship Certificate serves as *prima facie* evidence of such compliance and sets limitations for the operation of the ship in accordance with the class of the ship. Mandatory training and certification for crew is set out through the amendments to the STCW Convention and Code.⁶⁹ These requirements should arguably address many of the risks and uncertainties that initially plagued underwriters and should be enough to convince an insurer to provide cover. However, there are still some pertinent factors that have not been comprehensively addressed by the Polar Code. Hebbar et al (2020) note that the effect of extremely low temperatures on dangerous goods is yet to be adequately addressed through Chapter VII of SOLAS and its mandatory applicable codes.⁷⁰ Infrastructure shortage and communication issues due to remoteness, high latitude, and lack of satellite coverage are not addressed by the Code. The technical requirements of the Polar Code also require more detail from classification societies and flag state administrations.

Classification societies have heeded the call to specify design and construction standards in accordance with IMO legislation and guidance, yet they somewhat confusingly developed separate

⁶⁴ J. Bai, ‘The IMO Polar Code: The Emerging Rules of Arctic Shipping Governance’ (2015) 30 The International Journal of Marine and Coastal Law 674, 682.

⁶⁵ Ibid. at 683.

⁶⁶ United Nations Law of the Sea Convention 1833 UNTS 3 (adopted 10 December 1982, entered into force 16 November 1994) (LOSC). Russia, Northern Sea Route Rules 2013, regulation 3; Canada, Arctic Shipping Safety and Pollution Prevention Regulations SOR/2017-286 Regulation 12(1) (a)&(b).

⁶⁷ Arctic Council, *Arctic Marine Shipping Assessment Report 2009*, p 65.

⁶⁸ L. Fedi et al ‘The impact of the Polar Code on risk mitigation in Arctic waters: a “toolbox” for underwriters?’ (2018) 45(4) Maritime Policy & Management 478-494, 485.

⁶⁹ Guidance on methodologies for assessing operational capabilities and limitations in ice, IMO Doc. MSC.1/Circ.1519 (6 June), Appendix: Polar Operational Limit Assessment Risk Indexing System (POLARIS). STCW Convention and the STCW Code, above, n. 52.

⁷⁰ See Hebbar et al, above, n. 32 at 239.

systems resulting in a diversification of standards. The International Association of Classification Societies (IACS) provided a uniform approach in setting out seven construction classes based on the seasonal operation of the vessel known as ‘Polar Classes’.⁷¹ These categories can work to supplement the IMO’s goal-based standards and are useful in quantifying the level of risk associated with them operating in ice. It is well known that ships operating in ice require hull strengthening, yet this also significantly increases the costs and emissions of both ship construction and operation.⁷² Therefore, shipowners would want to carefully calculate the necessity of ice-strengthening based on the risks associated with the vessel operating in ice. The IMO recommends using the POLARIS to do this which calculates Risk Index Outcome (RIO) that informs all operations and is the basis of any decision to limit or continue operation.⁷³ The RIO considers the ship’s polar class standard as determined by IACS, the actual ice conditions in which the ship operates, and related Risk Index Values (RIV). The ice conditions are categorised according to an ice-type determined by the World Meteorological Association.⁷⁴ A shortcoming of the POLARIS, however, is that it does not account for the extent to which a ship operates in varying ice conditions.⁷⁵ The POLARIS method therefore does not consider ‘...whether a ship’s exposure to some specific ice conditions is sporadic and limited, or frequent and extensive.’⁷⁶ As such, supplementary methods are needed to account for varying ice loading, and long-term ice loads which take into account the ship’s route, operating capacity and related weather/ice exposure. It has also been noted that the Polar Code only includes two threshold ‘metocean’ conditions in their recommendation on avoiding hazardous conditions, yet there are further challenges such as, ‘...the impact of wind, waves, and visibility and the combinations of different atmospheric and oceanic parameters (icing, wind chill, sea-ice pressure, drift, and ridging).’⁷⁷

In addition to the above, from a P&I insurance perspective, the Polar Code presents even further challenges. While the risks it covers are distinct, obtaining full H&M cover is a condition precedent to obtaining P&I cover for arctic shipping.⁷⁸ The P&I Clubs will not normally issue a shipowner with a “Blue Card” for such high-risk trade in its absence. A P&I insurer will also be interested in other details like the vessel’s ice class. This notwithstanding the fact that, the liability of the P&I insurer in respect of arctic shipping arises not necessarily from a breach of the Polar Code, but from legislation imposing such liability⁷⁹ and any other risk they may voluntarily take on.

⁷¹ IACS, UR II Polar Class Descriptions and Application (IACS Req. 2006/Rev.2 2016).

⁷² M. Bergström, F. Li, M. Suominen, P. Kujala, ‘A goal-based approach for selecting a ship's polar class’ (2022) 81 *Marine Structures* 103123 available under a creative commons license v. 4.0 (<http://creativecommons.org/licenses/by/4.0/>) at <https://doi.org/10.1016/j.marstruc.2021.103123> (accessed 1st February 2024).

⁷³ Guidance on methodologies for assessing operational capabilities and limitations in ice. MSC.1/Circ.1519.

⁷⁴ World Meteorological Organization, *WMO sea-ice nomenclature: terminology, codes and illustrated glossary* (Secretariat of the World Meteorological Organization: Switzerland, 1970).

⁷⁵ See Bergström et al, above n. 72 at 3.

⁷⁶ Ibid.

⁷⁷ M. Müller, Knol-Kauffman, M., Jeuring, J. *et al.* ‘Arctic shipping trends during hazardous weather and sea-ice conditions and the Polar Code’s effectiveness’ 2 *npj Ocean Sustain* 12 (2023) available under a creative commons license v. 4.0 (<http://creativecommons.org/licenses/by/4.0/>) at <https://doi.org/10.1038/s44183-023-00021-x> (accessed 1st February 2024).

⁷⁸ D. L. Torrens, ‘Marine Insurance for the Northern Sea Route: Pilot Study’ *INSROP Working Paper* IV.3.3, NO. 1-1994, 133.

⁷⁹ T. Wilhelmsen and H. J. Bull, ‘Shipping, Insurance and the Polar Code’ in Y. Tanaka et al (eds), *The Routledge Handbook of Polar Code* (Routledge: London, 2023) 689.

Mandatory regimes

There are various mandatory regimes of insurance provisions applicable to arctic shipping such as those found in the CLC,⁸⁰ the Bunkers Convention,⁸¹ and the NWRC/Wreck Removal Convention.⁸² Regarding pollution, particularly oil, whether accidentally or intentionally spilled, it has been noted above, that the Polar Code applies a zero-discharge regime. However, since the Code has no mandatory insurance provision for arctic shipping, the provisions of the CLC will apply. Article VII requires a shipowner to have compulsory insurance. If pollution damage occurs, the shipowner is strictly liable except where certain defences apply.⁸³ Interestingly, the CLC provides for direct action against the vessel's insurer.⁸⁴ Thus, the claimant may choose to go against the shipowner, who in turn will be indemnified by the Club or the Club may be sued directly. The Bunkers Convention also provides in article 7 for compulsory insurance. Just as in the CLC, the claimant(s) may bring direct action either against the shipowner or his P&I insurer.⁸⁵ This is pertinent as heavy fuel oil is still being used to power commercial vessels in the Arctic. Although the IMO has concluded a 'draft regulation' recently to ban the use and carriage of heavy fuel oil in arctic waters which is expected to take effect in July 2024, despite this, an exemption was made to allow arctic states to waive this for their own flagged vessels sailing in their domestic waters until 2029.⁸⁶ While the CLC and Bunkers Convention provide for limitation of liability regimes, the potential impact on the arctic marine environment still presents difficulty to P&I insurers. There is yet to be a maritime casualty in the Arctic necessitating the application of these Conventions. Any maritime casualty resulting in a major oil spill may far exceed the shipowner's limitation amount. Even if the 1992 Fund Convention⁸⁷ makes up for this, the amount of damage to the arctic marine environment is still unquantifiable. While the insurance industry is bracing itself for the first serious casualty, it is arguable that the extent of the impact of any oil pollution damage may very well shape the attitude of P&I insurers in their risk assessment of the Arctic.

The occurrence of a maritime casualty in the Arctic may also render a vessel to become a wreck. The need to mitigate this additional navigation hazard necessitated the NWRC Convention which came into force in April of 2015.⁸⁸ As concerns arctic shipping, the Convention also has a regime of compulsory insurance.⁸⁹ As with the CLC and the Bunkers Convention, the NWRC also has a regime

⁸⁰ International Convention on Civil Liability for Oil Pollution Damage (adopted 29 November 1969, entered into force 19 June 1975) 973 UNTS 3 (CLC). Being supplemented by the 1992 Protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (adopted 27 November 1992, entered into force 30 May 1996) 1953 UNTS 330 (FUND 1992). Some states party to the 1969 CLC have not ratified the 1992 regime.

⁸¹ International Convention on Civil Liability for Bunker Oil Pollution Damage (adopted 23 March 2001, entered into force 21 November 2008) IMO Doc. LEG/CONF.12/19, 27 March 2001; OJ L 256, 25.9.2002, pp.9-16 (Bunkers Convention).

⁸² Nairobi International Convention on the Removal of Wrecks (adopted 18 May 2007, entered into force 14 April 2015) 55565 UNTS 3283 (NWRC/Wreck Removal Convention) (not in force in the United Kingdom).

⁸³ CLC, above, n. 80. Article III provides for the defences.

⁸⁴ CLC, above, n. 80. Article VII(8).

⁸⁵ Bunkers Convention, above, n. 81, article 7(10).

⁸⁶ Humpert, above n. 4. The 'draft regulation' was adopted by MEPC 76 and will enter into effect by way of amendment to MARPOL Annex 1 (as a new additional regulation 43A).

⁸⁷ CLC, above n. 80. The 2003 Protocol (supplementary fund) (adopted 16 May 2003, entered into 3 March 2005) 92FUND/A.8/4, Annex 1 supplements the compensation provided under the 1992 Fund Convention, (and provides a third tier of compensation).

⁸⁸ NWRC, above, n. 82.

⁸⁹ NWRC, above, n. 82, article 12.

of direct action against the insurer.⁹⁰ Thus, a P&I insurer may have to seriously consider the expenses to be incurred if a vessel becomes a wreck in the Arctic before providing cover for an arctic voyage.⁹¹

Conclusion

Despite the prospects of new business opportunities in the Arctic, and regulatory improvements, the Polar Code is still a hindrance for the acceleration of new economic activities in the Arctic.⁹² The adoption of the Polar Code presented a useful risk assessment framework, but it remains largely inadequate in measuring tangible cost factors for quantifying a premium.⁹³ Although these challenges persist, arctic shipping activities have increased by 7% per annum during 2010 to 2020.⁹⁴ In particular, more recently Norway has seen rapid growth in its northern waters and Barents Sea, and it presently leads all arctic states in respect of traffic increases.⁹⁵ This is largely due to Norway's investment in infrastructure and the loading of Liquefied Natural Gas (LNG) – economic activities which are set to increase with Russia's Novatek's most recent megaproject, Arctic LNG 2 which according to Bloomberg has (despite US sanctions being imposed in November 2023) begun operating in late December 2023.⁹⁶ Norway, in contrast to Russia, benefits from having an ice-free area within its arctic EEZ for most of the year. For the opening of new shipping routes that are more likely to be 'ice-covered' to varying degrees throughout the year, marine insurers will be more cautious and will need to undergo a transition period in evaluating risks and adopting appropriate risk management frameworks and supporting methodologies before they decide to provide H&M and P&I cover. Although it is acknowledged here that arctic shipping is, perhaps to an extent inevitable, it is not possible to state whether increased economic activity in the Arctic is in accordance with the Paris Agreement.⁹⁷ There is a paucity of information on this point. While marine insurers certainly remain the gatekeepers of arctic shipping, they may want to balance the prospect of new business with the greater risks associated with the climate agenda, particularly if arctic shipping becomes an enabler of fossil fuel exploration and extraction which is inconsistent with the 1.5° Celsius mandate. Arctic shipping therefore truly does present unique risk management challenges for insurers, which no doubt they will continue to grapple with for some time yet well into the future.

⁹⁰ NWRC, above, n. 82, article 12(10).

⁹¹ J. Herbert, 'The Challenges and Implications of Removing Shipwrecks in the 21st Century' (Lloyd's: London, 2013) 22.

⁹² Fedi et al, above n. 68 at 489.

⁹³ J. Saul, 'Arctic headache for ship insurers as routes open up' (Reuters 2020) available at www.reuters.com/article/us-climate-change-arctic-shipping-insura/arctic-headache-for-ship-insurers-as-routes-open-up-idUKKBN27C1P1/ (accessed 11 December 2023).

⁹⁴ M. Müller, 'Arctic shipping trends during hazardous weather and sea-ice conditions and the Polar Code's effectiveness' (High North News, 3 September 2020) available at www.highnorthnews.com/en/imo-moves-forward-ban-arctic-hfo-exempts-some-vessels-until-2029 (accessed 12 December 2023). In the context of the NSR it has increased by 10% during the same period (Humpert, above n. 4).

⁹⁵ M. L. Druckenmiller et al (eds), *Arctic Report Card 2022* (National Ocean and Atmospheric Administration, US Department of Commerce, 2022).

⁹⁶ M. Humpert, 'Norway Sees Greatest Increase in Arctic Shipping Traffic' (High North News, 7 March 2023) available at www.highnorthnews.com/en/norway-sees-greatest-increase-arctic-shipping-traffic (accessed 11 December 2023).

⁹⁷ Paris Agreement to the United Nations Framework on Climate Change, 12 December 2015, 3156 UNTS 79. Available at https://treaties.un.org/Pages/showDetails.aspx?objid=0800000280458f37&clang=_en (accessed 7 January 2024).

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ORCID iD

Pia Rebelo: 0000-0002-7465-7529