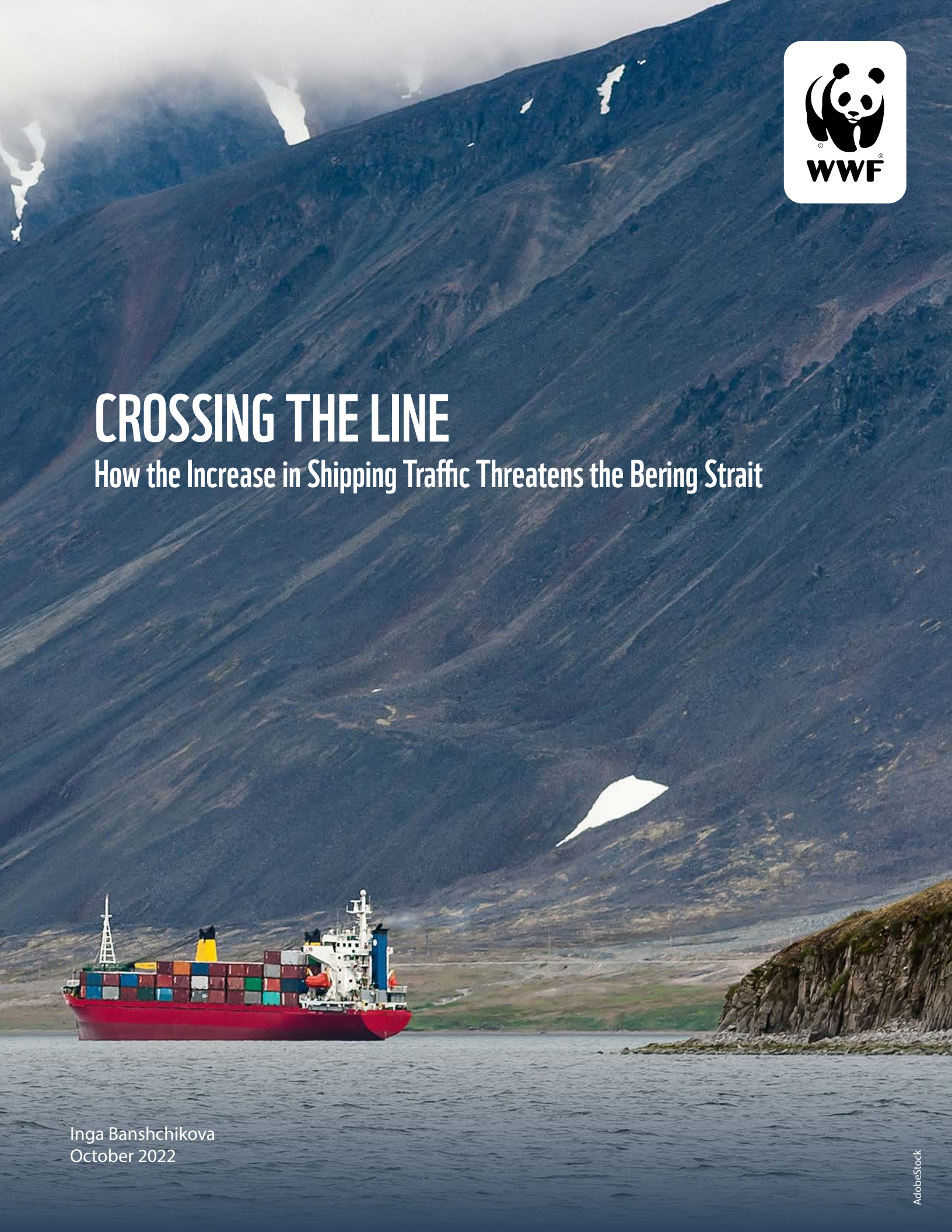

CROSSING THE LINE

How the Increase in Shipping Traffic Threatens the Bering Strait

Inga Banshchikova
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Acknowledgments: Margaret Williams and Elena Agarkova-Beloff

Executive Summary

Climate change and its impact on nature and human communities define the Arctic literature nowadays. Rising sea and air temperatures, thawing permafrost, loss of sea ice, and accelerating coastal erosion are just a few of the forces now altering life in the circumpolar Arctic. This publication focuses on the outcomes and consequences of climate-driven loss of sea ice, which will intensify shipping through the Bering Strait and, if not managed well, could result in significant consequences for nature and people. In this remote and extreme ocean, the year-round ice cover was once a significant barrier to human activity. As the Arctic Ocean becomes navigable, new shipping routes have appeared, accelerating a fresh burst of industrial action across the region and contributing to the brunt of climate change marine wildlife and communities already feel. Today, permanent sea ice is so diminished that we are witnessing the growth of an entirely new economic regime in the Arctic.

The perception of the Arctic as a resource storehouse is only growing, especially in the Russian part of the region. The Russian Far North possesses the richest reserves of deposits in the Arctic zone. The country's natural resource-dominated economy guided Russia's leadership in building capacity in the Arctic region. Unlocking and monetizing the country's vast hydrocarbon reserves in the Arctic became possible with the logistical advantages of delivering them at a competitive price to Asia and Europe along the now-navigable Northern Sea Route (NSR), one of the flagship trade routes of the north and the shortest shipping lane between East Asia and Europe.

The expansion of maritime activity over the NSR heightens the risks to Arctic ecosystems, including pollution, increasing the likelihood of groundings, collisions, strikes of marine mammals or small watercraft, and spills of oil or other types of contaminants. It is especially relevant for biologically productive ecosystems such as the Bering Strait region. The Bering Strait is the NSR's eastern gate, the narrow corridor between northern and east–west transportation routes.

The unique diversity and high density of the marine ecosystem support a rich web of life in this part of the Arctic. Each spring, tens of thousands of whales pass north through the strait to Arctic waters. This region is home to thousands of Siberian Yupik, Central Yupik, Chukchi, and Inupiaq people, dependent on marine subsistence activities. Today, the ecological and cultural values of the Bering Strait ecosystem are at risk by the rapid industrialization of the NSR and the projected growth of vessel traffic.

This paper presents a comprehensive look at the types and volumes of commodities that account for the expansion of maritime shipping activity along Russia's northern coast and highlights the risk to already climate-imperiled ecosystems, species, and people. With a focus on the NSR and the Bering Strait, this report aims to increase public understanding of the trends in shipping traffic in the Arctic and to raise awareness of the risks that traffic poses. The paper suggests mitigation measures that might help reduce these threats and protect the precious ecosystem.

Around the world, from Alaska's Prince William Sound to the Gulf of Mexico to Norilsk, Russia, oil spills and other ship-borne pollution have irreversibly damaged natural ecosystems and destroyed lives and livelihoods. Despite advances in oil spill removal technologies, once the oil is in the water, it is too late. In the Arctic, emergency response will always be hampered by extreme weather conditions and the region's remoteness. We hope that by highlighting the types of traffic and commodities traversing the NSR and Bering Strait, we can accelerate efforts to protect the Bering Strait and neighboring waters from potential harm.

Introduction: New Challenges for the Arctic

Early 2022 finds the Arctic in the spotlight, going through unprecedented shifts in its physical, social, geo-economic, and geopolitical realities. As climate change accelerates, the Arctic experiences cascading impacts such as rising sea levels, marine heat waves, thawing permafrost, ocean acidification, and severe weather events. These acute and gradual changes, which are happening four times faster in the Arctic than in the rest of the world, contribute to shifting distributions of fish and wildlife and loss of habitat for birds and marine mammals (Rantanen et al., 2022). It is especially relevant for ice-dependent species such as narwhals, belugas, bowheads, polar bears, and walruses. As sea ice melts and temperature rises, those species face tremendous challenges, including the possibility of extinction. According to the latest United Nations (UN) Climate Panel report *Climate Change 2022: Impacts, Adaptation and Vulnerability*, the region is witnessing extreme annual ice loss with a prospect of experiencing a practically ice-free summer Arctic before 2050 (Intergovernmental Panel on Climate Change, 2022).

A profoundly negative impact of Arctic climate change is felt not only regionally but globally. The rest of the world is affected by altering atmospheric and oceanic circulation and greenhouse gas concentrations. The most recent science shows that numerous Arctic climate effects are projected to grow further (Intergovernmental Panel on Climate Change, 2022). The ice-covered region is often used to convey the climate emergency. The local population also struggles to adapt to a dramatically changing polar ecosystem, experiencing damage to infrastructure, diminished access to traditional food sources, and loss of customary livelihoods and cultural practices. The Arctic is home to over 40 Indigenous groups, roughly 10% of the whole Arctic population, who are vulnerable now in their effort to continue traditional practices in the ever-changing world (Evans, 2022). The environment shapes their life and culture. The "Arctic paradox" that first appeared in 2005 states that although people living in the Arctic are considered far from the sources of pollution, they are the most contaminated (Gabrielsen, 2005).

While the Arctic meltdown poses severe threats to biodiversity and local people, the region has become more attractive for those seeking access to Arctic fish, timber, and mineral resources. The Arctic is rapidly becoming a new frontier for investors interested in oil and natural gas, coal, iron, copper, nickel, rare-earth metals, gold, and diamonds, onshore and offshore. The sad irony is that the melting of the Arctic ice is opening up access to more of the same commodities whose use precipitated it—fossil fuels (Borgerson, 2008). Drilling in the Arctic would add new environmental stressors like water, air, and noise pollution, contributing to the brunt of climate change marine wildlife and communities already feel. According to the US Geological Survey (USGS), the area north of the Arctic Circle is estimated to hold up to 90 billion barrels of undiscovered, technically recoverable oil; 1,669 trillion cubic feet of natural gas; and 44 billion barrels of liquid natural gas. These resources account for roughly 22% of the world's remaining undiscovered hydrocarbon reserves (Bird et all., 2008).

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The perception of the Arctic as a resource storehouse is especially relevant for the Russian part of the region. The extraction of natural resources, primarily oil and natural gas, is Russia's major Arctic industry. The Russian Far North possesses the richest reserves of deposits in the Arctic zone. According to the Strategy for the Development of the Arctic Zone of the Russian Federation and Provision of National Security for the Period through to 2035 (2020), the country's Arctic zone accounts for 80% of natural gas and 17% of crude oil and condensate produced in the country. The rise of liquefied natural gas (LNG) shipping enabled the monetization of Russia's remote gas reserves. Since more than half of the country's budget depends on revenue derived from the extraction of natural resources, primarily oil and natural gas, the Arctic region plays a pivotal role in Russia's economic, infrastructural and technological development. The country's natural resource-dominated economy guided Russia's leadership in building capacity in the Arctic region (International Energy Agency, 2022). The Russian government provides significant support for the oil and gas industry, so the country has invested considerable resources to develop its Arctic territory. Unlocking and monetizing the country's vast hydrocarbon reserves in the Arctic became possible with the logistical advantages of delivering them at a competitive price to Asia and Europe along the now-navigable northern shipping routes. The transport infrastructure development is a part of the Russian strategy in the Arctic zone to provide the export of raw materials and the delivery of construction materials, equipment, and cargo to support industries (The Official website of President of Russia, 2020).

The NSR is one of the flagship trade routes of the north and the shortest shipping lane between East Asia and Europe. It includes waters within the Russian Federation's exclusive economic zone (EEZ), stretching from the Novaya Zemlya archipelago along the coast of Siberia to Cape Dezhnev (see Figure 4). It is 30% to 40% shorter than traditional shipping lanes, which could save fuel, time, and money and reduce environmental impact (Humpert, 2011). According to Russia's *Strategy for the Development of the Arctic Zone* (2020), developing the NSR as the Russian Federation's competitive national transportation passage in the world market is one of the primary national interests. Russia has heavily invested in infrastructure to develop the NSR to make it a year-round navigable international transit artery in the Arctic, increasing Russia's exports eastward to Asia-Pacific (Stolyarov, 2021). The latest development plan for the NSR approved by the Russian government (2022) allocated around 1.8 trillion rubles ($29 billion) for infrastructure development with over 150 planned measures (The Russian Government, 2022).

The expansion of maritime activity along the NSR heightens the risks to Arctic ecosystems, including increasing the likelihood of groundings, collisions, strikes of marine mammals or small watercraft, and spills of oil or other types of contaminants. The increasing number of vessels transiting the Arctic waters means more air and noise pollution sources, more ocean discharges, and the introduction of invasive species. As economic activity is accelerating, it is essential to minimize risks from shipping in Arctic waters and implement the most substantial prevention measures possible, focusing on the most sensitive maritime areas.

Arctic Bottleneck: The Bering Strait

FIGURE 1. The Bering Strait's narrowest point is about 53 nautical miles (85 km) wide. Big Diomede (Russia) and Little Diomede (US) are situated only 2.5 nautical miles (4 km) apart. © NASA.

The Bering Strait, the narrow waterway separating the continents of Asia and North America, is the eastern border of the NSR. The strait is an international gateway for vessels traveling from the North Pacific Ocean to the Arctic Ocean, serving as the corridor between northern and east–west transportation routes (Ellis and Brigham, 2009). It is a transboundary area between the Russian Far East and Western Alaska that connects the Bering Sea to the Chukchi Sea. The Bering Strait's narrowest point is about 53 nautical miles wide. Big Diomede (Russia) and Little Diomede (US), the two islands in its center, are only 2.5 nautical miles apart.

With diminishing Arctic sea ice, this region is experiencing increased levels of vessel traffic and the major driver of its growth is the NSR development. The cargo from Arctic projects, cabotage, and international transit shipments always goes beyond the legal boundaries of the NSR (Interfax, 2021a). The destination voyages between the NSR and Asian ports and transit voyages[1] via NSR impact the Bering Strait ecosystem (Todorov, 2022; Gunnarsson, 2021). The Bering Strait links the east–west markets (from Asia to Europe and North America) and the west–east (from Europe to Asia). The 2021 data showed that apart from Russian ports, Chinese ports represented the largest destination for transit voyages on the NSR, 30 percent of all transits (Humpert, 2022a). South Korea and Japan were among the eastward shipping destinations (CHNL Information Office, 2021c). Due to industrial development in the Arctic, interest in the Bering Strait as a critical passageway between the Pacific and the Arctic is growing throughout the region and beyond.

Although the area of the Bering Strait is subject to severe weather and strong ocean currents, this narrow international passage has one of the most remarkably productive ecosystems. It is hard to believe, but these narrow icy waters are one of the most vibrant marine mammal migration corridors. Tens of thousands of whales pass north through the strait to Arctic waters each spring. Thanks to the currents that deliver an array of food to the region, other mammals, such as ice seals and walrus, forage here. Millions of seabirds arrive to nest on islands and rocky cliffs in the strait. Thousands of people residing on Alaska's Seward Peninsula and Russia's Chukotka Peninsula travel to the coastal areas to hunt, fish, and gather marine resources.

The unique diversity and high density of marine life support a rich web of life in this part of the Arctic. The Bering Strait region is home to thousands of Siberian Yupik, Central Yupik, Chukchi, and Inupiaq people, who are dependent on marine subsistence activities. Communities in the area are closely tied to marine species such as bowhead whales, beluga whales, walruses, ice seals, birds, fish, macroalgae, and shellfish (Hildebrand et al., 2018; Ellis and Brigham, 2009). As a part of the ocean with such a high concentration of wildlife, which provides food, sustenance, income, and a way of life for Indigenous peoples, the Bering Strait and surrounding waters are fragile and likely to experience significant impacts from the increased vessel traffic associated with the expansion of commercial activity.

Shipping along the NSR profoundly affects biodiversity and local communities' traditional way of life, elevating risks of maritime accidents, pollution, spills of oil and other contaminants, and other environmental impacts.

[1] A transit voyage on the NSR is a passage via the NSR crossing both the western and eastern borders of the NSR without calling at intermediate ports/locations along the route (Gunnarsson, 2021).

Too Important to Lose: Risks for the Bering Strait from Shipping

Although the volume of vessel traffic is far from that of traditional shipping routes, the recent data reflect a significant increase in the number of commercial vessels, including oil tankers, freighters, and LNG tankers, transiting the Bering Strait. The number of vessel transits[2] in the Bering Strait has doubled since 2009, from 262 transits per year to 555 transits in 2021. In 2020 this number was even higher, at 557 transits (Marine Exchange of Alaska, 2022). Cargo ships comprise the largest portion of all the vessels crossing the Bering Strait (more than 40% in 2021), including bulk carriers, container vessels, heavy load carriers, reefer ships, and landing crafts. Tankers and tug vessels constituted more than 20% of all ships in 2021 (Marine Exchange of Alaska, 2022). The 2020 data showed that the regular shipments of LNG and raw materials like ore concentrate, timber, and coal predominated in the traffic on the NSR going eastward (Yermakov and Yermakova, 2021; Grigoryev et al., 2021; The Public Council of the Northern Sea Route, 2021; CHNL Information Office, 2021a), posing dangers to the migration and well-being of marine life, and threatening Indigenous communities of the Bering Strait. In 2021, 47 LNG deliveries were made to Asian markets from the Russian port of Sabetta alone (CHNL Information Office, 2021c). Although more frequent voyages were made via NSR to European ports than ports of the Asian Pacific region, current geopolitical tensions resulting from the Russian invasion of Ukraine force Russia to turn to Asian partners.

Container ships, tankers, supply vessels, and bulk carriers contribute to the spread of invasive species that can disrupt ecosystems that have evolved and adapted to live together over millions of years (Geiling, 2014). A more significant number of vessels means more air and noise pollution sources and increasing probabilities of groundings; collisions; strikes with marine mammals, small watercraft, and fishing boats; and oil spills or other types of contaminants. Another concern is ship waste. As a part of regular operations, ships produce a range of substances that are eventually discharged into the ocean, including sewage, garbage, gray water, oily water mixes, and bilge water (Ellis and Brigham, 2009). Without effective management, vessel waste can have significant negative impacts on people and the marine environment, ranging from introducing bacteria and disease to inflicting damage on marine habitat. Gray water (untreated wastewater from a ship) can contain environmentally harmful pollutants such as microplastics, detergent and soap residue, pharmaceutical and personal care products, heavy metals, coliform bacteria, and pathogens.

Today, the ecological and cultural values of the Bering Strait ecosystem are jeopardized by the rapid industrialization of the NSR and the projected growth of vessel traffic for the Bering Strait. Some of the vessel routes lie through the ice seal, walrus, whale, and fish subsistence use areas and habitat, threatening the food supply of local communities. Potential changes to animal dis-

[2] A transit voyage through the Bering Strait is a voyage that crosses the Bering Strait passageline either northbound or southbound (Marine Exchange of Alaska, 2019).

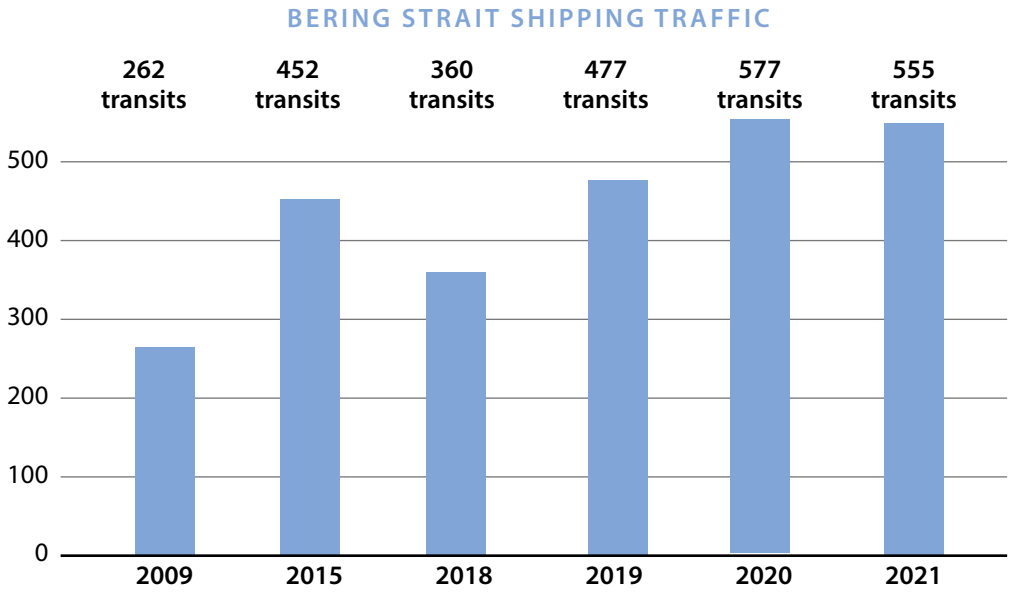

FIGURE 2. The number of vessel transits in the Bering Strait has doubled since 2009 (Marine Exchange of Alaska, 2022).

tribution and behavior, primarily due to noise from expanded vessel traffic, are among the significant concerns of Indigenous peoples (Hildebrand et al., 2018). Indigenous communities are also affected by safety concerns caused by proximity between small hunting boats and large commercial vessels, resulting in swamping or collisions and disturbance of subsistence activities.

Among the most significant risks to Arctic ecosystems in general and the Bering Strait region in particular is the prospect of oil spills, typically resulting from groundings and collisions. Heavy fuel, for instance, could have immediate and long-term consequences for marine biodiversity (Ellis and Brigham, 2009). While this is true for all marine ecosystems, the Bering Strait is at a disadvantage because it lacks the infrastructure and resources to respond to such incidents. The Bering Strait is considered a remote area under US Coast Guard rules; there is no permanent presence of the Coast Guard in the area. The closest stations are hundreds of miles away. The lack of accurate and complete hydrographic data, limited very-high-frequency and high-frequency radio coverage, and communication options also challenge Bering Strait maritime safety. The specific conditions, such as extreme weather, moving ice floes, high winds, and low visibility, create a significant "response gap" for a timely and practical ability to clean up spills (WWF International Arctic Programme, 2007). Response options may be significantly limited or precluded in this environment, making spill response operations extremely difficult or ineffective (Robertson and Kumar, 2008). Furthermore, critical assets for response—aircraft, vessels, and trained personnel—are few and far between in the Arctic. This low level of capacity to clean up spills and the sensitivity of the Bering Strait environment can impact the consequences of a spill (WWF International Arctic Programme, 2007).

There is no comprehensive ocean planning system in place to improve safety and mitigate environmental impacts from increased commercial vessel traffic in the Bering Strait. As economic activity is accelerating in this region, it is essential for Arctic nations to swiftly put in place measures that will protect the unique marine environment and local communities from challenges they have faced and may experience in the future. Since the Bering Strait is a transboundary area equally shared by the United States and Russia, it is essential for the two countries to continue working together to protect the region.

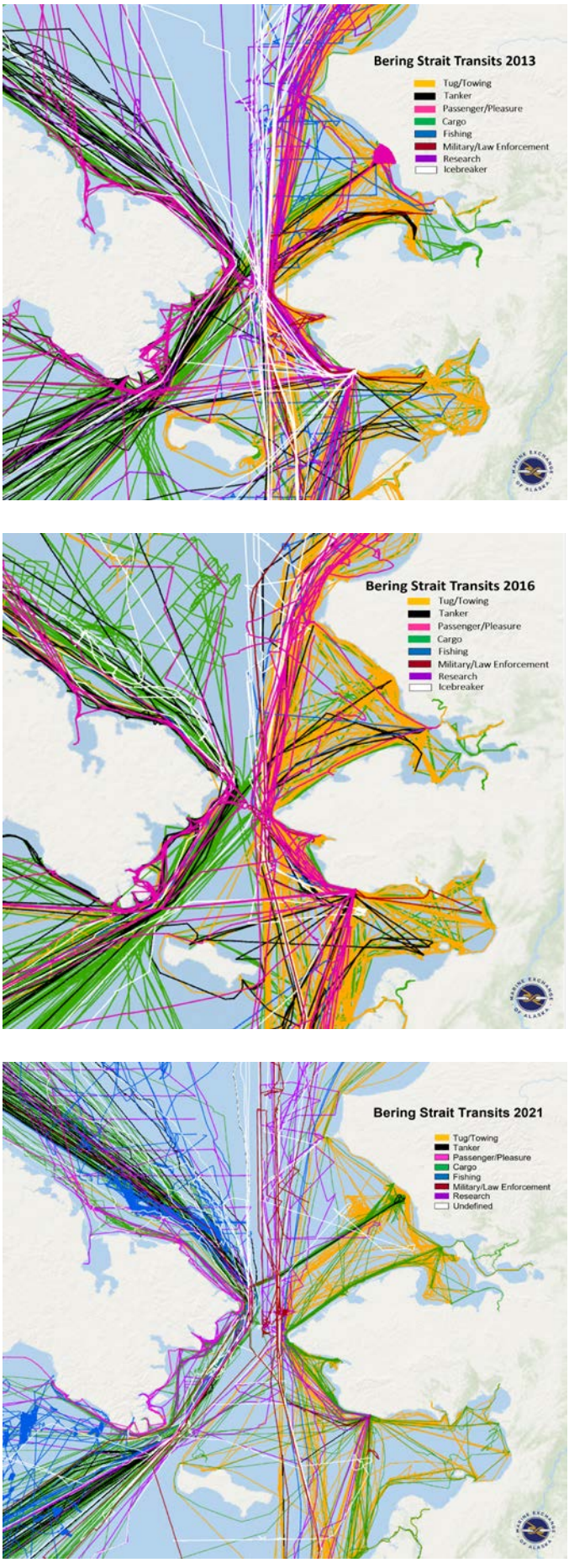

FIGURE 3. The shipping traffic density map for the Bering Strait vessel transits in 2013, 2016 and 2021 (Marine Exchange of Alaska, 2022).

Northern Sea Route: Governance and Legal Status

Since the primary goal of this Arctic shortcut between Europe and Asia has been closely connected to monetizing Russia's vast oil and gas reserves in the region, the NSR is too expensive a project to give up. The immense investment in the development of Arctic ports and infrastructure, expansion of shipbuilding resources, including capabilities to build Arctic-class tankers and nuclear icebreakers, is a sign that Russia will not leave its strategic opportunity as it is now an important engine of economic growth, job creation, and money-making in the country.

The Northern Sea Route lies within Russia's EEZ and is officially defined by Russian legislation as "a water space adjacent to the northern coast of the Russian Federation, covering inland sea waters, the territorial sea, contiguous zone, and exclusive economic zone of the Russian Federation and bound to the east by the maritime delimitation line with the United States of America and the parallel of Cape Dezhnev in the Bering Strait, to the west by the meridian of the Cape Zhelaniya to the Novaya Zemlya archipelago, and by the eastern shoreline of the Novaya Zemlya archipelago and the western borders of the Matochkin Shar, Kara Gates, and Yugorsky Shar Straits" (Russian Federal Law No. 132-FZ, 2012; Grigoryev, 2019). The Bering Strait, as emphasized by both Russian law and the Agreement on the Maritime Boundary, signed between the USA and USSR in 1990, is NSR's eastern gate. The Russian Federation views the NSR as an internal waterway, while part of the international community does not (Gricius, 2020; Overfield, 2022). For instance, The United States has strongly advocated for the right of innocent passage, stating that all Arctic straits are international, opened up to unrestricted navigation (Gudev, 2018; Fahey, 2018; Solski, 2020).

Although under the 1982 UN Convention on the Law of the Sea there are three freedoms of high seas within the 200-mile EEZ (freedom of navigation, freedom of overflight, and freedom to lay submarine cables) and the NSR passes through water areas with completely different legal regimes—inland waters, 12-mile territorial sea, 24-mile contiguous zone, and 200-mile

FIGURE 4. The officially defined Northern Sea Route boundary (NSR Administration, 2020).

EEZ—Russian law regards the NSR as a solid transport route with a unique navigation mode (Gudev, 2018). The national legislative framework governing navigation in the NSR explains this position with two main arguments. The first is that Russia considers the NSR a "historically established national transport communication of the Russian Federation," meaning that the legal doctrine qualifies these waters as inland because they historically belong to Russia and have never been covered by international conventions before but have been controlled exclusively by national norms. The Russian Federation believes that it has been working on the economic, cultural, and scientific development of these areas, investing its resources, and thus deserves internationally recognized historic status over these waters. Second, Article 234 of the United Nations Convention on the Law of the Sea (UNCLOS) gives coastal states exclusive rights to adopt and enforce national regulations to control marine pollution in the ice-covered areas within their EEZ. These laws could be more stringent than international standards. This UNCLOS article allows Russia to exceed its original jurisdiction over the NSR (Gunnarsson and Moe, 2021). Some experts believe that if the northern routes are ever entirely free from ice, this might deprive Russia of the legal grounds to refer to Article 234 as a justification.

Ship operators of commercial vessels intending to follow the Northern Sea Route are subject to compliance with Russian legislation. They must apply to the Chief Directorate of the NSR for a special navigation permit to enter the NSR waters at least 15 days before the voyage. Vessels are supposed to meet specific criteria, like ice-reinforcement requirements, prove their insurance coverage, provide a copy of the polar ship certificate and report on the vessel's condition and a voyage plan (The Northern Sea Route Administration, 2021; Maritime Code of the Russian Federation No. 81-FZ, 1999). In August 2022 the Russian government proposed a bill that will require foreign warships and other foreign government vessels to request a permit for the passage along the Northern Sea Route via diplomatic channels no later than 90 days before the expected date of the voyage (The State Duma, 2022).

Since 2022 the state-owned Russian nuclear energy agency, Rosatom (State Atomic Energy Corporation Rosatom), which operates the world's only fleet of nuclear-powered icebreakers, has been fully responsible for the management of the navigation via the waters of the NSR. The Chief Directorate of the NSR was established in Rosatom in 2022 to coordinate ships' passage, including the issue and revocation of navigation permits (PortNews, 2022c). The Ministry of Transport of the Russian Federation develops public policies and legal regulations related to the NSR. Its affiliated agency, the Northern Sea Route Administration, oversees the certificates of the conventional ice pilotage on the NSR and provides information services, making recommendations on voyage planning and icebreaking support (NSR Administration, 2022c). Other government entities actively engaged in developing the NSR include the State Commission for Arctic Development, the Ministry for the Development of the Russian Far East and the Arctic, the Foreign Ministry, and the Ministry of Natural Resources and Environment. The Russian strategy in the Arctic is to establish a complex of maritime rules and requirements to ensure economically beneficial conditions and safety for international shipping while strengthening Russian control over NSR waters.

In 2021 Rosatom introduced the concept of the Big Northern Sea Route (BNSR), which will logistically unite waters from Norway to China along the entire maritime route between the western and eastern maritime borders of Russia, including the Bering Strait (Interfax, 2021a). The BNSR does not affect the legal status and official boundaries of the NSR. It provides a unified logistics and infrastructure, including hubs, transshipment ports, and coastal and transit traffic development with a particular focus on container traffic in the Euro-Asian direction. A similar idea was suggested previously by the governors of several of Russia's northern provinces, who welcomed the NSR expansion. In February 2020, the governors of St. Petersburg and the Murmansk and Arkhangelsk regions, Sakhalin and Kamchatka, proposed to create a plan of infrastructure development for what they call the Great Northern Sea Route (from St. Petersburg to Vladivostok) and provide it with state support. They believed that the Great Northern Sea Route should include the western part (the Arkhangelsk and Murmansk regions and St. Petersburg) and the Far East (from the border of the Northern Sea Route in Chukotka to Vladivostok). Such a move would, they anticipated, increase coastal traffic and promote diversification of transport and the development of port infrastructure, helping create an integrated approach in the development of the NSR. The eastward direction of the NSR is emphasized in these proposals as a territory of primary interest, threatening the vulnerable ecosystem of the Bering Strait.

Northern Sea Route: Polar Express?

Commercial cargo vessel operators are interested in the NSR because it is dramatically shorter than southern routes if ice and weather allow. The NSR can save, for instance, about 12 days for a ship traveling from Japan (Yokohama) to Europe (Rotterdam). It takes roughly 22 days via the Suez Canal but only 10 days via the NSR (Srinath, 2010). The Suez Canal shipping route totals 12,500 nautical miles, while the NSR is 7,300 nautical miles (Humpert, 2011). The distance from Northern Europe to China is approximately 40% shorter via the NSR than via the Suez Canal. At first glance, the benefits of the NSR are apparent. In addition to the fuel and time savings, the NSR avoids the queues in the Suez Canal route and the risk of pirate attacks. There are also no fees charged for ships' passage. Considering canal fees and fuel costs, the NSR could cut the price of a single voyage by a large container ship by 20%, saving the shipping industry billions of dollars a year. The advantages of the NSR and potential economic feasibility open up the prospect for Arctic seaways to attract greater international economic integration, putting Arctic choke points such as the Bering Strait at more significant risk.

In March 2020, a 400-meter-long container ship, the Ever Given, blocked the Suez Canal for six days, and the need for alternative global transportation routes was suddenly in the spotlight. The Russian Ministry of Foreign Affairs used the Suez Canal situation as an opportunity to promote the greater international use of the NSR. In an interview, Nikolay Korchunov, Russia's senior Arctic official, pointed to what he viewed as the shortcomings of existing sea corridors, stating that the NSR should be considered a better option for commercial ships (Ria News, 2021). The blockage of the Suez Canal provoked public debate on container shipping in the Arctic, and the Northern Sea Route has gained increased attention in the industry as a result.

The NSR has its drawbacks, though. The navigational season is still short (three to four months each year). Conventional vessels could go through the NSR without ice reinforcement in the summer/autumn period. Still, even at this time, due to the unpredictable ice conditions, ships navigating the route must be adequately equipped with a reinforced hull, a specifically trained crew, and

FIGURE 5. Cargo shipping lanes. A graphical comparison of the NSR (in red) and the Suez Canal Route (in blue). The NSR is shorter by 5.2 nautical miles (Humpert, 2011).

Elizabeth Kruger / WWF U.S.

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FIGURE 6. The Ever Given ship ran aground in the Suez Canal, blocking one of the world's busiest shipping lanes for 6 days.

other features unique to the region. The need for icebreaker escorts poses another challenge. In November 2021, more than 20 vessels were stuck and delayed in the waters of the NSR. Early and unexpected freezing trapped them and forced them to wait for weeks for icebreaker assistance. As a result, vessels loaded with goods could not reach their destination. Although there is enthusiasm for providing year-round transits via the NSR, there is a shortage of infrastructure to guarantee stability. Although new icebreakers are on order, it takes time before they can start operating. Additionally, icebreaking assistance tariffs can also be high depending on the ice class of the vessel, the season of navigation, and the number of NSR zones crossed.

A 2016 study by the Copenhagen Business School's Maritime Division found that the NSR will become fully economically viable only after 2035 (Hansen et al., 2016). Another study concluded that, given low bunker fuel prices, a short sailing season, and continuing treacherous ice conditions in the Arctic, even in summer months, ordinary merchant ships may not find the use of the NSR commercially viable until 2040 at the earliest (Vidal, 2016). Moreover, a French container transportation and shipping company, Compagnie Maritime d'Affrètement Compagnie Générale Maritime (CMA CGM), and its German counterpart, Hapag-Lloyd AG, decided not to use Arctic passages due to environmental concerns (Hand, 2019). In 2021, to limit black carbon and other environmental impacts, the second-largest shipping company in the world, Swiss-Italian MSC: Mediterranean Shipping Company, expressed its willingness to avoid sending vessels through the Northern Sea Route (Kuras, 2021).

It is still unclear whether the NSR will be able to compete with the Suez Canal as a major shipping route between Europe and Asia. It is also hard to conclude whether the associated commercial projects will be feasible in the face of economic sanctions, high costs, and the logistical complexity of operating in difficult weather conditions with limited infrastructure and uncertain demand for hydrocarbons. At the same time, the Russian Federation's dedication to developing the infrastructure along the route, including hubs, transshipment facilities, and ice-class vessels, increases the chances of cost-efficient shipping and project operations. The shrinking Arctic polar ice mass due to climate change helps global trade achieve its goals. Over the past few years, it has become clear that Russia envisions the Arctic as essential for its homeland defense and economic future, both for its energy and shipping potential (Gricius, 2020). The number of the country's natural resource development projects in the region and the growing maritime infrastructure and military presence demonstrate that Russia will not give up on Arctic shipping in the foreseeable future (Gricius, 2020). For this reason, the risks for the Bering Strait are apparent.

Russian Arctic Ambitions

On April 13, 2022, Russian President Vladimir Putin, during a videoconference on development of the Arctic zone of the Russian Federation, emphasized that ongoing and future Arctic projects remain the country's top priority. Currently, more than 460 state-supported projects are being implemented in the Russian Arctic, and the government intends to expand its network of fossil fuel activity in the region. In this course of action, the Northern Sea Route is regarded as a primary means of distributing extracted hydrocarbons to Eastern and Western markets. Shipping markets in Asia have become the country's top priority, and there is more support coming from the government to develop Arctic infrastructure, like railways, ports, and icebreaker construction. Although several Russian Arctic projects will now be delayed or shelved, the overall message and priorities will stay the same.

These ideas were echoed by the new Naval Doctrine of the Russian Federation approved by Vladimir Putin on July 31, 2022. The doctrine identifies development of the Arctic zone as a strategic resource base and the development of the NSR as a national transport corridor among main country's priorities (The Official website of President of Russia, 2022b). The document displayed that Russia recognizes the Arctic as an area of global economic and military competition.

The increased prominence was given to the Arctic and the NSR by several key policy documents that currently define Russian Arctic strategy, outlining the key messages and goals to achieve during the next 15 years:

According to these documents, the Russian government plans to increase the volume of shipments via the NSR and ensure year-round navigation. In May 2018, President Putin decreed that shipping volumes must reach 80 million tons by 2024. Since then, Russian ministries have come up with ambitious plans for meeting that goal. The range of projections has varied among different Russian agencies. For example, Rosatom envisioned an even greater volume, so the NSR could increase cargo shipments through the Russian Arctic up to 92 million tons by 2024. The Ministry of the Far East and the Arctic anticipated that volumes would reach 95 million tons in 2024 (PortNews, 2019). *The Strategy of the Development of the Arctic Zone of the Russian Federation* (2020) increased those ambitions. It states that freight traffic should grow from 31.5 million tons to 90 million tons by 2030 and to 130 million tons by 2035, with LNG production growing from 8.6 million tons in 2018 to 64 million tons by 2030 and 91 million tons by 2035. By the end of the program, LNG is expected to constitute 80% of the Russian cargo transported on the NSR (The Official website of President of Russia, 2020).
The goals have not been changed even under the sanctions and overall economic crisis in Russia following the war in Ukraine. In fact, the projections increased further. The latest *Development Plan for the Northern Sea Route* (2022) expects the NSR traffic to reach 150 million tons by 2030 and 220 million tons by 2035. The government's plan is that four Russian major energy companies will take the burden of fulfilling these obligations (The Russian Government, 2022).

- Executive Order (Decree) of the President of the Russian Federation No. 204 dated May 7, 2018 On National Goals and Strategic Objectives of the Russian Federation through to 2024
- Executive Order (Decree) of the President of the Russian Federation No. 164 dated March 5, 2020 On Foundations of State Policy of the Russian Federation in the Arctic through to 2035
- Executive Order (Decree) of the President of the Russian Federation No. 645 dated October 26, 2020 On Strategy for the Development of the Arctic Zone of the Russian Federation and Provision of National Security for the Period through to 2035
- Decree of the Russian Government No. 2115-p dated August 1, 2022 On Approval of the Development Plan for the Northern Sea Route for the period through to 2035M

FIGURE 7. The lead ship "Arktika" of the Project 22220 nuclear-powered icebreakers also known as LK-60 type icebreakers. The largest and most powerful icebreaker in the world to date (Atomflot, 2020).

These Russian national policies that encourage further development of hydrocarbon projects operating in the Russian Arctic in the vicinity of the NSR attribute to the perspective of the expenditure of the shipping traffic through the Bering Strait.

To create conditions for the implementation of investment projects in the Russian Arctic, the *Strategy for the Development of the Arctic Zone and the Development Plan for the Northern Sea Route* propose developing NSR's maritime infrastructure, including renovation of ports, setting new seaports and railroad links leading to these ports from inland, expanding search and rescue fleet, improving navigational and hydrographic surveys. The proposed measures in the Development Plan include developing marine LNG transshipment complexes on the Kamchatka's southeast coast and near the port of Murmansk, a hub port for transit traffic in Vladivostok, and other transportation and logistics hubs (Decree of the Russian Government No. 2115-p, 2022). Russia is planning to construct new nuclear-powered icebreakers and other vessels, including container carriers and other cargo and passenger ships equipped for travel between ports in the Arctic zone. By 2035, the Russian government intends to build at least 40 Arctic vessels for various purposes, upgrade four regional airports, construct railways and seaports, and facilitate massive exploitation of Arctic natural resources.

Since August 2012 Russia has been constructing a series of nuclear-powered icebreakers with a capacity of 60 megawatts for Project 22220, also known as LK-60 type icebreakers. They are currently the largest and most powerful icebreakers ever constructed. New ships can operate equally efficiently in both deep water and shallow water and were designed to effectively clear paths for various types of vessels in the Arctic all year round. These icebreakers can replace two types of their predecessors at once and, consequently, reduce the overall cost of operating the nuclear icebreaker fleet, fully preserving all its capabilities (Atomflot, 2020). As of 2022, two LK-60 icebreakers (*Arktika* and *Sibir*) are in service. The third icebreaker (*Ural*) is expected to be commissioned at the end of 2022, and two more ships are currently under construction (*Yakutiya* and *Chukotka*). In April 2022 Russian government stated that it plans to allocate 118 billion rubles for the construction of two additional Project 22220 icebreakers that would be delivered in 2028 and 2029 (Smertina and Skrolygina, 2022).

In addition to LK-60 Russia plans to build three icebreakers in an even more powerful class, known as Project 10510 or LK-110 and LK-120 Lider-class vessels (Humpert, 2019b). It is planned to build three vessels of this type by 2033 with a lead of the series already under construction. However, the impacts of COVID-19 and the war in Ukraine may cause delays in that schedule. The Lider-class icebreakers will break through the 2-meter-thick Arctic ice at a speed of 15 knots and break through the 4.3-meter ice at 2 knots. The icebreaker will be able to open almost 50-meter-wide ship lanes across the region for escorts of commercial ships (Iceberg, 2021). The new icebreakers will speed up transportation along the NSR and optimize its economic productivity, stimulating the increase in the maritime traffic.

The Strategy of the Development of the Arctic Zone emphasizes energy sector projects. Moscow encourages companies to develop new oil and gas production technologies and favors the creation of jobs in the Arctic through the establishment of new oil and gas production zones, the development of hard-rock mineral deposits and hard-to-recover hydrocarbon reserves, and the production of LNG (The Official website of President of Russia, 2020). The government's economic measures include boosting private investment in critical energy projects on the continental shelf. To help the energy industry, in March 2020, the State Duma adopted the law on tax benefits for oil and gas projects in the Arctic (Interfax, 2020). The law contains amendments to the Tax Code of Russia to stimulate the production of hydrocarbons from the shelf. The amendments provide privileges for developing new offshore fields in the Arctic (Interfax, 2020c). In addition to this, the Russian budget contains a large amount of money devoted to Northern Sea Route development. In July 2021, Andrei Belousov, first deputy prime minister, stated that the NSR development project would require 716 billion rubles ($9.7 billion). The 2022 Development Plan for the NSR officially allocated about 1.8 trillion rubles ($29 billion) for the NSR.

The NSR's role is still clearly envisioned to connect Russia's Arctic hydrocarbon riches with relevant markets. The privileges for the energy sector and ambitions for shipping stimulate industry in the Arctic region, boosting annual cargo shipments and energy projects and threatening the Arctic ecosystem. Hydrocarbons have recently represented the lion's share of the overall shipments via the NSR, especially for shipments going eastward through the Bering Strait. The further the energy projects develop in the Russian Arctic, the more risks they create for the environment.

Russian Arctic Ambitions

Current Trends in Northern Sea Route Cargo Shipping
Before Russia's invasion of Ukraine, the data indicated that shipping traffic along the Northern Sea Route was steadily growing. The total cargo volume on the NSR changed from 5.15 million tons in 2015 and 7.5 million tons in 2016 to over 20 million tons in 2018 and over 31.5 million tons in 2019. According to the NSR Administration, about 33 million tons were transported along the NSR in 2020 (Vasiliev, 2021), a 4.7% increase compared to 2019. In 2021, 34.9 million tons of cargo were transported along Russia's NSR, surpassing 2020 figures by almost 2 million tons (Humpert, 2022a).

FIGURE 8. The total cargo volume transported along the Northern Sea Route from 2015 to 2021 (Humpert, M., 2022a)

Overall, hydrocarbons represent the lion's share of shipments via the NSR and the Bering Strait. In 2020, 86% of total shipments via the NSR were transporting hydrocarbons to export markets, including LNG (18.9 million tons), oil (7.7 million tons), and condensate (1 million tons). General cargo amounted to 3.5 million tons, or about 11% of total shipment volume. Refined products (0.6 million tons) and coal (0.3 million tons) accounted for relatively minor shares of 2% and 1%, respectively (Yermakov and Yermakova, 2021; Grigoryev et al., 2021; CHNL Information Office, 2021b).

In 2021, the main share of the cargo volume belonged to LNG and gas condensate (19.6 million tons), oil and oil products (7.7 million tons), coal (221,000 tons), ore and ore concentrate (47,700 tons); other cargo included technological equipment (4 million tons). At the end of 2021, oil, gas, petroleum products, coal, and ore concentrate constituted almost 28 million tons of the total volume of cargo transported along the Northern Sea Route (Arctic Russia, 2022a). The regular shipments of LNG and raw materials, like ore concentrate, timber, and coal, which predominate in eastward NSR traffic, pose dangers to the migration and well-being of marine life and threaten Indigenous communities who are reliant on the health of the Bering Strait ecosystem.

The number of permits for navigation in NSR waters also increased from 799 in 2019 to 1,014 in 2020 (Kireeva, 2021). In 2021, the Northern Sea Route Administration issued 1229 permits for navigation, a 20% increase compared to the previous year (NSR Administration, 2022a; Vinogradova, Filipenok and Tkachev, 2022). In 2020 around 15% of all the vessels using the Northern Sea Route were foreign flagged. Russia, China, and Canada were the top three nations using the Arctic route. However, there were also ships under the Netherlands, Bahamas, Hong Kong, and Norway flags (Kireeva, 2021).

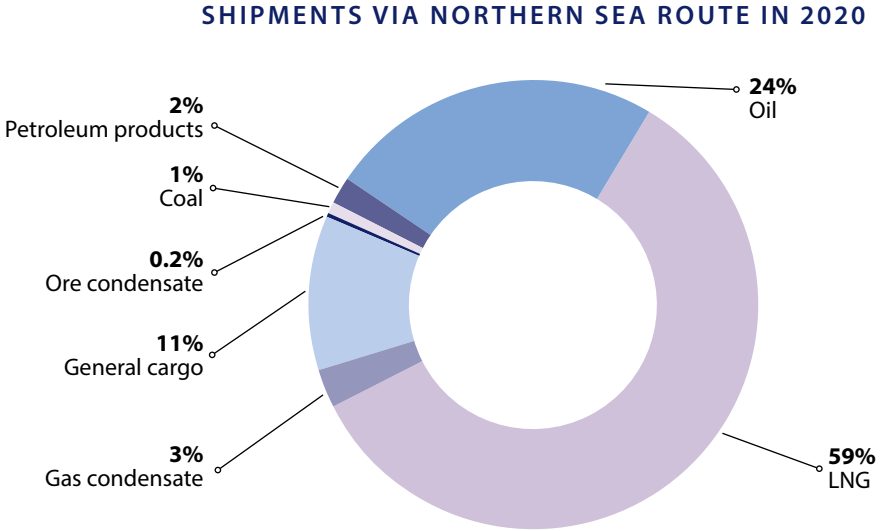

FIGURE 9. The structure of the shipping traffic on the Northern Sea Route in 2020 (Grigoryev et al., 2021

Transit traffic also saw record highs in 2021, with 86 transit voyages carrying 2.3 million tons of cargo in (Humpert, 2022a; CHNL Information Office, 2021c). In 2019, 29 transit vessels passed through the NSR, completing a total of 37 voyages. The biggest group of transits were made by general cargo vessels (11 voyages). A significant number of these vessels belonged to the Chinese logistics services supplier company China Ocean Shipping (Group) Company (COSCO) (CHNL Information Office, 2020b). In 2018, COSCO made only eight voyages (Staalesen, 2019b). In 2020 the number of transit voyages increased sharply, ending up with 64 total voyages (CHNL Information Office, 2020a). These figures are especially striking in light of the COVID-19 pandemic. Again, most of the general cargo ships belonged to COSCO. COSCO's eight vessels made 11 voyages from east to west and in the opposite direction (CHNL Information Office, 2020a). At the same time, it is worth mentioning that the share of transit shipments along the Northern Sea Route is only 4.8%, which equals only 1.28 million tons of cargo volume.

In 2021 major transit shipments through the NSR were accomplished by foreign-flagged vessels from China, Portugal, Germany, Norway, Liberia, the Netherlands, etc. Russian ships made only 11 transits. In 2021 Chinese ports were the most common destination for transit voyages on the NSR, apart from Russian ports. In 2021, 30% of all transits went to Chinese ports. The transit cargo traffic from the Russian port of Murmansk to the Asian market alone increased by 0.8 million tons (CNHL Information Office, 2021c). The largest volume of cargo transported via transit shipments accounted for iron ore and iron ore concentrate in the direction of China together with general cargo. Most of these shipments were transported by the Chinese company COSCO. Hydrocarbons also occupied a significant share of transit shipments (CNHL Information Office, 2021c; Humpert, 2022a).

The available statistics for 2021 indicate that the leading share of NSR's cargo flow went to Europe. However, since 2018 and the active development of Russian LNG projects, Asian markets (China, Japan, and Korea, as the primary destinations for the west-east and east-west shipping through the Bering Strait) have been gaining momentum.

At the same time, the information from the NSR Administration and Rosatom indicates that the route is not expected to see any international transits in 2022 for the first time in 15 years (PortNews, 2022a; Humpert, 2022g). In light of economic sanctions, only non-Russian flagged LNG carriers are projected to remain on the route. Even the Chinese state-owned shipping company COSCO has not yet completed a single transit voyage (Humpert, 2022g). This step back of international shipping operators does not indicate that the upward trend in vessels transiting the Bering Strait will stop. The accessibility of the NSR is increasing, and the latest Russian strategic documents indicate that the country is planning to triple the cargo volume transported via the NSR. Although the geopolitical tensions resulting from the Russian invasion of Ukraine will affect the ability to meet these goals, slowing down and delaying Russian Arctic projects, if the government implements these plans even partially, the risks for the Bering Strait will grow.

Russian Arctic Energy Projects and Other Activities

FIGURE 13. Rosneft's ice breaking multipurpose support vessel (Ship building complex Zvezda, 2022)

The expansion of the Russian Arctic's industrial natural resources-related projects creates potential for increase in shipping traffic along NSR and the Bering Strait, which means more risks and threats to biodiversity and ecosystems. The speed of economic development and maritime infrastructure growth in the area is faster than the ability of the environment to adapt to new challenges. Even with the COVID-19 pandemic, the cargo volume for NSR has not decreased. Although the sanctions influence the scope or timeline of the planned projects and could cause a setback in shipping through the Northern Sea Route, the overall goal to make NSR a year-round navigational shipping lane remains a critical component of the Russian Arctic strategy.

In fact, on April 13, 2022, Vladimir Putin called the sanctions imposed on the Russian Arctic projects a "new window of opportunity." He encouraged further reinforcement of the development of the Russian Arctic, involving more non-regional players with the focus on the supply of energy resources to Asia. The proclaimed course toward expanding the country's fossil fuels distribution eastward is tied together with investments in transport corridors, including the Northern Sea Route. The Russian Arctic projects are expected to add more than $395 billion to the country's Gross domestic product (GDP) by 2035, and tax revenue is expected to reach more than $171 billion (The Official website of President of Russia, 2022).

Following the same logic, the Ministry of Natural Resources and Environment of Russia prepared eight new oil and gas sites in the Russian Arctic for licensing for exploration in the Gulf of Ob and the Yenisei Bay. They believe these projects will help fulfill the cargo volume goal stated in the latest Russian Arctic strategy. Although preserving the Arctic ecosystem and biodiversity is mentioned as one of the priorities, the main narrative shaped in Russia around the Arctic region as a resource base for Russian economic development indicates high risks for the Arctic environment. Shipping plays one of the primary roles in the creation of these threats. In 2020 LNG, gas condensate, and crude oil export accounted for two-thirds of NSR total cargo volume. Most Russian Arctic projects are focused on developing oil, natural gas, and coal and facilitating their ship transport to European and Asian markets.

In 2019, the Russian government recognized LNG development as a significant political and commercial priority. Since 2014, LNG transportation volumes have been rapidly increasing in the Russian Arctic, driven by implementation of the leading oil and gas and LNG production projects. The epicenters of Russia's Arctic hydrocarbon development are sizable natural gas fields on the Yamal and Gydan Peninsulas. The most significant contribution to the cargo traffic in 2021 was made by export transportation of Russia's second-largest natural gas producer, Novatek; state-owned energy

corporation Gazprom Neft; and state-controlled leading Russian oil company Rosneft (Arctic Russia, 2022a; Humpert, 2022a). Novatek's Yamal LNG plant products and crude oil that Gazprom Neft produces on its Novoportovskoye field on the Yamal Peninsula are significant sources of shipping activity in the Russian Arctic. The government still plans for LNG products from the Yamal and Gydan Peninsulas and oil deliveries to represent the primary incremental cargo sources for the NSR through the 2030s.

Russian authorities expect Novatek alone to ship 35.5 million tons of LNG in 2024 to international markets and 70 million tons of LNG in 2030. In 2021 Novatek's Yamal LNG produced more than 19.6 million tons of LNG, showing a 4% increase over 2020 levels. In 2021 more than 18.7 million tons of LNG were exported from the port of Sabetta alone, including 47 LNG carriers that went to Asia market (China, Japan, South Korea) (CNHL Information Office, 2022). The company spent $21 billion to develop another LNG production facility in the Russian Arctic, Arctic LNG 2 (Khrennikova and Tanas, 2019), a liquefied natural gas plant supporting three production lines, each with a capacity of 6.6 million tons per year. In 2021 Novatek also bought two more fields on the Yamal Peninsula, which will be enough to build an LNG plant that produces 15 million tons per year (Vedomosti, 2021). The Russian government included the construction of Utrenny terminal for LNG and gas condensate in the 2022 Development Plan for the Northern Sea Route. The terminal is expected to increase hydrocarbons exports to 19.8 million tons annually as part of the development of the Utrenny gas condensate field, a resource base of Arctic LNG 2 project (Shugaev, 2022; Shorokhov, 2022).

Gazprom Neft is expected to export 6.7 million tons (49 million barrels) of oil from Novoportovskoye field deposits alone in 2024. Arctic oil accounted for 31% of the company's total hydrocarbon production and will continue to grow in the future (TASS, 2021). Gazprom Neft is the largest crude oil producer and exporter by sea from Russia's Arctic. The flagship oil project is the Novoportovskoye development on the Yamal Peninsula, with annual peak oil production of 8.5 million tons (Energybase.ru, 2022). The crude oil produced in this field is already transported year-round. Another Gazprom Neft Arctic project, in the Pechora Sea (Prirazlomnoye field), is expected to reach an output of 5 million tons per year (Alifirova, 2022). The facility is equal to the size of two football fields and covers all operations, including well-drilling, production, processing, storage, and the offloading of oil to tankers.

The Rosneft major Arctic project Vostok Oil is expected to provide up to 30 million tons (220 million barrels) of shipments by 2035. The reserves of these fields are estimated to have 2.6 billion tons of oil. Vostok Oil is a flagship project that represents the Russian government's hopes to increase the country's GDP due to both direct and indirect economic effects. For instance, the production potential of 13 oil and gas fields included in the project represents a massive undertaking that will lead to significant job creation (approximately 400,000 people involved). The project consists of 15 field camps, two airfields, a port, and an oil pipeline of about 400 km (Rosneft, 2021c). After the project reaches its full capacity, it is supposed to produce up to 100 million tons of oil annually (Arctic Russia, 2022b). The 2022 Development Plan for the Northern Sea Route emphasized the important role of the construction of oil terminal Sever Bay (part of Vostok Oil project) on the coast of the Kara Sea for the NSR infrastructure development and shipping traffic. The terminal is supposed to become Russia's biggest facility of such kind that is expected to handle the annual transshipment of about 100 million tons of oil from the fields of Rosneft's project along the NSR by 2030 (Staalesen, 2022b; Shapovalova, 2022).

The production of coal is the focus of Russian authorities too. A new coal deposit, Syrodasayskoye, is being developed in the Russian Arctic. Despite the sanctions, the project is on schedule and is expected to provide up to 10 million tons of coal at the second stage (Markova, 2022). Mining has already started, and 260 thousand tons of coal are planned to be mined by the end of 2022 (PortNews, 2022a). The Yenisey Seaport coal terminal, one of the infrastructure facilities for Syrodasayskoye coal deposit, was mentioned in the 2022 Development Plan for the Northern Sea Route as Russian priorities for the NSR development. The terminal is expected to be operational by 2023 and to reach 10 million tons annual capacity (PortNews, 2022a). This project heavily relies on the Northern Sea Route as well.

As both the environment and people are under increasing pressure from climate change in the Arctic, the hydrocarbon projects multiply negative impacts on this unique ecosystem. For instance, at least three of Rosneft's projected fields are within the borders of a protected nature reserve in the Taymyr Peninsula, Brekhovskye Islands. These territories include rare wetlands and lakes with unique bird life and flora (Staalesen, 2021). This area is home to several Red Book-listed species like yellow-billed loon, tundra swan, and red-breasted goose. The risks of pollution, an accidental spill of oil, and other types of contaminants with no adequate infrastructure to respond to the emergencies are increasing, not only from the facilities but from shipping.

Most of the Russian Arctic hydrocarbon projects will increase vessel traffic in the northern latitudes. These projects directly involve the construction of new ships of different types, including oil tankers, LNG carriers,

and ice-class tankers. In 2022 because of the sanctions, Rosneft and a Russian nickel and palladium mining and smelting company, Nornickel, decided to build icebreakers powered by diesel fuel instead of LNG for companies' operations (Staalesen, 2022c). To ensure the delivery of growing hydrocarbon shipments, Russian government and energy project leaders are planning the construction of transshipment terminals on the NSR to reduce overall transportation costs further, making the NSR voyages more attractive for ship operators. These are only the most prominent examples of ongoing and planned projects in the Russian Arctic that will increase exports to Asian markets and, consequently, the number of vessels passing through the Bering Strait daily.

The economic consequences of Russia's invasion of Ukraine have resulted in severe setbacks for Russian Arctic projects. Several prominent investors and partners withdrew their assets from the Russian Arctic projects or refused to participate in upcoming ones. This pushback will have a significant impact on the plans of the Russian government since Russia relies heavily on foreign finances and technologies in fulfilling its energy projects ambitions. Companies like British Petroleum, Equinor, Shell, ExxonMobil, TotalEnergies, and Chevron announced they would stop new investments and begin exiting joint ventures (Schreiber, 2022). For instance, BP pulled back its shareholding in Rosneft, likely impacting the Vostok Oil project. TotalEnergies promised to stop purchasing Russian oil and gas by the end of 2022 and make no further investments there. The company holds on to several investments in Russian Arctic, including its stakes in Russia's Novatek Yamal LNG and Arctic LNG 2 projects till the end of 2022 (Mallet, 2022; Humpert 2022b). The Russian government hopes to substitute these investments with Chinese involvement, but China's position is unclear and may change depending on the course of events. In September 2022 Novatek announced that it will not be able to complete the first stage of the Arctic LNG 2 project on time, until at least August 2023 (Humpert, 2022f). Western sanctions have placed in doubt company's ability to continue the construction of the facility and related infrastructure, but Novatek is currently looking to replace its former western allies with domestic Russian companies. The company believes that it will be able to overcome existing complications and that they already have contracted several potential customers for their products on the international market (Humpert, 2022f; Prime, 2022).

The sanctions will not be able to shut down the whole industry, especially when most of the major projects are at the final stage or completed. Russian companies are trying to increase production at their working facilities beyond the original capacity and find new partners to cover the gap. They intend to comply with hydrocarbon delivery obligations for now, which means that the risks for the environment stay.

Sustainable Shipping Initiative in Russia

On May 20, 2021, at the XII Ministerial Meeting of the Arctic Council in Reykjavik, the Russian Federation assumed the chairmanship of the Arctic Council for 2021–2023, announcing that sustainable development of the region in its social, economic, and environmental dimensions would be a priority for the Arctic Council during its chairmanship (Russian Geographical Society, 2021). In June 2021, the Russian administration presented the goals and program at the St. Petersburg International Economic Forum. The Russian chairmanship's motto is "Responsible Governance for the Sustainable Arctic" (Information and Analytical Centre of State Commission for Arctic Development, 2021). Russia's plan for its two-year chairmanship included 116 events in 11 regions of Russia focused on climate change and Arctic ecology, Indigenous minorities, emergency prevention, infrastructure development and sustainable navigation, economic collaboration, international scientific cooperation, youth, Arctic tourism, and cultural events (The Russian Government, 2021). Among nine different projects, Russia submitted a proposal for consideration to the Sustainable Development Working Group of the Arctic Council, for a project called Sustainable Shipping in the Arctic.

The project's overall goal was to develop standards that, if met, would make the Northern Sea Route the most environmentally friendly shipping path for cargo transportation. The focus areas of the project were shipping safety, shipbuilding, economy, and ecology. The plan mentioned the necessity to cooperate in training maritime personnel for work in the Arctic, developing unified educational standards in this area, ensuring the preparedness of emergency services and units, and developing communication and navigation facilities. The strategy emphasized the need to expand the maritime economy space and efforts to build high-quality and efficient port infrastructure (Information and Analytical Centre of State Commission for Arctic Development, 2021). However, beyond outlining these general intentions, the proposal offered little specific information on particular actions.

Prior to the war in Ukraine, environmentally oriented discourse became a new trend for the Russian Arctic industry representatives. For instance, in June 2021, Novatek and a subsidiary of TotalEnergies SE signed a memorandum of understanding (MOU) on decarbonization, hydrogen, and renewables. Through this MOU, the two countries agreed to reduce gas emissions at LNG joint projects by implementing carbon capture and storage technologies and by utilizing renewable energy sources. The companies committed to applying technical solutions to improve power generation efficiency for LNG production, including using waste heat utilization technologies (TotalEnergies, 2021). However, this project was never implemented.

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In June 2021, Russia's largest oil producer, Rosneft, stated that it had signed an agreement on cooperation in wind power generation Vestas to use the Danish company's technologies for the Vostok Oil project (Lee, 2021). Rosneft proclaimed its overall intention to cut carbon emissions, proposing a 30% reduction in its Carbon Management Plan 2035 (Rosneft, 2020). At the same time, the company's leader, Igor Sechin, in his speech at the 2021 St. Petersburg Economic Forum criticized foreign countries' excessive support for energy transition and warned about risks from "regulatory policy focused on green energy subsidies" (Staalesen, 2021). Sechin lamented what he said was underinvestment in the oil industry, warning of future energy shortages. Instead of supporting the renunciation of hydrocarbons or introducing protectionist measures, Sechin stressed that companies could produce oil with "advanced technologies for environmental protection" (Staalesen, 2021). Speaking of the possibility of producing clean hydrocarbons, he pointed to the Vostok Oil fields as an example, noting that Vostok Oil's product contains uniquely low sulfur content.

As evidenced by the expansion of investments across Russia's Arctic coast, Russia had no intention to reduce drilling in the Arctic, especially with western sanctions in place. Although the Russian energy sector is increasingly feeling environmental pressure, to date, oil and natural gas remain top priorities for both the government and industry. Russia's proclaimed focus on sustainability in the Arctic and new directions of international cooperation could have been a starting point to turn green rhetoric to real change within the Arctic Council's framework. But it is no longer the case, taking into consideration current geopolitical and economic tensions.

China: Near-Arctic State

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FIGURE 14. Chinese icebreakers *Xue Long 1* and *Xue Long 2*.

In recent years, China has demonstrated a willingness to expand its influence in the Arctic. After 2014 Western sanctions and especially in light of the Russian invasion of the Ukraine and its increased geopolitical isolation, Russia became highly dependent on Chinese investments, considering China to be its top trading partner, or at least the one it counts on. At the same time, China has preferred to occupy a unique position, abstaining in UN votes condemning Russia but saving its economic relationship with the United States and the European Union. Although the Chinese state-owned companies consider the current geopolitical situation an opportunity to embed themselves deeper in the Arctic region, benefiting from the drop in asset prices (Bloomberg News, 2022a; Bloomberg News 2022b), Chinese firms are mindful of the risk of being hit by sanctions and suffering reputational damage (Aizh and Tan, 2022). Despite significant discounts, China is avoiding new contracts with Russian hydrocarbon producers, sticking, however, with old ones (Bennett, 2022).

In 2013, China started to pursue an active economic development policy in the Arctic. First, it became an observer on the Arctic Council. The same year, Chinese President Xi Jinping put forward the Belt and Road Initiative, known as BRI, the New Silk Road or One Belt One Road. BRI is a global strategy that focuses on infrastructure development and the economic integration of countries along the route of the historic Silk Road. The project's goal is to build a network of railways, highways, and energy pipelines both westward and southward to expand the international use of Chinese currency and ensure cooperation across six main economic corridors encompassing China. The BRI was initially focused on China's neighboring countries in Eurasia, including Russia. In late 2013, Russia's Novatek and the Chinese National Petroleum Corporation (CNPC) partnered on a joint venture to fund the Yamal LNG project, where China still has a 20% stake. The same year (2013), Chinese company COSCO sent the first container-transporting vessel on a transit sail along the NSR (Mitchell, 2013). In the following years, COSCO increased its activity, conducting

two transits of the NSR in 2015, six in 2016, and five in 2017. In 2017 the launching of the Yamal LNG project was widely celebrated by Chinese media because it ensured China's status in world energy markets and promoted the BRI initiative. The project helped China fortify its position in the region and ensure its future involvement in other energy projects in the Arctic (Filimonova and Krivokhizh, 2018).

To enhance its presence in the area, China introduced the Polar Silk Road in 2017 as a part of a more global version of the BRI. This initiative was intended to create a platform for collaboration with other Arctic actors to develop Arctic shipping routes. In the same year Beijing continued to pursue new investments in Arctic energy resources, particularly LNG. In 2017 American and Chinese companies signed a contract with the state of Alaska to explore Alaska LNG resources. And although that development is now on hold, this project promoted a trend for the Chinese businesses to be involved in LNG-associated projects in the Arctic (CNBC, 2017). LNG projects fit into the overall intention of the country to become carbon-neutral by 2060—a paradox, considering the country's refusal to abandon coal power anytime soon (Cheng, 2021).

A year later, China's State Council Information Office released an official white paper titled China's Arctic Policy. The document aligned the course for future Chinese development goals in the region with the BRI. This step was an official statement reflecting the country's intention to play a more prominent role in the area. In the white paper, China named itself a "near-Arctic state" and encouraged Chinese companies to invest in infrastructure along Arctic shipping routes (Nakano and Li, 2018).

China's expanding commercial interests in Central Asia, the Russian Far East, and the Arctic have been increasing Chinese commerce through Russian Arctic waters (Stronski and Ng, 2018). In 2019, Chinese shipping companies conducted 14 transit voyages from Asia to Europe or vice versa, along the burgeoning route (Humpert, 2019c). The same year, Beijing flexed its muscles as a nation with growing capacity in both polar regions when it sent its icebreaker, Xue Long 2, to participate in the 36th Antarctic expedition. The willingness to introduce the Chinese icebreaker is evidence of a commitment to the Arctic region (Filimonova and Krivokhizh, 2018).

Chinese companies are still key partners in Novatek's second LNG project, Arctic LNG 2, with a 20% stake. In addition to COSCO's voyages, Chinese companies are partners in all three shipping consortia that have entered into agreements concerning LNG transportation from Yamal LNG. The first, a Canada-China consortium, includes companies Teekay and China LNG Shipping. This consortium has ordered six tankers for Yamal LNG. The second, a Japan-China consortium, includes companies Mitsui O.S.K. Lines and China Shipping. They have ordered three more tankers for Yamal LNG. The third consortium, consisting of Greek company Dynagas, China LNG Shipping Co., and Sinotrans Shipping Ltd., has ordered five tankers for Yamal LNG (Interfax, 2019). Through its participation in these shipping consortia, China is yet the most significant foreign operator of vessels along the Russian segment of the NSR.

In 2021 Novatek and Chinese state-owned firm Shenergy Group Company agreed to have a long-term LNG sales contract, promising more than 3 million tons of LNG over 15 years (Hydrocarbons Technology, 2021). This year also marked the inclusion of Arctic and Antarctic policies within the new Chinese governmental Five-Year Plan (Lanteigne, 2021). In the paper, Beijing confirmed its intention to develop the Polar Silk Road initiative further and expand its engagement with the Arctic Ocean. The fact that polar areas were included in the official strategy demonstrates the significance of the Arctic to China's economy and foreign policy interests (Lanteigne, 2021). The document also signals Beijing's emerging interest in science cooperation in the area.

Although China heavily invests in LNG projects in the Arctic, it is interested in other opportunities for resource extraction, including raw materials. China cooperates with other Arctic players. Greenland is emerging as a potential component of the Polar Silk Road for the mining resources of its coastal regions. The island's deposits of base and precious metals, uranium, and rare-earth elements (Lanteigne and Shi, 2019) and its economic need for investors make Greenland very attractive to Chinese businesses. China is currently the world's leading producer of rare-earth elements. Chinese company Shenghe Resources is already developing Greenland's Kvanefjeld mine in cooperation with an Australian firm. In addition, Chinese business is a part of a zinc mining project at Citronen Fjord in the high north of Greenland and an iron deposit project at Isua in the southwest (Lanteigne and Shi, 2019).

The Greenland mining projects have raised concerns about the environmental, social, and cultural life of local people. Major local political parties have expressed opposition to the projects because of the ecological risks (e.g., disturbance of hunting areas) (Volpe, 2020). Despite local concerns about Chinese involvement, Greenland's desire to boost its economy with foreign investment and to reduce unemployment might outweigh all other concerns.

Since the Arctic region is one of the critical regions for China, its financial presence in the region is likely to stay.

Potential Tools and Recommendations to Reduce the Risks

In May 2021, the International Energy Agency issued a new report, *Net Zero by 2050*, which concluded that a complete transformation of energy production, transportation, and consumption is required to have a fighting chance of limiting the rise in global temperatures to 1.5°C (International Energy Agency, 2021). Yet the development of hydrocarbons, new shipping corridors, and geopolitical tensions have made achieving this goal increasingly unlikely. The overlap between industry, wildlife, and local populations is increasing. The existing pace of the economic development of the region does not provide any real opportunity to decrease shipping intensity. The longer shipping season will likely increase air, water, and noise pollution with associated risks for public health, costly marine accidents, the introduction of invasive species, strikes with marine mammals and birds, and disruption of northern peoples' use of the territory. The region is still poorly studied due to its harsh environment and remoteness. The specific impacts of increased vessel traffic in the area are being learned as wildlife adapt, but the existing system is not enough to protect polar waters as marine operations increase. However, there is an opportunity to identify and implement best shipping practices according to the latest science and practical knowledge. Since the Arctic region in general and the Bering Strait area in particular are experiencing extraordinary change and new challenges, the focus should be on a sustainable approach.

The International Maritime Organization (IMO) is a specialized agency of the United Nations that serves as the global regulatory authority as regards international standards for ensuring the safety of international shipping and protection of the marine environment, including in the Arctic. IMO's international instruments, codes, and guidelines, including the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Regulations for Preventing Collisions at Sea (COLREGs), and International Code for Ships Operating in Polar Waters (Polar Code) provide a framework for shipping governance regime for the Arctic waters.

The legal status of the Bering Strait is not defined by any special international convention. The United Nations Convention on the Law of the Sea (UNCLOS) recognizes straits covered by territorial waters which connect one part of the high seas or exclusive economic zone (EEZ) to another part of the high seas or EEZ as "international straits" (UNCLOS, Article 37). International straits are subject to the right of "transit passage," which refers to "freedom of navigation and overflight solely for continuous and expeditious transit of the strait." (UNCLOS, Article 38). A coastal state's authority to regulate transit passage is more limited than its authority to regulate vessel activities in other types of domestic waters.

In 2018, the IMO approved two-way routes on both sides of the Bering Strait that the United States and Russia had jointly proposed, as well as three areas to be avoided (ATBAs) in the US waters of the Northern Bering Sea (around Nunivak Island, St. Lawrence Island, and King Island). Although these measures are voluntary, there is currently a high compliance rate (Fletcher et al., 2020). On top of IMO measures, there are regional and bilateral agreements and domestic measures imposed on vessels subject to the coastal state's jurisdiction. For instance, in the US, under the Ports and Waterways Safety Act (PWSA) and US Coast Guard regulations, the Coast Guard is empowered to establish vessel traffic services and routeing measures in maritime areas within its jurisdiction, including the US side of the Bering Strait.

Collaborative action is needed to meet environmental protection and conservation goals in the Arctic, especially in transboundary areas like the Bering Strait region. International cooperation is necessary to develop unified positions in supporting efforts of international organizations like the IMO and bilateral and regional initiatives, especially to prevent emergencies like spills of oil or other contaminants. This paper recommends several mitigation measures to ensure better regulation of Arctic shipping with a particular emphasis on the Bering Strait:

1. Address existing gaps and challenges in the IMO legislation to ensure periodic refining based on scientific data, practical experience and the level of risk at international fora and domestically, promoting reductions of emissions from shipping, switch from heavy fuel oil (HFO) to distillates or alternative fuels or methods of propulsion that are safe for ships and could contribute to the reduction of black carbon emissions from ships when operating in or near the Arctic. Implement emissions reduction targets.

2. Promote the international and domestic implementation of the complete ban on using HFO-based bunker fuels ahead of IMO's schedule without exemptions and waivers.

3. Introduce dynamic voluntary shipping measures tailored to vessel size and class to ensure environmentally sound maritime operations through collaboration with regional and maritime experts. Design the recommendations to be flexible and to reflect weather conditions, seasons, and wildlife migration patterns. The guidelines should be regularly reviewed by consulting subject-matter experts and stakeholders using the latest available science. For example, introduce dynamic speed regulations to reduce strikes and collisions with marine mammals and mitigate contributions to greenhouse gases and underwater noise pollution while increasing vessel safety.

4. Address impacts on marine mammals and ecosystems by establishing ships' routeing measures and areas of ecological and cultural significance to avoid navigational hazards. These measures include establishing shipping lanes, traffic separation schemes, precautionary areas, areas to be avoided, deep water routes, and two-way routes. Establish an Area to Be Avoided (ATBA) surrounding the Little Diomede Island in the Bering Strait. In addition, consider seasonal or dynamic protective areas for the Bering Strait region.

5. Enhance data sharing; improve vessel traffic monitoring by expanding the use of Automatic identification systems (AIS) technology and other e-navigation measures to improve ship tracking and transmission of navigational safety information.

6. Ensure zero discharge of untreated gray water and sewage; avoid dumping of treated sewage, gray water, garbage, ballast exchange, or oily substances in marine protected areas (MPAs), Indigenous use and protected areas, and sensitive and significant areas in the Arctic waters. Establish minimum distances from shore and communities for discharge in the Bering Strait.

7. Update inadequate nautical charts for the Arctic region to ensure safe and secure maritime transportation throughout Arctic waters.

8. Improve domestic and bilateral emergency prevention and response capabilities, including detailed joint emergency protocols and a dynamic program of contingency planning and exercise in the Bering Strait region.

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Conclusion

Polar regions are rapidly approaching the level of physical, ecological, economic, and social change that is potentially irreversible for hundreds of years due to global warming (Intergovernmental Panel on Climate Change, 2022). Rapid sea-ice loss enables greater access to high latitudes for industries such as resource extraction, fisheries, and shipping. Expanding economic opportunities increase risks to the environment along the Arctic coasts. Climate change impacts on the Arctic are already occurring at an unprecedented pace, even without the additional burden from shipping and mining. Although the geopolitical implications of the war in Ukraine are unpredictable, the magnitude and rate of change in the region are already far beyond average.

The investments already devoted to Arctic maritime trade, navigation, and resource extraction will motivate oil, gas, and coal industries to advance into new and previously unavailable Arctic lands. The dependence on natural resources and intention to maximize profits will likely promote economic activity to compensate for financial losses. Russian determination to maximize the availability of its Arctic waters to commercial shipping and resource development will likely remain. It will be accompanied by environmental risks, including oil spills; air, water, and noise pollution; ship collisions with whales; and disruption of marine mammal migration paths in areas with a high concentration of wildlife, like the Bering Strait. Heavy investments in infrastructure, growing demand for hydrocarbons from the Asia-Pacific markets, and the need to find new fossil fuel customers indicate that cargo shipping traffic through the Bering Strait will continue to increase in the coming years. As a result, further increases in economic development could seriously disrupt the ecosystems of the Arctic, including the sensitive Bering Strait.

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