

The future of Arctic shipping

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Arctic sea ice is melting rapidly, and within the next decade the effects of global warming may transform the Polar region from an inaccessible frozen desert into a seasonally navigable ocean. The summer of 2011 saw a record 33 ships, carrying 850,000 tons of cargo navigate the Northern Sea Route (NSR) off Russia's northern coast. This year's shipping season may see up to 1.5 million tons of cargo, as Germany's Alfred Wegener Institute predicts the NSR to be ice-free and passable for ships by early summer.

The North West Passage (NWP), first ice-free in 2007, and the Transpolar Sea Route (TSR) may also open up to shipping traffic over the coming decades. An in-depth assessment of the viability of shipping along the TSR will be published in the upcoming Arctic Yearbook 2012, which will be available from the Northern Research Forum's website from October 2012. The development of Arctic offshore hydrocarbon resources and related economic activities will also improve the integration of the Arctic economy in global trade patterns. Multi-year ice and the limited seasonal window for trans-Arctic voyages however, will for the foreseeable future remain formidable obstacles to the development of Arctic shipping and its economic viability. Trans-Arctic shipping routes will thus not serve as a substitute for existing shipping lanes, but will instead provide new and additional capacity for a growing transportation volume.

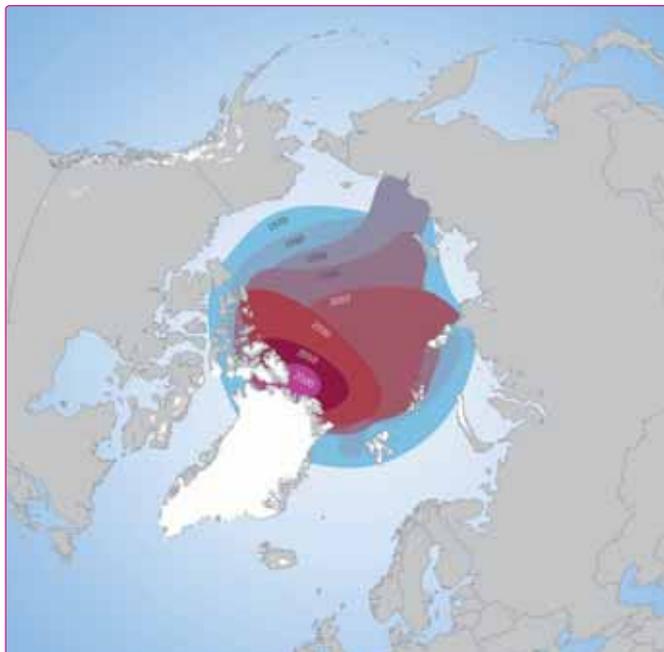


Figure 1: Sea ice extent observations (1970 to 2007) and forecast (2030 to 2100) reproduced using data from the NOAA GFDL model. Yearly extent represents an average 80 percent sea ice concentration (courtesy of wunderground.com).

A navigable Arctic Ocean?

Summer ice extent has declined by 40 percent since satellite observation began in 1979, and over the same period sea ice has thinned considerably, experiencing a decline in volume of 70 percent. Studies differ widely in their predictions of when summer

sea ice will melt completely. The latest findings suggest that Arctic sea ice may have entered into a new state of low ice cover. The article: A recent article by Valerie N. Livina and Timothy M. Lenton on the bifurcation of Arctic sea-ice cover describes it as "distinct from the normal state of seasonal sea ice variation." Arctic sea-ice may have crossed a tipping point which could soon make ice-free summers an annual feature across most of the Arctic Ocean.

Longer ice-free periods

A new study by the National Aeronautics and Space Administration (NASA) suggests that multi-year ice, which is the oldest and thickest Arctic sea ice and the principal obstacle to shipping in the Arctic Ocean, is disappearing at a faster rate than the younger and thinner ice. The ice-free period along the Arctic's main shipping routes is expected to increase from around 30 days in 2010 to more than 120 days by the middle of the century. Furthermore, the distribution of the remaining summer ice will not be uniform across the Arctic Ocean. Studies suggest that sea ice will collect and persist longest along the northern flanks of the Canadian Archipelago and Greenland while the central and eastern part of the Arctic will see the most significant decline of ice, further extending the shipping season along the NSR. In 2011 the navigational season along the NSR lasted for 141 days, from early July until mid-November (see figure 1).

Significant obstacles remain

Nonetheless, significant obstacles to shipping remain such as icing from sea spray, wind chill, remoteness as well as their implications for rescue and emergency operations, and the lack of reliable weather forecasts. During the winter and spring months ice conditions along Arctic shipping routes will remain heavy, and the amount of floating sea ice and number of icebergs - a hazard to the safety of marine transport, may increase during the early melt season as more ice floes break apart and drift across the Arctic Ocean.

Shorter sailing distances

Routing shipping traffic through the Arctic allows for shorter sailing distances resulting in shorter trips. Shipping operators can achieve cost savings through a reduction of number of days at sea, energy efficiency improvements due to slower sailing speeds, or a combination of both.

Distance savings along Arctic shipping routes can be as high as 40 percent compared to the traditional shipping lanes via the Suez Canal. Shorter sailing distances allow for considerable fuel cost savings. The reduced number of days at sea allows a ship to make more return trips resulting in increased revenue and potentially greater profits.

Instead of realizing time savings, operators can also adopt super-slow sailing. A vessel traveling from China to Murmansk can reduce its speed by 40 percent and still arrive in Japan at the same time as a ship sailing at full speed traveling through the Suez Canal. Super-slow sailing can also double a vessel's energy efficiency performance, resulting in a significant reduction of greenhouse-gas emissions. If a future emissions control framework was to include global maritime traffic, this reduction of emissions could thus also result in significant cost savings.

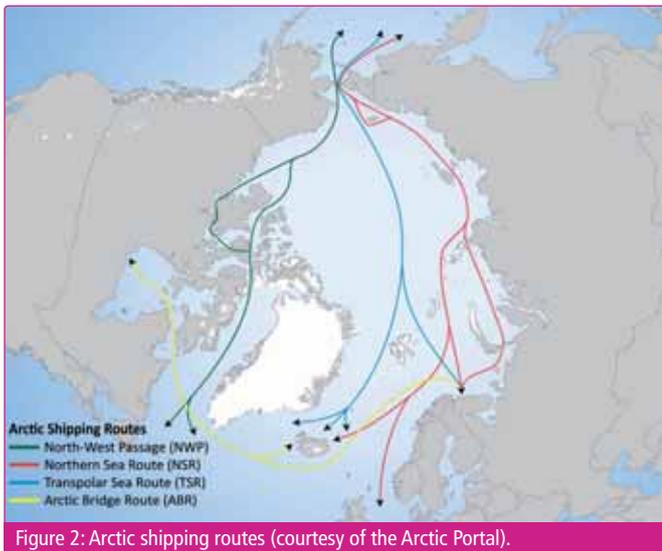


Figure 2: Arctic shipping routes (courtesy of the Arctic Portal).

Economic feasibility of Arctic shipping

Global shipping operations are dependent on three key factors: predictability, punctuality, and economy-of-scale, all of which are currently limited in Arctic shipping. Consequently, the lack of schedule reliability and highly variable transit times along the Arctic shipping routes represent major obstacles to the development of Arctic shipping.

The majority of cargo ships that travel the world's oceans operate on regular schedules, known as liner service. In total more than 6,000 ships, most of them container ships, follow a set route calling at a number of ports to load and unload cargo, which consequently supplies the concerned country's hinterland. Profitability can only be achieved with large-scale shipping based on stable and predictable (year-round) operations. The ability to schedule journeys a long time in advance and to guarantee uninterrupted service is considered key for container ship operators. Bulk dry and wet carriers, on the other hand, follow less predictable schedules and their routes depend more on changing supply and demand of less time-sensitive items. Of the four kinds of Arctic voyages undertaken in the Arctic Ocean - destination transport, intra-Arctic transport, trans-Arctic transport and cabotage - trans-Arctic shipping may face the most significant hurdle to becoming part of the global trade patterns.

Draft and beam restrictions

Arctic shipping routes, especially the NSR, are subject to significant draft and beam restrictions. Ships along the NSR must pass through a number of narrow and shallow straits in the Kara and Laptev Sea. The Yugorskiy Shar Strait at the southernmost entrance from the Barents to the Kara Sea follows a channel 21 nautical miles long and 12-30 meters deep. Along the eastern section of the NSR, ships must navigate either the Dmitry Laptev Strait or the Sannikov Strait to pass through the New Siberian Islands and travel from the Laptev to the East Siberian Seas. The eastern approach of the Laptev Strait has a depth of less than 10 meters, restricting the draft of ships to less than 6.7 meters. In addition, Russia's government only permits ships with the highest ice classification - 1A Finnish Swedish, to sail the route. Currently, only three vessels out of more than 2,000 Panamax ships have that classification.

Arctic shipping infrastructure

A key characteristic of Arctic shipping routes is the limited number of ports of call. According to the Arctic Logistics

Information Office, 16 ports, most of them ice-covered for part of the year, are located along the NSR. The port of Murmansk and the port of Petropavlovsk on Russia's far-east Kamchatka peninsula are considered essential for the development of the NSR. Both ports are expected to serve as terminals and hubs of the NSR. In November 2011 Vladimir Putin announced a major overhaul of the entire Russian transport system with special attention to maritime traffic in the Arctic. Russia plans to build up to 10 emergency centers focused on meteorological and rescue services as well as border patrol along the NSR. The capacity of Russia's seaports is scheduled to increase 50 percent by 2015 and the country plans to invest 134 rubles (€3.4 billion) into developing maritime traffic over the next 10 years.

The port of Kirkenes, Norway and the port of Vopnafjörður, Iceland may serve as major future Arctic hubs. Iceland's strategic location at the entrance and exit to the Arctic Ocean and Vopnafjörður's suitability as a deep-water port with depth up to 70m, may allow development into a transshipment hub. Future development and investment will however, depend significantly on the country's financial and economic situation and foreign investments. Over the past decade China has continuously increased its economic cooperation with the small island nation and China's premier Wen Jiabao recently visited Iceland to further strengthen the economic ties between the two countries. A Chinese delegation also visited the Faroe Islands, a small group of islands under the sovereignty of the Kingdom of Denmark, where domestic policy makers have also identified the island's role in future Arctic shipping as a priority.

Conclusion

Over the past decades the Arctic has witnessed a much faster than anticipated decline of sea ice and the continuation of this trend will transform the Arctic Ocean into a navigable seaway over the coming decades. Yet due to the region's unique navigational and economic challenges Arctic shipping will, for the foreseeable future, only be cost effective for a limited number of operators.

ABOUT THE AUTHORS

Malte Humpert is the founder and executive director of The Arctic Institute. He has been working on Arctic issues since 2007, focusing primarily on shipping along the Northern Sea Route, oil and gas developments in the Bering and Chukchi Seas, and the impact of climate change on Arctic sea ice.

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ABOUT THE COMPANY

The Arctic Institute

The Arctic Institute is an interdisciplinary and independent research platform for information and in-depth analysis about the developments in the Arctic based in Washington, DC, USA.

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