Marine Policy 34 (2010) 713–715

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Short communication

The implications of Arctic sea ice decline on shipping

Joshua Ho *

S. Rajaratnam School of International Studies, Nanyang Technological University, Singapore

ARTICLE INFO

Article history:
Received 17 September 2009
Received in revised form
28 October 2009
Accepted 28 October 2009

Keywords:
Northern Sea Route
Northeast Passage
Arctic sea ice decline
Shipping routes
Transit passage

ABSTRACT

Although a 'blue' Arctic Ocean is predicted in the summertime to occur from the middle of this century, current rates of warming indicate an earlier realization. Also, routes along the coast of Siberia will be navigable much earlier. However, before the Arctic routes can reliably be used on a large scale for transit by shipping along its passages, more investments are required on infrastructure and the provision of marine services to ensure the safe and secure transit of shipping with minimal environmental impact.

Long neglected and dismissed as scientifically unfounded, global warming has now been accepted as a new reality that will have a direct impact on the safety, security and the environment of human habitats. The effects of climate change as a result of global warming include the increase in frequency and intensity of adverse weather events; water shortages; sea level rise, and as a consequence flooding, and subsequent destruction of coastlines; a decrease in crop yields due to increasing temperatures and a reduction in water supply; and an increase in temperature-related illnesses and deaths [1]. Some traditional industries like agriculture, fisheries and tourism might be reduced or even disappear altogether in regions that are heavily affected by climate change. If societies are not able to adapt to climate change, great human suffering will occur.

If global warming due to greenhouse gas accumulations is expected to be severe world-wide, it is enhanced in the Arctic regions. Climate model studies of increasing atmospheric greenhouse-gas scenarios confirm that anthropological global warming will be even more enhanced in the high northern latitudes due to complex feedback mechanisms in the atmosphere–ocean–ice system [2]. The climate models used by the Intergovernmental Panel on Climate Change (IPCC) predicted that the warming in the Arctic over the next 50 years would be in the range of 3–4 °C, more than twice the global average. However, the models also indicate a large spread in the results, suggesting that the Arctic may be where the most rapid and dramatic changes will occur during the 21st century [3].

Already observations confirm that the air temperature has increased at double the rate of the global average over the last hundred years with the total ice extent decreasing at a rate of 3–5% per decade, the older multi-year ice decreasing twice as fast, river discharge from Russia increasing, the tundra permafrost thawing and snow cover on land decreasing [4].

The high likelihood that the IPCC models were conservative in their forecasts on warming in the Arctic was highlighted in an article that appeared after the IPCC reports were made known. The article concluded that 47–57% of the observed warming trends from 1953 to 2006 were exogenous to the IPCC model forecasts and were approximately 30 years ahead of the ensemble mean model forecast [5]. The article's conclusion was that the IPCC models as a group had underestimated the impact of Global Greenhouse Gas loading in the Arctic and the transition to a new Arctic state, that is an ice-free Arctic during the summer months, is more likely to occur within this century, and could even be within the years 2026–2046, instead of the 2050 to anywhere well beyond 2100 forecasted by the IPCC's business as usual scenario. Hence, the sensitivity of the Arctic region could well be greater than expected.

And again even this estimation could still be conservative. None of the models has taken into account the methane release due to a thawing of the Arctic lakes. Scientists have discovered that even a modest thaw of the perennially frozen soil that lies under the lakes surrounding the Arctic as well as the caps on the dry land around them could trigger a vicious warming cycle as the methane gas released will trap 25 times more of the sun's heat than carbon dioxide does [6]. A complete thaw will discharge 10 times the current amount of methane already helping to heat the planet.

* Tel.: +65 6790 6624; fax: +65 6794 0617.
E-mail addresses: ishhho@ntu.edu.sg, joshua.h.ho@gmail.com.

0308-597X/$ - see front matter © 2009 Elsevier Ltd. All rights reserved.
doi:10.1016/j.marpol.2009.10.009

These observations and analysis of current warming trends indicate that the Arctic sea ice is melting at a faster rate than previously forecasted. One of the positive impacts of this early Arctic melt is the opening up of the Northern Sea Route (NSR) or the Northeast Passage for ship transportation.

1. The Northern Sea Route or Northeast Passage

During the last 75 years, the Soviet Union and Russian Federation have operated in the Northern Sea Route. Maritime transport has been extensive and reached its peak of 6.6 million tonnes in 1987, mainly in the form of the regional export of natural resources and to a lesser extent of cargo to the communities along the Siberian coast. After the collapse of the Soviet Union, much optimism was envisaged in the 1990s with respect to the increased use of the Northern Sea Route for maritime transport between Europe and Asia. This optimism has yet to become a reality, mainly because of the fact that the Northern Sea Route has never been ice free, even during the summer months, to allow for significant maritime transportation between Europe and Asia. The current volume of shipping appears to be 2.13 million tonnes in 2007 and the transportation of hydrocarbons within the Barents and the White Seas reached 8.5 million tonnes in 2006 [7].

The Arctic Marine Shipping Assessment (AMSA) has been conservative in its assessments of when regular trans-polar transport may occur [8]. It assesses that shipping in the coming decades will remain dominated by an increase in regional transportation in waters close to Norwegian interests, namely in the Barents, Pechora and Kara Seas. Coastal and port access in all these areas will experience immediate seasonal improvements due to the reduced appearance of sea ice. From around 2025, AMSA assesses that transit traffic in the Northern Sea Route may be more regular. Even though the sea routes along the Siberian coast may open up earlier, the depth of water along the coast may limit the size and freight capacity of ships that can transit the route. AMSA estimates that regular trans-polar summer transport (four months) may not occur until towards the middle of this century, from 2040 onward.

However, the maritime activities along the Northern Sea Route have changed over the last two years. Previously, no non-Russian ships traversed the Northern Sea Route along the Siberian coast, but now merchant, research and expedition vessels have journeyed through the Northern Sea Routes during the summer seasons since 2004 and this volume is set to increase. For example, the predicted volume of transport in the Northern Sea Route, primarily associated with transporting natural resources, gas and oil, may increase by up to 5.5 million tonnes in 2010, and by up to 12.8 million tonnes by 2020 [9].

There have also been signs that trans-Arctic passage may open up much quicker than expected. For example, in 2008, the Arctic Ocean experienced for the first time ever an ice-free and navigable Northern Sea Route along the Siberian coast [10]. This occurred during a summer melt season after a winter in which the maximum ice extent was greater than had been observed in the previous five years, suggesting that seasonal temperature fluctuations have increased and that future ice-free passages during the summer months along the Siberian coast are highly likely. Recently on the 9 September 2009, it was reported that two German merchant vessels were the first ever to pass through the formerly impenetrable Northeast Passage or the Northern Sea Route, departing from Ulsan in South Korea to Novy Port in Russia [11]. The ice-class ships were to eventually sail around the Yamal Penisula, cross the Barents Sea to Murmansk and head on to Rotterdam. Satellite photos also highlight the possibility of a clear route through the Northeast Passage and since 2008, a clear passage of the NSR.

2. Future shipping in the Arctic

The Centre for High North Logistics in Norway, a private-sector funded research centre, has already embarked on studies that should have been completed in June 2009, on the business case for trans-Arctic container shipping. The size of ships being examined include 100,000 ton LNG carriers and up to 5000 TEU container ships for deployment by 2015 [12]. There is also the possibility that the city of Adak, located in the Aleutians West Census Area, Alaska, United States, could serve as a possible international hub port for Arctic shipping [13]. Both these developments seem to indicate an earlier ice-free passage via the Northern Sea Route. The US National Intelligence Council, in its study on Global Trends 2025, has suggested that the date for a seasonally ice-free Arctic could even be as soon as 2013 [14].

That being the case, tremendous shipping benefits would accrue as transiting the Northern Sea Route above Russia between the North Atlantic and the North Pacific would trim about 5000 nautical miles and a week's sailing time compared with the use of the Suez Canal and through the Malacca Straits. This may have an adverse impact on existing regional container hub ports like Singapore which sits astride the main east-west transportation thoroughfare and is a major regional transshipment port. If container ships use the Northern Sea Route, it would make more sense to stop at new or existing ports in Northeast Asia and use these ports as transshipment centres to the Southeast Asian region, instead of the port of Singapore. Some possible ports that could be used in such a manner in Northeast Asia may include Hong Kong, Shanghai, or a Japanese port. If this were to occur, the container volumes handled by the port of Singapore might decrease for four months of the year.

3. Improvements needed before shipping in the Arctic can become a reality

However, before the Northern Sea Route can reliably be used as a transit route between Europe and Asia, several issues will need to be resolved. For example, for vessels operating in the Arctic part of the world oceans, it is crucial for navigation to have access to synoptic environmental observations of the weather, sea ice and ocean conditions and their forecasts. Such information will be essential in both strategic and tactical navigation support and help to ensure safe and efficient operation in ice-covered waters. In particular though, five issues will need to be resolved. Firstly, environmental monitoring and forecasting services providing meteorological, oceanographic and sea ice information to support shipping all year round will need to be significantly enhanced. Secondly, search and rescue as well as ice-breaker support services, with seasonal and regional increased access, will need to be provided in a comprehensive manner. Thirdly, experienced mariners who are trained for Arctic operations are needed to operate the ships. Fourthly, new ship technology is required for independent ship operations in ice covered waters, which will remain present for most of the year. Fifthly, when traffic gets heavier, it may be necessary to implement vessel traffic systems (VTS) along narrow straits that may end up as choke points, like the Barents Straits. Lastly, an integrated governance and regulatory framework based on the United Nations Convention on the Law of the Sea is needed.

When it comes to governance, there may be a need to adopt a more inclusive approach when it comes to the management of the

Arctic routes. Currently, the Arctic Council provides the forum for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic Indigenous communities. The Arctic Council addresses issues of common concern, in particular that of sustainable development and environmental protection. It is a non-treaty intergovernmental ministerial level forum established by the Ottawa Declaration of 1996 [15]. Members of the Arctic Council include Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States, five of which have Arctic Ocean basin coastlines and three of whom have no coastlines in the Central Arctic Ocean. As issues regarding the Arctic, especially shipping issues, may impact on other stakeholders who are not members of the Arctic Council, a more inclusive approach may be required. Models exist where stakeholders are included in discussions for the management of a critical waterway used for international navigation. For example, the Malacca Straits Cooperative Mechanism was established in 2007 under the principles of UNCLOS Article 43 to deal primarily with the safety and environmental protection issues along the Malacca Straits [16]. Security issues can be addressed but were secondary. The Cooperative Mechanism is led by the littoral states of Indonesia, Malaysia and Singapore, but includes other stakeholders like the International Maritime Organisation (IMO); the Nippon Foundation; the shipping industry, like INTERTANKO, INTERCARGO, BIMCO, the International Chamber of Shipping (ICS) and other interested non-littoral states in its Forum for Cooperation discussions.

4. A new transit passage between Europe and Asia?

Despite the fact that a 'blue' Arctic Ocean is predicted in the summertime (four months) to occur from the middle of this century to as late as the 22nd Century, current rates of warming indicate an earlier realization. However, even before trans-polar navigation is realized, routes along the coast of Siberia will be navigable much earlier. Already there are plans to build trans-Arctic ships and plans for hub port development in Northeast Asia that will take advantage of this passage. Such plans indicate that the Northern Sea Route may be opened up for passage even as early as 2013 given current observed rates of global warming that have been beyond the expectations of existing forecasts. Accelerated warming could also occur if methane trapped under the Arctic permafrost is released on a greater scale. But before the Northern Sea Route can reliably be used on a large scale for transit by shipping along its passages, more investments are required on infrastructure and the provision of marine services to ensure the safe and secure transit of shipping with minimal environmental impact.

References

[1] Tay S, Pangmalit P, Tang E. Special Report on Climate Change Challenges in Southeast Asia. Report of Shell—SIIA Expert Roundtable on Climate Change Challenges in Southeast Asia; 2008.
[2] Intergovernmental Panel on Climate Change. Climate change 2007: synthesis report. Switzerland: World Meteorological Organisation; 2008.
[3] Intergovernmental Panel on Climate Change. Climate change 2007: the physical science basis: contribution of Working Group I to the fourth assessment report. UK: Cambridge University Press; 2007.
[4] Bobylev LP, Kondratyev KY, Johannessen OM. Arctic environment variability in the context of global change. New York: Springer–Praxis; 2004 p. 470.
[5] Stroeve J, Holland MM, Meier W, Scambos T, Serreze M. Arctic sea ice decline: faster than forecast. Geophysical Research Letters 2007;34:L09501.
[6] Simpson S. The Arctic thaw could make global warming worse. Scientific American; 29 June 2009.
[7] Frolov IE, Krutskih BA, editors. Hydrometeorological supplying of Arctic navigation in XX and beginning of XXI centuries: Federal Survey on Hydrometeorology and Environmental Monitoring. St. Petersburg: Arctic and Antarctic Research Institute; 2008.
[8] Arctic Marine Shipping Assessment. The future of Arctic marine navigation in mid-century: scenario narratives. Global Business Network Report; May 2008.
[9] Frolov IE, Krutskih BA, editors. Hydrometeorological supplying of Arctic navigation.
[10] Johannessen OM, Pettersson LH. Arctic climate and shipping in Gottemoeller. In: Tamnes R, editor. High north, high stakes: security, energy, transport, environment. Norway: Fagbokforlaget; 2008. p. 95–114.
[11] First through Northeast Passage. The Barents observer; 9 September 2009.
[12] Tschudi FH. Norwegian commercial perspective. Presentation at the conference on energy security in Asia organized by the Norwegian Institute for Defence Studies (IFS) and the China Foundation for International and Strategic Studies (CFISS), Beijing, 21–22 May 2009.
[13] Kitagawa H. Japanese perspective. Presentation at the conference on energy security in Asia organized by the Norwegian Institute for Defence Studies (IFS) and the China Foundation for International and Strategic Studies (CFISS), Beijing, 21–22 May 2009.
[14] National Intelligence Council. Global trends 2025: a transformed world. Washington, DC: US Government Printing Office; November 2008. p. 53.
[15] Arctic Council Secretariat. About the Arctic Council. Arctic Council Webpage; 22 2007 October.
[16] Ho JH. Enhancing safety, security and environmental protection of the straits of Malacca and Singapore: the cooperative mechanism. Ocean Development & International Law 2009;40(2):233–47.