Challenges and Opportunities for Arctic Transportation caused by the shrinking Arctic Ice Cover

Ove Tobias Gudnestad
Department of Mechanical and Structural Engineering and Materials Science, University of Stavanger
Stavanger, Rogaland, Norway
Yong Bai
College of Civil Engineering and Architecture, Zhejiang University,
Hang Zhou, Zhejiang Province, China

ABSTRACT
The shrinking ice cover of the Arctic opens up for increased opportunities for trade between the European Countries and the Eastern Economies. The Northern Shipping Route has been established with an organized Russian Management system in place and the navigation in the Arctic is improving with the launch of new satellites. In other areas of the Arctic, the Norwegian and Danish administration are responsible for the European Arctic while the Canadian and the US administration are responsible for the Americas. We are of the opinion that it is of importance to confirm the applicability of the Northern Sea Route in case savings can be realized with respect to release of pollution and cost savings. This is considered necessary, as recently, Nike and several corporations have decided not to ship through the Northern sea Route (Arctic Today, 2019). They have “ teamed up with the Ocean Conservancy in a pledge not to use Arctic shipping routes,” citing both safety and environmental concerns about traversing the region. In general, there are few incidences associated with transport in the Arctic, however, there are still technical issues to resolve and we will point out challenges and solutions as well as research needs to ensure that Arctic shipping operations are safe and sustainable.

KEY WORDS: Northern Sea Route, past incidents, sustainable transit, potential risks, infrastructure, variable ice conditions, warming climate, cruise traffic, fishing activities, container traffic.

INTRODUCTION
The Northern Sea Route Administration (no date) is in charge of organizing navigation in the water area of the Northern Sea Route. The main targets of the Institution are to ensuring safe navigation and protection of marine environment from the pollution in the water area of the Northern Sea Route. The tasks are done in a professional manner and the number of incidences is very few. In the past, there were many ships lost in the area (Marchenko, 2016), however, with more modern ship design and implementation of ice strengthening ship design codes, the incidences are few. We should realize, however, recent examples of incidents where vessels not authorized for travel in the area have had problems (e.g. the tanker Nordvik, Sept 2013, FleetMon, 2013). For a thorough discussion, see Marchenko (2014a and 2014b). Furthermore, the Research Vessel Akademik Ioffe ran aground in the Canadian Arctic in 2018 (Humpert, 2018), sending a warning signal to the Arctic cruise industry.

Hill et al. (2015) have discussed transportation risks, safety and security in view of the warming of the Arctic climate and the reduction of the ice cover. In our paper we will present a holistic view of the challenges for Arctic Transportation caused by the shrinking Arctic Ice Cover and cite recent publications shedding new lights on the effects of the shrinking cover. The objective is to demonstrate how the challenges can be overcome and communicated to the users so an increased confidence can be established.

Regarding present challenges and research needs to ensure that Arctic transportation is safe and sustainable, we will call for research into a number of activities. This would in our opinion improve the general confidence in the use of the Northern Sea Route. In Appendix 1, we further summarize the suggested actions. The themes being discussed are the following:

• Ship design to resist impacts with multiyear ice and small icebergs that may not easily be seen by the ship watch or by radar.
• Risk analysis to ensure that all ship functions have sufficient backup in case of collision with ice floes and in case of loss of main power, propulsion system or steering gear.
• Full chartering of all main shipping routes and emergency routes to ensure that shallows are identified to avoid any grounding of vessels along the route. This will also include the effect of the shoreline erosion on formation of sandbanks, etc.
• Awareness of sudden violent storms (polar lows) which will be more frequent in an arctic ice-free ocean than they used to be in a situation of ice closer to the coastline.
• Any oil pollution in these waters will be a challenge as the possibilities to collect oil spills are very limited in icy waters and the infrastructure to cope with oil spills is limited.
• Identification of safe havens along the route for shelter or for emergency stops.
• Identification of the availability of emergency assistance and repair possibilities.
• Availability of and requirements to search and rescue capabilities in the vast area of the Northern Sea Route.
• Use of fuel, which do not heavily pollute the environment. Of particular concerns is the spreading of soot particles. This will exclude the use of fuel with high Sulphur content.