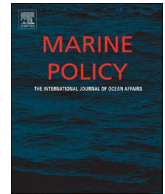




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Cooperation in developing a disaster prevention and response plan for Arctic shipping

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ABSTRACT

The melting Arctic ice creates opportunities in cargo and passenger shipping for the international maritime community. Considering the circumpolar circumstances, the growth in Arctic shipping can result in a higher risk of mishaps and disasters. Disaster response may be more complex due to harsh, unpredictable weather conditions, varying stakeholders, differing political systems from the border countries and the disputed accountability for costs. Planning for an Arctic disaster is a ‘wicked problem.’ A ‘wicked problem’ is one that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. These conditions are due to the complexity of stakeholder interdependencies, environmental conditions, social/cultural/political concerns, and economic risks. The ‘wicked problem’ context helps to view decisions made on disaster prevention and response plans for Arctic shipping in terms of mitigation and minimization of the extent and duration of the negative consequences, rather than with a solution mindset. To achieve this goal, cooperation strategies are developed. This study maintains that cooperation among involved stakeholders is the most effective mechanism for an appropriate prevention and response plan. Cooperation not only increases effectiveness, but also the speed of response.

1. Introduction

The Arctic sea ice extent shows a deviation from the 1981–2010 in recent years (see Fig. 1). Per the United States National Snow and Ice Data Center (NSIDC) and the United States National Aeronautics and Space Administration (NASA), the length of the melting season has been growing and continues to grow by several days each decade over roughly the last 50–100 years [14]. Navy scientists expect ice-free conditions for a full month each year by the mid-2030s, and two to three months ice-free by the year 2050 [74]. As the Arctic ice melts, more maritime opportunities and challenges are presented to travel across the region, extract resources, and impact the local populations. Furthermore, as these events increase, competition among stakeholders is triggered creating disputes [35].

For the *maritime industry*, shorter shipping routes from Europe to Asia mean reduced inventory costs for shippers and fuel savings for shipping companies [41]. Some shippers have already begun transit through the Bering Strait using two main Arctic routes (see Fig. 2): The Northern Sea Route (NSR) along the Russian coast and the Northwest Passage through Canada [48].

For the *maritime tourism industry*, several Arctic regions continue to grow as destinations [72]. As populations age in western economies,

consumers seek experiences rather than goods [22]. Travelling to unusual destinations is an attractive way to create these experiences.

The *fishing industry* has a major economic stake in the Arctic and continues to grow as Norway, Russia, and Greenland try to maximize the value of fish stocks. Overfishing has presented many problems for nations. To seek new fishing areas and access fish species that are limited, fishing traffic will increase as the Arctic becomes more accessible [45].

The most significant industry with the largest potential impact on the Arctic region is the *oil and gas industry*. The US Geological Survey in 2008 estimated that nearly one-quarter of the world's oil and gas reserves lie beneath the Arctic waters [32]. In addition, Arctic land-based mining has contributed to the increased traffic by bringing supplies and machinery to the mines and transporting valuable minerals.

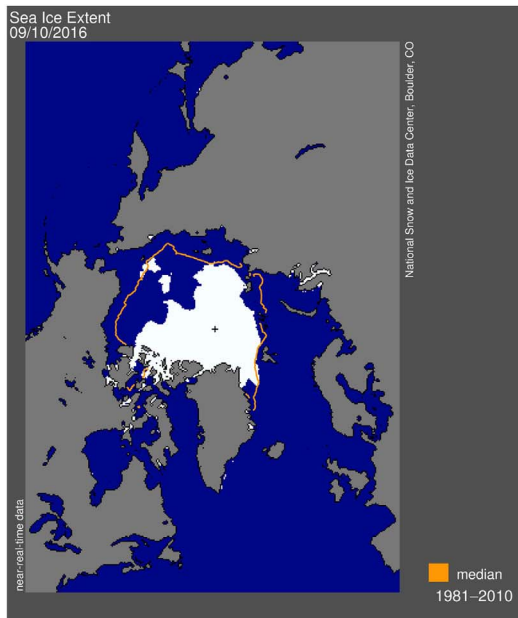
As the maritime traffic associated with these activities increases so does the risk of disaster in the fragile Arctic marine environment including oil pollution, ship strikes of whales, noise perturbation, chronic pollution, and an unknown magnitude of consequences if other disasters take place. Overcoming barriers such as these, require collaborative action. Developing plans and techniques to best manage these Arctic risks require action and cooperation locally, nationally, and internationally.

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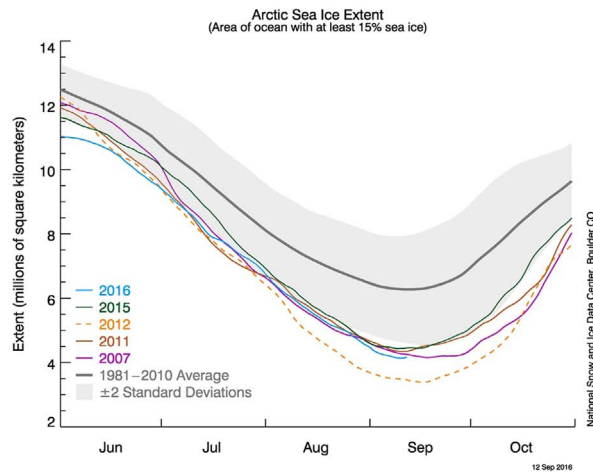
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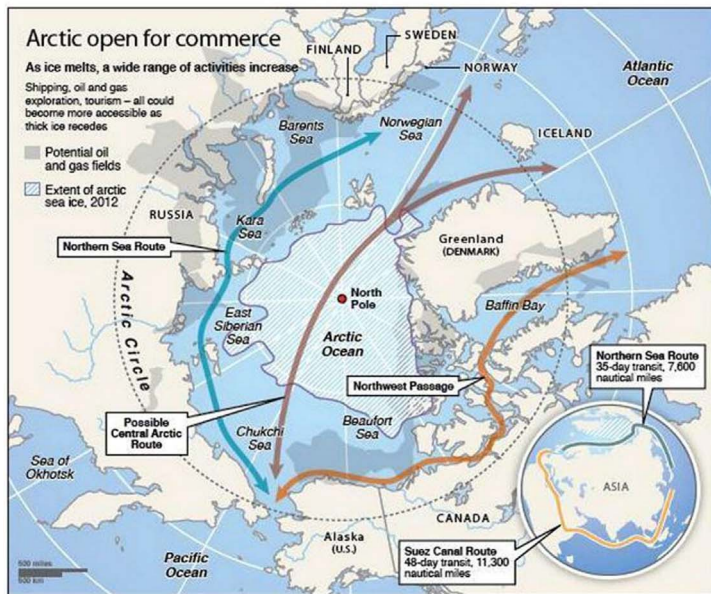


(a) Arctic ice extent in 2016

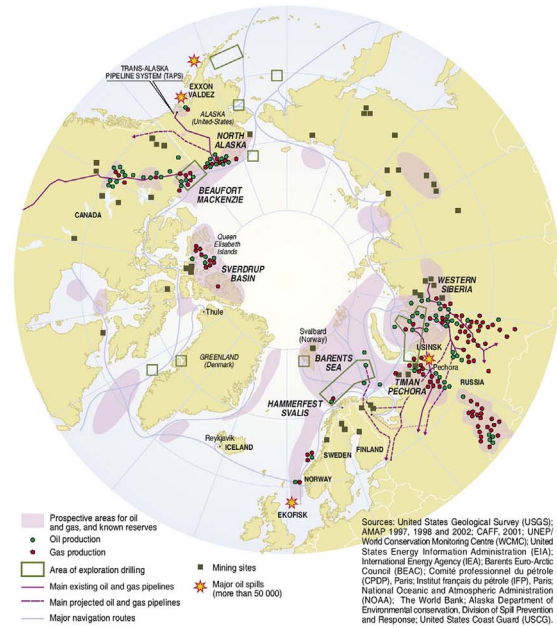


(b) Arctic ice extent in the past decades

Fig. 1. Arctic sea ice extent (courtesy of [56]) (a) Arctic sea ice extent in 2016. (b) Arctic sea ice extent in the past decades.



(a) Possible Arctic routes (Sanchez, 2015)



(b) Oil and gas industry development in the Arctic (Ahlenius et al., 2005)

Fig. 2. Arctic opportunity and activity. (a) Possible Arctic routes [65]. (b) Oil and gas industry development in the Arctic [2].

Managing for all the potential consequences of and impacts from increased maritime traffic stemming from fishing, oil and gas exploration, maritime mining and extraction, and other kinds of high-environmental-impact activities is a ‘wicked problem.’ A wicked problem is one where the planning (in this case for an adverse event) is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. The purpose of this paper is to illuminate the wicked maritime problem of managing safety in the Arctic environment, to highlight the unique difficulties and consequences for all in pursuit of the Arctic’s growing opportunities and untapped resources, and to propose mitigation through a model of

cooperation among Arctic stakeholders to effectively plan for prevention and post mishap response.

2. Literature review

Since the release of the Arctic Council’s Arctic Marine Shipping Assessment (AMSA) report in 2009, and considering the growing importance of shipping operations in the Arctic, research on transportation through the Arctic has significantly grown in the burgeoning academic literature on port and shipping operations [19,20,29,31]. The literature on Arctic shipping can be divided into the following three

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