

RISKS & OPPORTUNITIES FROM MORE MARINE TRAFFIC IN THE ARCTIC

Leah Beveridge & Dr. Ronald Pelot, Dalhousie University
September, 2014

The environment is changing and it is expected that more vessels will travel through the Canadian Arctic than in the past for transit, fishing, tourism, oil and gas, and mining. This document describes the risks to vessels and their crew from the harsh Arctic waters, the risks to the environment from having more vessels in the area, and the ways in which people may be affected, both good and bad.



TRANSIT SHIPPING



CRUISE TOURISM



OIL & GAS EXPLORATION



TRADITIONAL USES



COMMERCIAL FISHING



SEALIFT AND RESUPPLY

Key risks to vessels and their crew

Key risks to the environment

Key outcomes of more ships, trips, and people

This research is part of the PASSAGES Project – Protection and Advanced Surveillance System for the Arctic: Green, Efficient, and Secure by Dalhousie University, Airbus Defence & Space, exactEarth Ltd., and the Fraunhofer Institute FKIE.



Note: This document provides a list of the possible risks and opportunities discussed in other texts; they may not all occur.

Risks to Vessels & Crew Members

There are many characteristics of the North that make operating in the Arctic more dangerous. The **long days and nights** can mentally affect the people on the vessels, and the darkness at night can also make it very difficult to see. **Fog** is also known to be a big problem affecting crew members' ability to operate.

Storms are another major concern when operating vessels in the Arctic. It is expected that the number and frequency of storms will increase as the climate continues to change. There is also less sea ice because of climate change, which means that there is more open water and as a result, **waves** can get bigger. That means that when there is a storm, the waves can have an even greater impact.

Cold temperatures are a big issue, both for the boats and for the people on them. When cold water is sprayed onto a vessel, the water will freeze on impact. Over time, a thick layer of ice can develop, which makes the vessel unstable. The cold and ice can also cause machinery, such as radios and navigation equipment, to stop working.

Sea ice, of course, is also a big problem. Vessels that are built to go through ice can still be damaged if they are going too fast, through ice that is thicker than what they are built for, or just from wear and tear over time. Although the amount of sea ice may be decreasing with climate change, there is more **floating ice and icebergs**, which are very dangerous for vessels, especially small pieces of ice that barely float above the surface of the water.

A major risk to vessels and crew members is that the Canadian Arctic is **lacking infrastructure**; there are no ports, there are limited navigational aids (e.g., buoys) and communications (e.g., radio and satellite), and little of the sea floor has been charted. Search and rescue operations are also very difficult because there are not many resources based in the region.

Last, a concern with growing vessel activities in the region is that there will be crew members and captains with **limited experience** in the Arctic, which means they do not have a complete understanding of all the risks, particularly how to operate in ice.



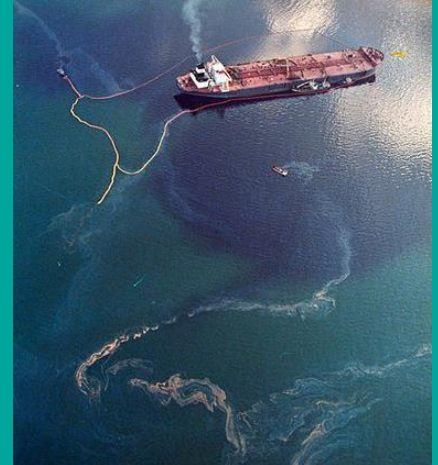
Just because a vessel is ice strengthened does not mean it is ice invincible.

The M.S. *Explorer* is an ice-strengthened ship. It was on a cruise in Antarctica, with an experience captain, when a piece of ice punctured a hole in the side of the vessel. Oftentimes, the bow of the vessel is built to be able to go through ice, but the sides are not.

Photo from the Chilean Air Force/AP from the National Geographic News:
<http://news.nationalgeographic.com/news/2007/11/071127-antarctica-cruise.html>

Risks to the Environment

- ***Collisions and vessel strikes** with marine animals are a global problem. They usually happen between a vessel and a whale, particularly a calf, juvenile, or a mother with a newborn.
- ***Wakes** can change the wave energy along the coast. This can have impacts on coastal plants and animals, and can increase erosion. If the wake is big enough and in the right place, there is also the risk that seal dens can be flooded.
- ***Noise** from vessels interferes with the sounds animals make, which can make it difficult for them to communicate and navigate. It can also damage tissues and organs and can lead to hearing loss. Animals may avoid an area with a lot of loud noise, but they have been documented returning to an area once the noise stops.
- ***Discharges** include bilge water, tank washings, grey water (from laundry, etc.), sewage, ballast water, garbage, and accidental discharges of cargo. Emissions into the air can also have an impact, such as greenhouse gases, aerosols, nitrogen and sulfur oxides, carbon monoxide, and black carbon.
- ***Garbage** that is dumped or lost from vessels can be ingested by animals, causing them to choke, or can get lodged in their digestive tract. It can also entangle animals and impact shorelines and seafloor plants and animals.
- ***Invasive species**, such as fish or clams, can be brought to an area in ballast water or on garbage or the surfaces of ships. They can unbalance the food web by competing for space and food, or by becoming food.
- ***Oil spills** cause short and long-term impacts. In the short term, feathers and fur can be oiled, oil can be ingested, and the waters can become toxic. Long-term effects are not very well understood in the Arctic, but it is known that oil can stay in an area for decades.
- ***Icebreaking** leaves a trail of open water behind, which can interrupt wildlife migration patterns. It can also confuse marine mammals that use leads to navigate; if they start following an open water trail, thinking it's a lead, and then the ice refreezes above them, they become trapped with no air.



25 years after the *Exxon Valdez* oil spill in Prince William Sound (1989), trace amounts of oil can still be found on nearby beaches.

The harsh environment – sea ice, cold temperatures, limited visibility, high winds, and extreme storms – puts the Arctic at greater risk for an accidental spill. Not only is the chance of a spill greater, but it is more difficult to respond and clean it up if it occurs.

Photo from AP and John Gaps III/AP from the U.S. News & World Report:
<http://www.usnews.com/news/photos/2014/03/20/exxon-valdez-oil-spill-25-years-later>

More Ships, Trips, and People

More ships making more transits North will mean that there needs to be more infrastructure and services, which can also benefit nearby communities. However, more traffic will also mean more icebreaking, which can interrupt peoples' uses of the sea ice for their own transportation.

More vessels traveling North could mean there are more opportunities for sealifts, which could bring down the cost of goods and food. If more western foods are available at lower costs, though, people may start eating more store-bought food and less country food, which could have impacts on health and culture.

Environmental impacts could mean that people won't be able to eat as much country food, and so they will have to eat more store-bought food. If people are forced to rely more on store food, but the costs of goods and food do not become lower, then there could be a new financial burden on people.

If more people travel to the Arctic, more money may be spent in communities, which would be an economic benefit; income could increase and with it, there could be a higher standard of living. However, if there is more focus on the wage economy, then there may be less attention to traditional subsistence economies, which could, again, have impacts on health and culture.

More interest in the wage economy may also cause money to become more important, which could lead to social imbalances in communities. More people from outside the North coming to communities could also cause imbalances and social tensions.



More marine traffic presents a number of opportunities and risks for people.

There are many ideas about how people could benefit and be impacted, but more work needs to be done to understand what the positive and negative outcomes are and how the risks can be avoided and the opportunities realized.

Photo from Jonathan Hayward/Canadian Press from the CBC News, World:
<http://www.cbc.ca/news/world/arctic-fishing-moratorium-needed-scientists-say-1.1291084>

For more information:

Leah Beveridge, Dalhousie University
Email: passages@dal.ca
Phone: 902-494-8499

Twitter: @mrg_marin
Website: marin-research.ca
Website: passages.ie.dal.ca



Funding was provided by the German Ministry of Economy and Technology, Airbus Defence & Space, and the Natural Sciences and Engineering Research Council of Canada.

Front photos from: (top left) Nunatsiaq Online at www.nunatsiaqonline.ca/stories/article/65674commercial_arctic_shipping_a_long_way_off_maersk_boss_says; (top right) cruzeirospld.blogspot from Jim Walker's Cruise Law News at www.cruiselawnews.com/2010/08/articles/sinking/clipper-adventurer-cruise-ship-runs-aground-in-the-arctic/; (middle left) Martin Rogers/Getty Images from Popular Mechanics at www.popularmechanics.com/science/environment/climate-change/americas-arctic-challenge-4#slide-4; (middle right) Tristan Pearce from Resources North at www.resourcesnorth.org/ma/460/pearce; (bottom left) Slim Allagui/AFP/Getty Images from Global Post at www.globalpost.com/dispatch/news/regions/americas/canada/120424/scientists-call-arctic-fishing-moratorium; (bottom right) Shane Sadowy from NTCL at www.ntcl.com/gallery.