MANAGING SHIPPING IN THE FUTURE

– RECOMMENDATIONS TO REDUCE IMPACTS AND RISKS ASSOCIATED WITH INCREASED SHIPPING IN GREENLAND

Bowhead whale (Balaena Mysticetus) just under the ice. © naturepl.com / Martha Holmes / WWF

THE ARCTIC WILL SEE MORE SHIPPING

The maritime shortcut between Asia, North America, and Europe through the Arctic region is still a scenario for the future (WWF, 2017). Russia has focused on development of the Northern Sea Route, but commercial activities along the route remain slow. Routes are generally underdeveloped and remote with little infrastructure, sections remain uncharted and ice conditions still pose a threat to operations. The ice will remain thick and treacherous for years, requiring expensive ice breakers and strengthened hull [1] [2].But within the maritime industry there are expectations that this may change by 2040.

But shipping within the Arctic is growing. Driving this development is the demand for goods and services by the 4 million people that live in the Arctic region, but also by the world markets growing demand for Arctic resources, primarily fish and seafood, minerals and oil and gas[3].

Another dimension of increased Arctic shipping is tourism. The effects of climate change can be seen across the Arctic region and international negotiations to curb climate change has brought immense attention onto the Arctic region. In a globalized world the Arctic seems less distant and more accessible than ever before. An increasing number of tourists decide to discover the Arctic onboard one of the many cruise ships navigating Arctic waters each summer.

In many Arctic states cruise ship tourism is expected to follow previous growth patterns: Government of Greenland is preparing for a scenario where cruise ship tourism will nearly double by 2040[4].

IN GREENLAND SHIPPING IS CONCENTRATED IN WEST

Location data from ships allows us to study patterns of current shipping activities and to develop hypothesis about shipping in the future. The map below is based on actual shipping data collected by the Norwegian Coastal Administrations database HavBase. Data is from 2012 and each line represents the tracks of one ship.

The map illustrates how economic activities in Greenland is concentrated in South and West Greenland, where +90% of the population lives today. Urbanization is also taking place in Greenland,

[1] http://www.thearcticinstitute.org/the-future-of-arctic-shipping/

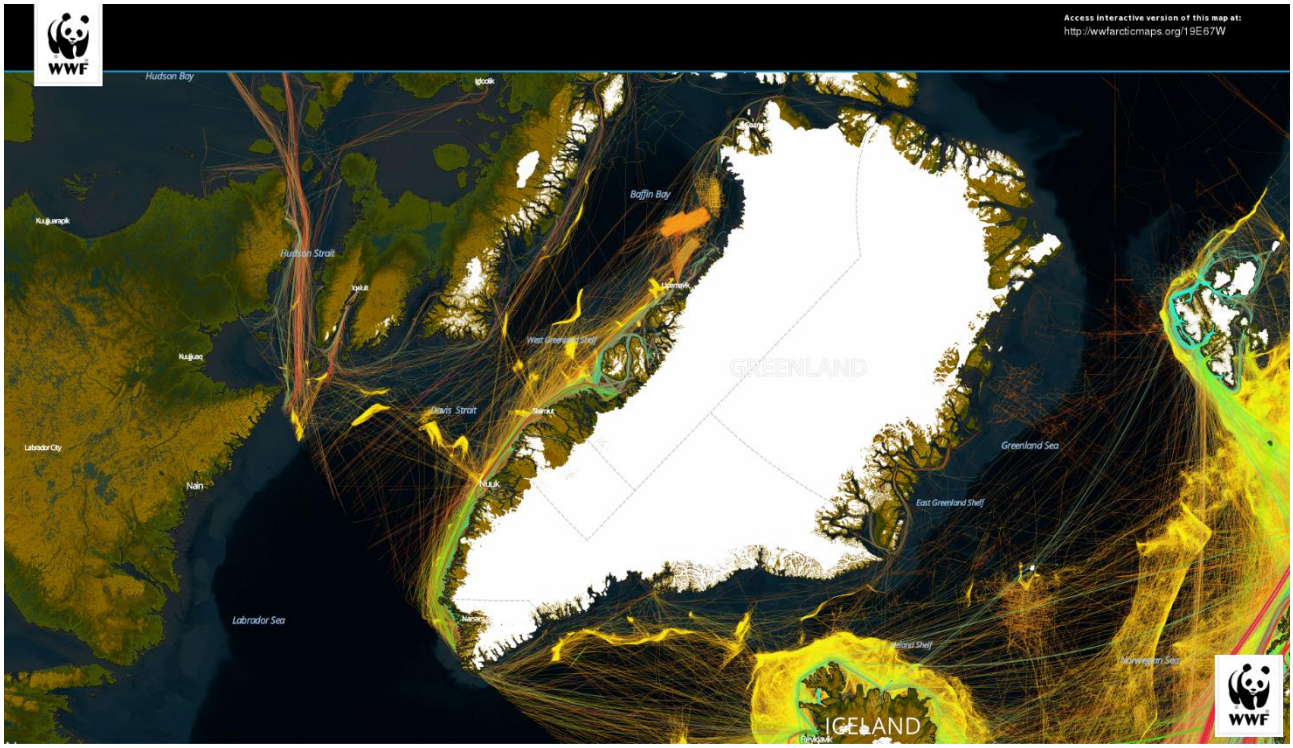
[2] https://services-webdav.cbs.dk/doc/CBS.dk/Arctic%20Shipping%20-%20Commercial%20Opportunities%20and%20Challenges.pdf

[3] https://pame.is/images/03_Projects/AMSA/AMSA_2009_report/AMSA_2009_Report_2nd_print.pdf

[4] http://naalakkersuisut.gl/~/media/Nanoq/Files/Hearings/2015/Turismestrategi/Documents/Turismestrategi%202016-2020%20FINAL%20DK.pdf

an increasingly people are leaving the smaller settlements. Today almost 1 in 3 live in Nuuk, the capital of Greenland. Demographic changes like this directly impacts shipping.

Important areas for fisheries are illustrated by the concentration of yellow tracks from fishing vessels, whereas the orange colors off Melville Bay in Northwest Greenland and in the Greenland Sea illustrate the use of offshore supply ships for exploration of oil and gas leases. These activities have slowed down dramatically since 2012. Blue lines up and down the coast on west Greenland and within the Disco Bay region indicate passenger and cruise ships. If the map was updated with 2017 data, we would likely see an increase in tracks of cruise ships connecting East Greenland with Svalbard and Iceland.



SCENARIOS FOR THE FUTURE

In 2015 Defense Command Denmark published a comprehensive Marine Environmental Risk Assessment concerning waters in and adjacent to Greenland (Forsvaret, 2015) to quality and describe the likelihood of marine accidents and the likelihood that Greenland will see pollution of the marine areas by spill of oil products, oil and chemical cargo products and fuel. The risk assessment includes a forecast of future shipping in Greenland out to 2027 based on expected new shipping activities and expected development in current shipping activities.

The context of the risk assessment is that the Danish Defense is responsible for surveillance and search and rescue operations in Greenland waters as well as marine protection of the larger part of the Greenland EEZ, covering waters beyond 3 nautical miles from the coast. The Government of Greenland on their side is responsible for protection of the marine environment of coastal waters and waters within 3 nautical miles as well as spills linked to the development of mineral resources, oil and gas within the entire EEZ. WWF and others has raised concern about the shared responsibilities, the capacity available locally to handle critical events like large oil spills or even worse, a collision or grounding of a cruise ship with likely hundreds or even thousands of passengers in need of evacuation on top of an oil spill from the ship's tanks.

WHAT WILL SHIPPING IN GREENLAND LOOK LIKE BY 2027?

Total expected growth in shipping (sailed nautical miles) is +24%.

- Likely no petroleum production in Greenland by 2027, but probably activities related to exploration and development of leases.
- Likely one or more mines in production by 2027.
- Likely cruise ship tourism will double by 2027.
- Likely passenger ship activities will increase 20% by 2027.
- Likely no significant increase in general cargo ships, container ships and product tanker activity before 2027.
- Likely same level of foreign bulk carrier passing through West Greenland waters as today.
- Unlikely that Greenland waters will be affected by trans-Arctic shipping by 2027.

Box based on the Marine Environmental Risk Assessment (2015). Prepared by DNV for Defense Command Denmark.

Since the Marine Environmental Risk Assessment was developed in 2015, scenarios for mineral and hydrocarbon activities have changes. Oil exploration companies have returned their leases in NW Greenland, and the London Mining Isua iron mining project discussed in the risk assessment is now closed. But other projects continue to develop. In South Greenland two mining projects targeting rare earth elements and uranium continue to develop and Ironbark Zinc now have a license to develop a large-scale zinc and lead mine in a location in the northernmost corner of the National Park of North and East Greenland. This illustrates how difficult it is to assess the risks associated with future shipping in Greenland as developments can change dramatically with the realization or collapse of a single mining project. The uncertainties are reflected in the Marine Environmental Risk Assessment, with the discussion about the expected development in bulk carrier activities.

Today the annual amount of oil spilled is estimated at 40 tons. More than half of this oil is spilled in the Nuuk region.

The Marine Risk Assessment includes probabilities of spills from various shipping activities and provides an overview of the vulnerability to a spill for fish, seabirds and marine mammals across 15 geographical areas and the four seasons of the year. Consequences of spills are rated in 6 categories ranging from low consequences to extreme consequences with major impacts on habitats and resources in the area.

The relative low traffic today results in relative low risks of oil spills compared to many European waters. The risks of a shipping-related oil spill are highest inside the 3 nm segments of southern and western Greenland, where activity levels are highest. Spills within 3 nm also have higher consequences than a spill taking place outside 3 nm.

Tourists on a ship viewing a glacier, Buchan Gulf, Baffin Island, Nunavut, Canada. © Pete Ewins, WWF Canada.

MORE SHIPS, GREATER RISKS

WWF sees a need for more focus on the safety and environmental impacts as Arctic shipping increases. Improving safety at sea to avoid loss accidents and ultimately loss of lives is important, but accidents can also have severe environmental and economic consequences. The Exxon Valdez grounding Prince William Sound, Alaska, in March 1989 even today is considered one of the most devastating human-caused environmental disasters. Over a few days 41,000 m^3 of crude oil was spilled into pristine Arctic waters with long-term consequences for ecosystems and for people. The risk of an accidental spill is low, but the consequences huge. Another aspect of increased shipping are the environmental consequences of the operations of ships, including noise and disturbance of habitat which this project has focused on.

SAFETY

Conditions in the Arctic are harsh and hazardous. The risks of accidents are high, raising significant concern within the insurance industry while the capacity to respond is often limited. Should an accident occur, search and rescue operations are difficult and expensive to carry out.

Key safety issues associated with shipping are:

Ice hazards – although Greenland waters are becoming increasingly ice-free, small and large icebergs from calving glaciers will continue to create unpredictable hazards from shipping.

Lack of charting – currently less than 10% of the Arctic Ocean is charted to international navigation standards states the World Economic Forum. Navigation safety remains a concern in Greenland as only 32 of the planned 73 digital maps of marine and coastal areas around Greenland have been updated by now.

Lack of search and rescue capacity – across Greenland communities are spread over vast distances and often it can take hours for search and rescue teams to reach the site of an accident. In frigid Arctic waters that delay can be deadly.

Extreme weather – icing and freezing spray can affect equipment and make vessels dangerously top-heavy. Climate change is making Arctic weather more unpredictable. This make weather monitoring and forecasting even more critical.

ENVIRONMENT

Increased shipping also poses many risks to Arctic wildlife and the habitat they depend on. Environmental impacts cover:

Noise – shipping noise masks the whistles, clicks and moans that whales use to communicate, navigate and find food. Higher noise levels can increase stress levels in marine mammals.

Ice destruction – navigating through sea ice disrupt habitat used by seal, walrus and polar bear for foraging, resting etc. And for people it breaks up what can be the only link to neighboring communities and harvest grounds in winters.

Collisions – for some species collision is a risk. Often the result is fatal.

Invasive species – ballast water that ships unload when they take on new cargo can contain invasive species. New international rules require ballast water to be treated, but those regulations have not yet come into effect and they don't include arctic-specific measures.

Pollutants – emissions from ships include pollutants such as NOx, SOx, greenhouse gases and black carbon, which can pose a threat to human health but also accelerated the warming of the Arctic. Waste generated onboard, including garbage, sewage, grey water and oily waste, can become pollutants if not properly managed. But facilities to handle waste are not found in all communities, increasing the risk of accidental or illegal release.

Oil Spill – According to the Arctic Marine Shipping Assessment 2009 report, the single biggest environmental risk posed by Arctic shipping is oil spills. Groundings, accidents or fires could release oil into remote locations where response capacities are hundreds of kilometers away.

Vulnerability –Arctic ecosystems are particularly vulnerable as Arctic summers are brief and feeding, mating, breeding and raising young has to happen within a brief window of opportunity, and anything that interferes with those activities can have serious consequences. Short Arctic food chains mean that species have few alternatives if one source of food disappears or is compromised. And Arctic ecosystems are already under enormous stress from climate change. With temperatures rising at twice the average global rate, sea ice is rapidly disappearing, and with it the foundation of Arctic marine life.

BAFFINLAND MARY RIVER PROJECT

August 2015 the Federal Timber left Milne Port carrying 53,000 tons of iron ore from the Baffinland Mary River mine. The bulk carrier navigated Eclipse Sound, sailed through the Greenlandic sections of first Baffin Bay and then Davis Strait before crossing the Atlantic to reach it's final destination of Nordenham, Germany.

The Baffinland Mary River project is targeting iron ore from a resource large enough to support mining for 21 years.

During the early revenue phase the annual production is expected to be 3.5 million tons of iron more. Ore will be trucked from the mine to Milne Port and from here shipped out via Eclipse Sound. For the approved project phase annul production is expected to climb to 21.5 million tons a year. As production increases, so will shipments. Baffinland Iron Mines Corporation (Baffinland from now) plan to continue using the 100-km dirt road from the mine to Milne Port to ship iron ore out via Eclipse Sound, but to increase capacity by establishing a railroad from the mining site south to another location - Steensby Port – where shipments can go out via Fox Basin and Hudson Strait.

For now Baffinland can only ship iron ore from out through Eclipse Sound during the open water season, covering the months of June through to October. But since 2015 the company has approached authorities in Canada with plans to increase shipping to match expected increase in production from the mine. Baffinland's first proposal (2015) was to extent the shipping season dramatically from only 5 to 10 months a year, leaving only the months of April and May closed to shipping in Eclipse Sound. The Nunavut Planning Commission responded to these plans with a decision that plans would not comply with the Northern Baffin Regional Land Use Plan. The commission's decision was based on concerns about the consequences of constant breaking of ice on both people and wildlife[5]:

'Ice is an essential part of life in the North. For people, for polar bears, for seals and other animals in the North, ice is a bridge – both metaphorically to the past and present Inuit values and activities, and also actually as a fact. Ice physically links Inuit to their Culture and Values.'

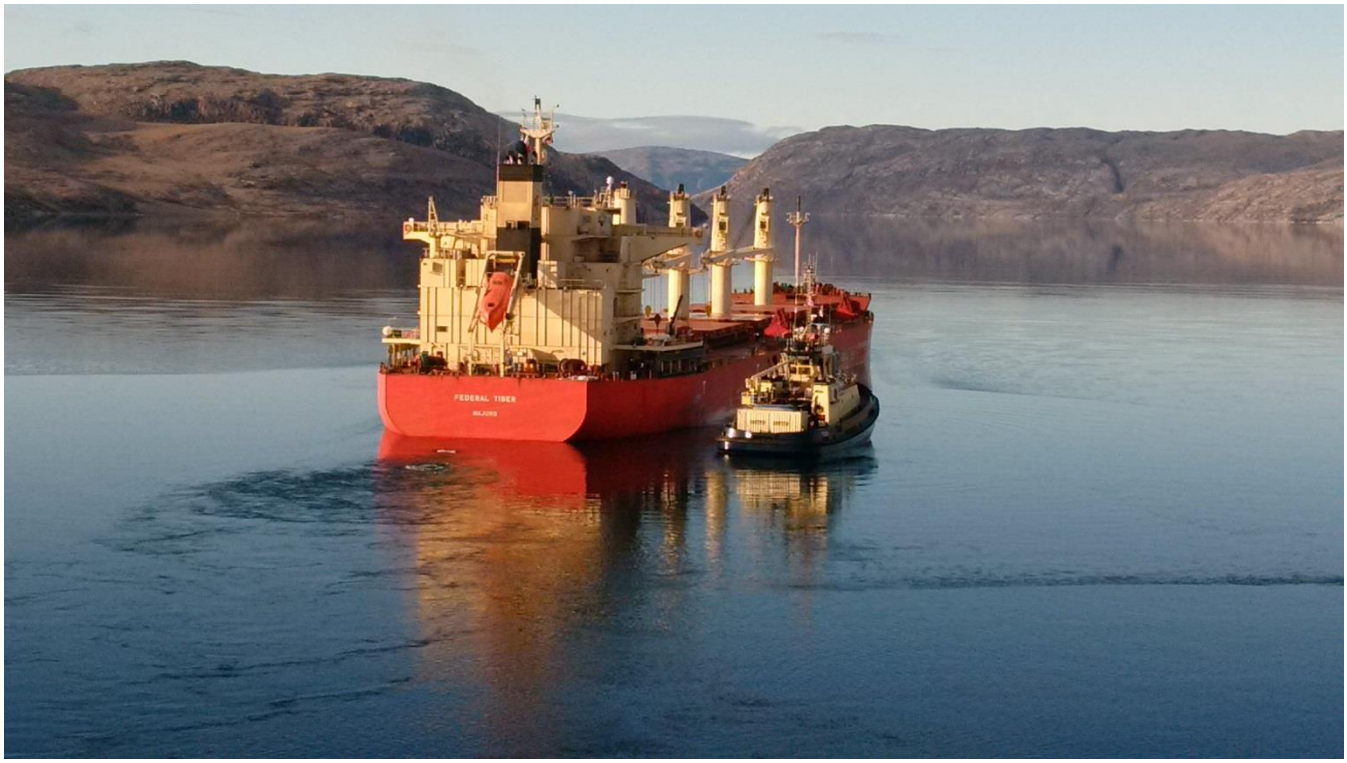
(Nunavut Planning Commission, 2015).

[5] http://www.wwf.ca/?17201/Baffinland-decision-shows-Nunavut-resource-development-regulatory-system-is-doing-its-job-says-WWF-Canada

Baffinland acknowledge the concerns raised by local communities, the scientific community, WWF Canada and others, and still responded with a proposal to complete shipping in Eclipse Sound and the Greenland section of Baffin Bay and Davis Strait for 7 months a year (June through to December) with an opportunity for additional shipping into the following month 'if needed'[6]. WWF Canada continues to raise concern about the plans to introduce shipping in the early months of winter as well as the plan to establish a railroad to open shipment out of Steensby Port as well. WWF Canada argues that the changes to the project are substantial and should be subject for a new Environmental Impact Statement followed by a new consultation process under the Nunavut Impact Review Board.

'Baffinland has done well to consult with communities and listen to people's concerns, but there is more work to be done. The shipping extension and increased volume during the open water season, combined with proposals for a new rail link, emphasize the need for a full review by the Nunavut Impact Review Board. The potential impacts deserve full public hearings'

(Paul Crowley, WWF- Canada's vice-president of Arctic Conservation).



The Federal Timber leaving Milne Port. August 2015. © BAFFINLAND.COM.

[6] http://www.wwf.ca/?23502/Request-to-extend-allowable-shipping-times-should-trigger-full-review-and-public-hearings

IN GREENLAND, THE EIA PROCESS IS NOT FOCUSED ON SHIPPING IMPACTS

Meanwhile in Greenland, there has been little debate about the Baffinland Mary River project even though their shipping route follows the west coast of Greenland from a location near Upernavik and all the way down to Cape Farewell, and even though shipping through Eclipse Sound will likely impact shared stocks of mammals, including narwhal, beluga and walrus. Satellite tracking has documented how 15-20% of narwhal found in Eclipse Sound during the summer will migrate down to the Disco Bay region in West Greenland for the winter. And how winter shipping from the mine will go right through important winter habitat for an estimated 10.000 beluga whales (Heide-Jørgensen, Sermitsiaq 13/2016).

Despite plans for frequent shipping operations in the Greenland section of Baffin Bay and Davis Strait, Baffinland's activities were not subject to an Environmental Impact Assessment until the company introduced plans for re-loading activities in Greenland waters. Therefore, in April 2015, the Government of Greenland completed a consultation on the company's scope for an Environmental Impact Assessment following the Environmental Protection Act[7]. The scope of the EIA discusses two alternative sites for re-loading activities; Baffinland's preferred site south of Nuuk and an alternative site near Maniitsoq, but little attention is focused around the consequences of frequent shipping along the proposed route that follows most of the west coast of Greenland.

The project proposal that is shared with the public is based on Baffinland's plan to introduce shipping 10 months a year. When ice conditions allow Baffinland will use larger ships to navigate Eclipse Sound (August and September) but for the months June – July and again October through to March 70 re-loading operations are planned in Greenland. Many consultation letters share concerns about the consequences of noise and the increased risk of oil spills along the route.

[7] http://naalakkersuisut.gl/da/Høringer/Arkiv-over-høringer/2015/Baffinland

In Greenland, the EIA process is on hold until a decision has been made in Canada concerning Baffinland's shipping season. This pause has allowed WWF Verdensnaturfonden (Denmark) to study the impacts of increased shipping along the Greenland section of the shipping route, to discuss opportunities to mitigate some of the risks associated with Baffinland's activities and to explore what management options are available to the Government of Greenland to mitigate the risks associated with development scenario of increased shipping. Parallel to this, it allows us to engage with communities in Greenland about the impacts of increased shipping on their communities.

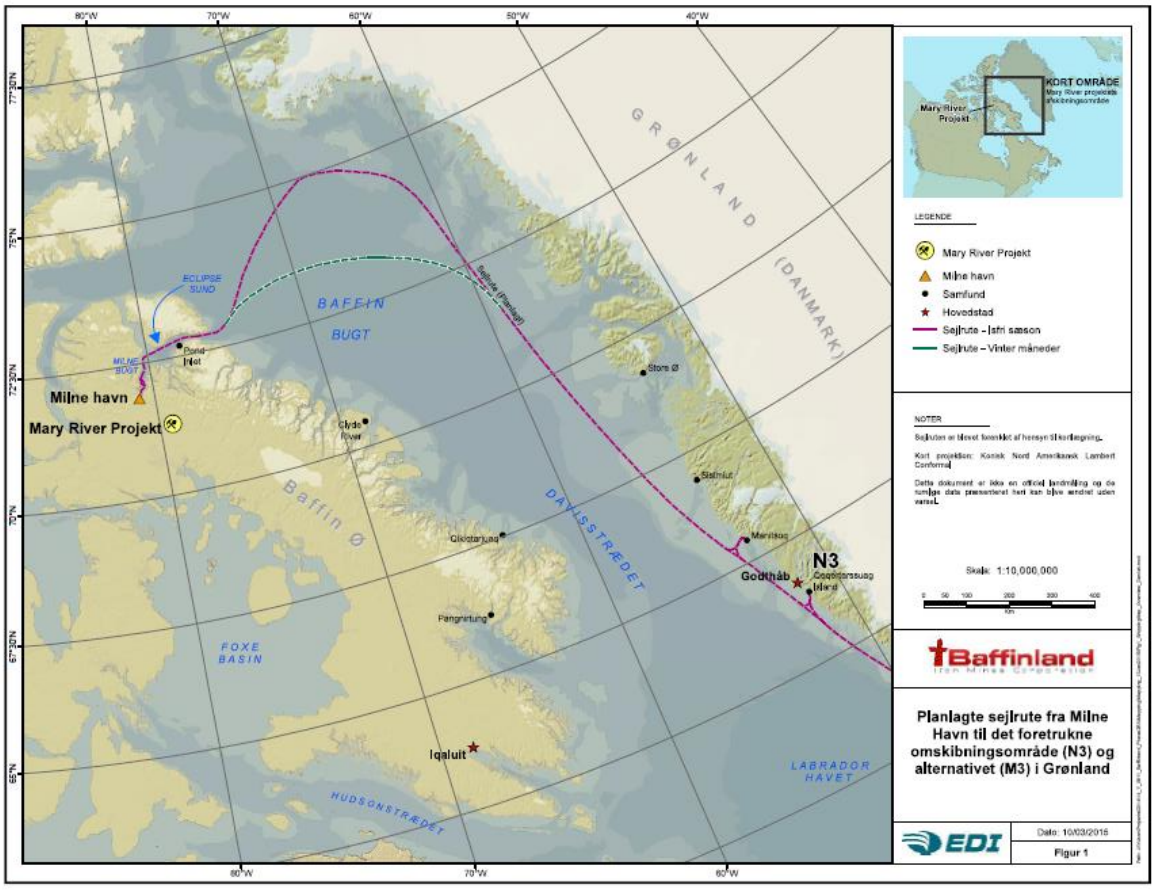


Figure 3. Planned route from Milne Port to the re-loading site. Shipping route for open water season (purple) and winter (green). Preferred re-loading site (N3) and alternative location. From Baffinland EIA scoping document. 2015. The documents are available on the Government of Greenland website (Høringsportalen).

IMPACTS ON MARINE MAMMALS

To determine the potential impacts of Baffinland's planned shipping operations for key marine mammals in the region: narwhal, beluga, bowhead whale, walrus, ringed seal and bearded seal, WWF Verdensnaturfonden contracted HB Shack Consulting. The full report is available on the WWF website, but key findings from the report are presented below:

Frequencies do overlap

- There is a significant overlap between the frequencies produced by the different ship types, and the underwater communication sounds produced by all the marine mammals considered here. Masking the communication signals of these species is therefore a potential risk, which would result in reduced communication ranges for the individual species. The shipping noise also falls within the range of hearing for all the marine mammals considered here, thus increasing the likelihood of potential impacts of noise on behavior, stress hormone levels etc.

The effects of shipping noise can occur at ranges of many kilometers

- Assuming that detection thresholds of narwhals and bearded seals are comparable to those of beluga whales and ringed seals, respectively, the rough estimates of maximum detection ranges presented in the figures below indicate that effects of shipping noise can occur at ranges of many kilometers.

- Detection ranges for bowhead whales cannot be calculated at this point, as there is not yet information available on their hearing thresholds. However information on behavioral changes and noticeable reactions to masking noise indicates that they can also be affected at distances of several kilometers.

- More precise estimates of detection distances require models employing measurements of several different parameters, such as background noise levels, and transmission loss, and more detailed information on hearing thresholds etc. of the focal marine mammal species.

Most likely immediate effects are masking and behavioral changes

- Masking and behavioral changes seem the two most likely immediate effects of shipping noise. In addition, the effect of shipping noise on stress hormone levels may be a serious issue, but the lack of knowledge in this field prevents the prediction of the scale and fitness cost of such an effect.

Wintering grounds are the most sensitive areas

- Wintering grounds in central Baffin Bay, Disko Bay and Store Hellefiske Banke are the identified sensitive areas in Baffin Bay and Davis Strait most particularly at risk of being affected by the proposed shipping route.
- The shipping route also cuts across or directly follows the spring and fall migration routes for beluga whales, narwhals and bowhead whales with potential negative consequences, such as icebreakers creating “dead end“ leads in the ice that animals might accidentally follow, or cause a prolonged migration time.

Best option is to avoid sensitive areas

- There are several possible ways to mitigate the potential negative impacts of shipping noise, but avoiding sensitive areas at sensitive times, seems to be one fruitful way to ensure a sustainable use of the Baffin Bay.

Identifying sensitive areas where species are at risk of increased noise exposure, is an important step in determining if and what mitigation measures may be required to minimize negative impacts of noise on marine mammal populations, as a consequence of increased shipping from the Baffinland Mary River project.

We have developed maps combining the identified sensitive areas and the detection range for beluga whales, ringed seals and walruses of a forward moving ice-breaking ins a summer /open water scenario, and a winter/ice-cover scenario (figure 4,5). The maps illustrate the especially critical wintering grounds in central Baffin Bay, Disko Bay and Store Hellefiske Banke are at risk of being affected, but also spring and fall migration routes for beluga whales, narwhals and bowhead whales moving from the North Water Polynya and over to Baffin Island, traverse or are overlaid by the proposed shipping routes.

An important conclusion in our report is that we know very little about key Arctic species that use the waters shipping routes traverse. We have made several assumptions throughout the report to make up for lack of knowledge about the hearing of marine mammals as well as the like consequences that noise from ships will have on them.

We must invest more in researching the impacts of increased shipping on Arctic marine mammals, and apply the precautionary principle to governance.

MAPS WITH SUMMER AND WINTER SHIPPING ROUTE, DISTRIBUTION OF WILDLIFE

The summer/open water scenario goes through Eclipse Sound, which is an important summer habitat for narwhal and bowhead whale, crosses the northern Baffin Bay and follows the west coast of Greenland. Off Disko Island and in the Sisimiut – Nuuk region the route does traverse areas important for walrus.

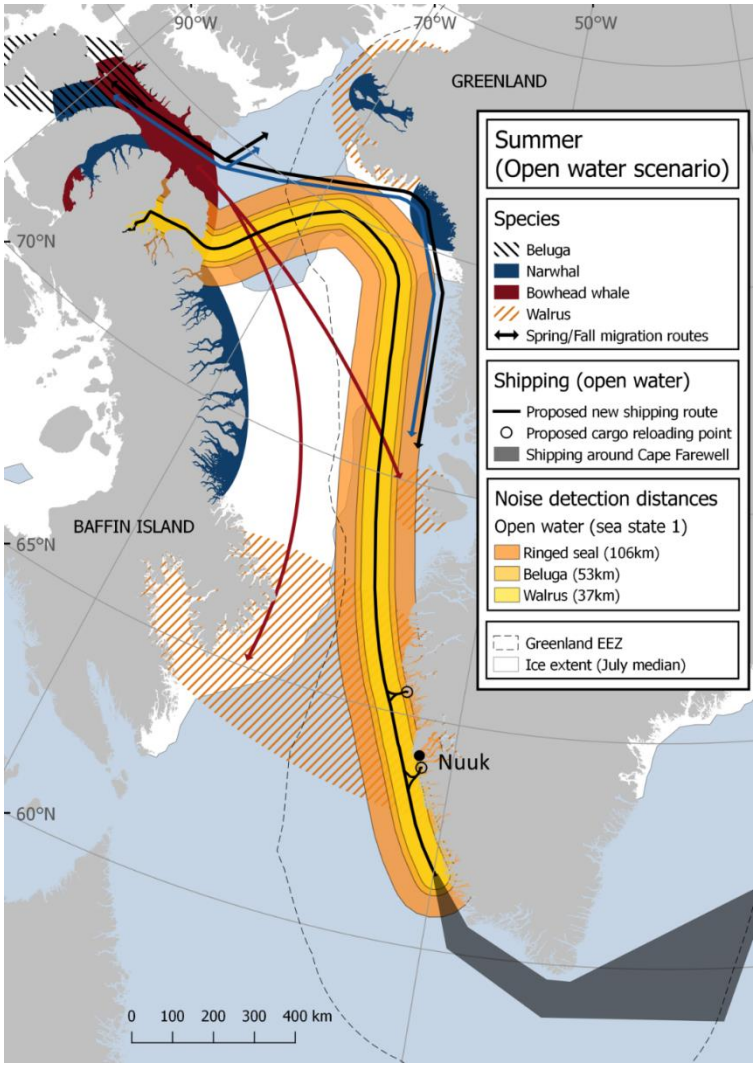


Figure 4: Noise detection distances of an icebreaker by a beluga whale, ringed seal and walrus at open water conditions along the proposed new shipping route at West Greenland waters. Summer distribution estimates for beluga, bowhead whale, narwhal and walrus. For sources see Potential impact of noise from shipping on key species of marine mammals in waters off Western Greenland – Case Baffinland. Schack H.B., for WWF Verdensnaturfonden. 2017.

The winter/ice-cover scenario takes a more southern route across Baffin Bay. The proposed route is near important wintering grounds for narwhal in central Baffin Bay, and waters off Nuussuaq and Disko Island that are important winter habitat for beluga and in the south also bowhead whale.

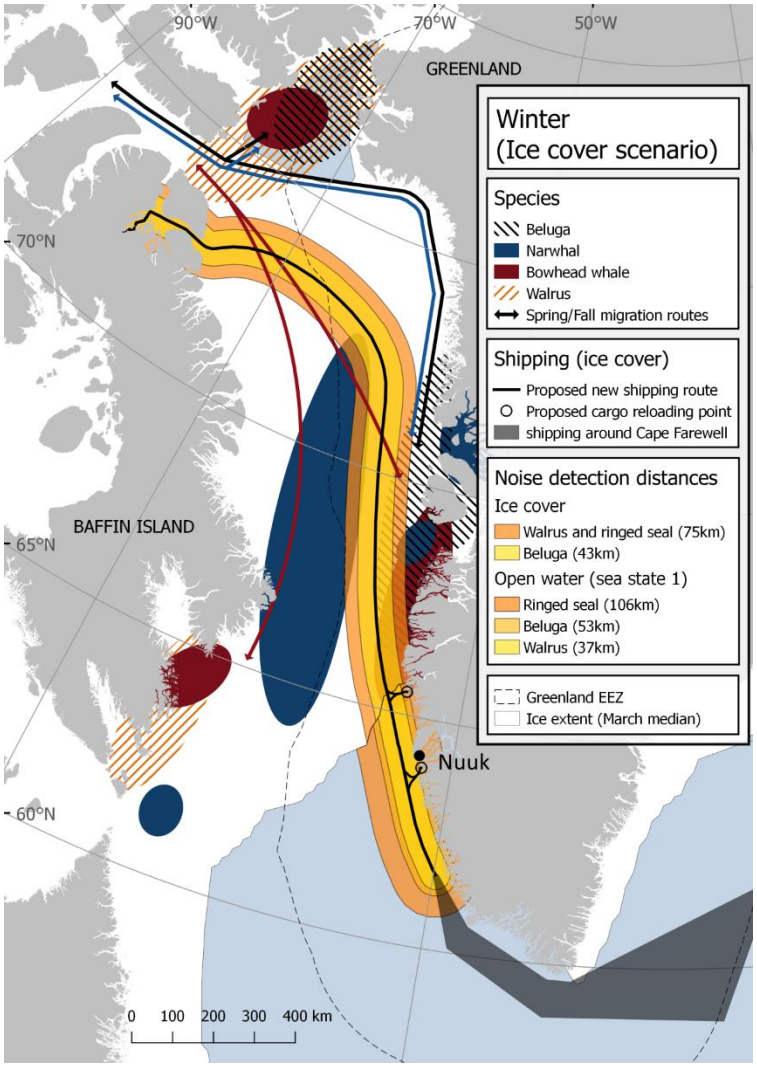


Figure 5: Noise detection distances of an icebreaker by a beluga whale, ringed seal and walrus at open water conditions along the proposed new shipping route at West Greenland waters. Winter distribution estimates for beluga, bowhead whale, narwhal and walrus. For sources see Potential impact of noise from shipping on key species of marine mammals in waters off Western Greenland – Case Baffinland. Schack H.B., for WWF Verdensnaturfonden. 2017.

WWF RECOMMENDATIONS

Noting the large gaps in our knowledge about the impacts of ocean noise on these marine mammals, WWF recommends that the precautionary principle be applied when developing new economic activities that will increase shipping.

A set of recommendations for Baffinland and for the Government of Greenland are listed below.

INDUSTRY

Industry - here Baffinland Corp. – must take steps to reduce the impacts of their activities on nature and wildlife. Initiatives to reduce the impacts of their operations on Arctic marine mammals in Baffin Bay starts with:

- Careful planning of shipping routes based in all available knowledge about wildlife and seasonality.
- Slow down to reduce noise from operations.
- Keep watch of wildlife.
- Avoid areas particularly sensitive to shipping.
- Redirect route according to seasonality.
- Prepare for accidents – have contingency plans and equipment available to handle accidental spills.

GOVERNMENT

There is widespread agreement within the shipping industry and research community that Arctic shipping will increase, but also agreement that we still know too little about the impacts of noise and disturbance on marine mammals in the Arctic. Therefore governments – here the Government of Greenland – must apply the precautionary principle and marine governance. This could include:

- Ensuring that environmental impact assessments thoroughly considers the impacts of shipping. While the early stages of the EIA process in Greenland has focused much on planned re-loading activities in a location near Nuuk/Maniitsoq, this projects likely will have consequences for marine mammals along the shipping route.
- Ensuring that the environmental impact assessments considers the cumulative effects of shipping. Some projects – like the Citronenfjord Ironbark Zinc. Project – will introduce shipping in almost pristine waters, but mining projects will be added noise and disturbance in waters already navigated.
- Take measures to manage and - if needed - to protect areas most vulnerable to shipping before shipping activities increase. Areas particularly sensitive to shipping includes the North Water Polynya and the Disko Bay and Store Hellefiske Banke region. Both areas are acknowledged as SUPER – EBSAs, areas that are unique in that they are environmentally and biologically significant marine areas.
- Take active steps to increase collaboration with authorities in Canada and Nunavut as wildlife are shared. The Baffinland Mary River project serves as one project of industrial development with transboundary consequences, as does likely oil exploration activities in the same waters. Dialogue and collaboration would be in line with the 1983 agreement between the Government of Canada and the Government of the Kingdom of Denmark for cooperation relating to the marine environment, and later the ESPOO convention on Environmental Impact Assessments in a Transboundary Context which Greenland ratified in 2001.
- Continue to strengthen the protection of the marine environment.
- Invest to secure that the response capacity to handle oil spills match the risks associated with increased shipping.
- Ban use of Heavy Fuel Oil (HFO) in Greenland waters. HFO is linked to black carbon, which is a threat to both the climate and human healthy, and in the event of a spill HFO is difficult to clean up in marine and coastal areas. In the Arctic region Svalbard came first with the introduction of a range of HFO free zones, and Greenland could learn from their experience.
- Continue political efforts to secure that all Greenland waters have updated navigational charts.

INTERNATIONAL FORA: IMO, ARCTIC COUNCIL

WWF is actively engaged in the International Maritime Organization (IMO), where we have been instrumental in developing the first Polar Code, which includes the first set of regulations for shipping in polar waters. We are committed to a Polar Code II that is even more ambitious with regulations for smaller ships and a general ban of the use of HFO.

WWF Arctic Programme is a permanent observer to the Arctic Council, and we are actively engaged in working groups and expert groups focused on biodiversity and threats to Arctic biodiversity. WWF is engaged in activities under the Arctic Marine Shipping Assessment (AMSA) driven by the PAME working group. For an upcoming PAME meeting in Helsinki (September 2017) WWF has prepared an information paper on ocean noise and its effects on Arctic marine biodiversity. The paper includes important next steps:

- Work with the Arctic Council to develop a comprehensive report on the state of knowledge and future research priorities on the impacts of underwater noise on Arctic Marine Mammals.
- Urge the Arctic states to implement the current Guidelines to reduce underwater noise and to take stock of existing measures being used in the Arctic to this effect. These guidelines are not binding and not Arctic specific, but they still represent the best knowledge we have.
- Work with the Arctic Council to develop Arctic- specific guidelines for reducing underwater noise from shipping.

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WHERE TO FIND MORE INFORMATION

From the WWF Verdensnaturfonden (DK) website you can download the full report on the potential impact of noise from shipping on key species if marine mammals in waters off Western Greenland – case Baffinland (2017). Go to www.wwf.dk

WWF Canada has a comprehensive Arctic programme, and Arctic shipping is an important element of this. The website holds information about Arctic shipping, and has a database of reports published by WWF Canada. This includes best practices for shipping in ice covered waters, fuel alternatives for arctic shipping and reports on responsible shipping with a focus on Hudson Strait. http://www.wwf.ca/newsroom/reports/arctic/

The Danish Defense has published a comprehensive marine environmental risk assessment for Greenland waters. The report includes a ship risk analysis with scenarios for future shipping as well as an environmental risk analysis with sensitivity for marine mammals, seabirds and fish. https://www2.forsvaret.dk/nyheder/nationale_opgaver/Documents/FINAL%20report_Environmental%20Risk%20Assessment%20Greenland%20DNV%20GL.pdf

The Arctic Council working group for Protection of the Marine Environment (PAME) has a website devoted to the Arctic Marine Shipping Assessment https://pame.is/index.php/projects/arctic-marine-shipping/amsa

Linked to the Arctic Marine Shipping Assessment work under the Arctic Council, University of Aarhus (DCE) has identified areas that are particularly vulnerable to shipping based on the PSSA criteria. The report includes a ranking of the areas identified. To follow up a report on an ecosystem approach to managing shipping in one fo the most vulnerable areas – Disko Bay and Store Hellefiske Banke – was prepared. In conclusion, the team of researchers finds that there are no immediate need for management of shipping here, but in the report local areas of concern are identified and measures to manage shipping discussed.

Rapporten Identifikation af sårbare marine områder i den grønlandske/danske del af Arktis kan hentes her:

http://www2.dmu.dk/Pub/SR43.pdf

Rapporten Analyse af mulig økosystembaseret tilgang til forvaltning af skibstrafik i Disko Bugt og Store Hellefiskebanke kan hentes her http://dce2.au.dk/pub/TR61.pdf

The 1983 Agreement between the Government of Canada and the Government of the Kingdom of Denmark for Cooperation Relating to the Marine Environment can still be found on the Government of Canada website: http://www.treaty-accord.gc.ca/text-texte.aspx?id=101887

The UN convention on environmental impact assessment in a transboundary context (Espoo convention) has a website with information about the convention, protocols under the convention and much more http://www.unece.org/env/eia/welcome.html .

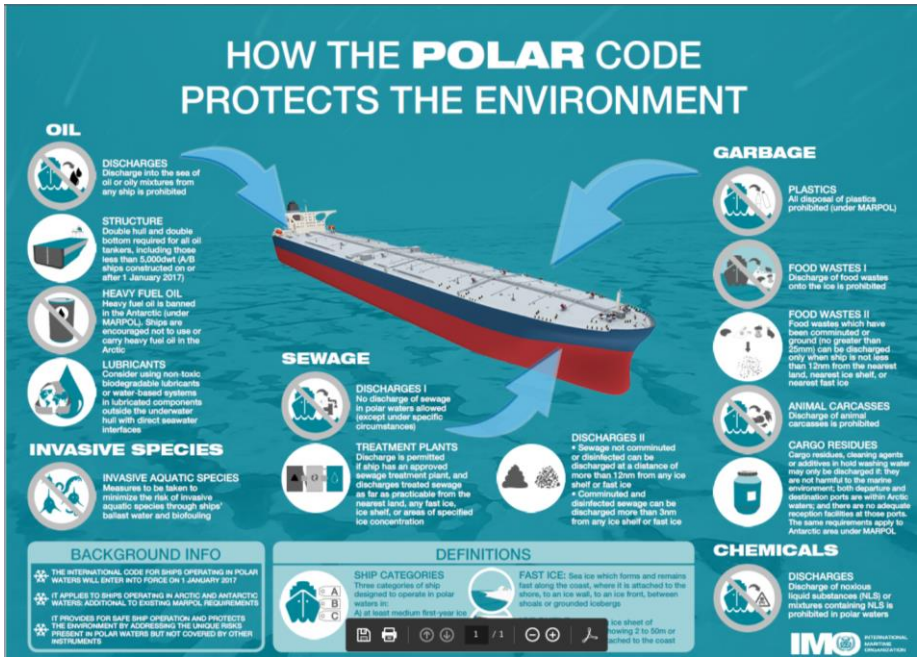
On the IMO website there is information about the Polar Code for safe shipping in polar waters. The site includes infographics about the code in 7 languages used across the world.

http://www.imo.org/en/mediacentre/hottopics/polar/pages/default.aspx

WWF is engaged in an alliance that works to strengthen the Polar Code with a HFO ban. The site includes infographics about the risks associated with the use of HFO in Arctic waters.

http://www.hfofreearctic.org/en/front-page/

http://www.hfofreearctic.org/wp-content/uploads/2016/10/HFO-Arctic-infographic.pdf



Infographic How the polar code protects the environment. © IMO.

WWF-DK

This fact sheet focuses on the impacts of increased shipping on 6 Arctic marine mammals (narwhal, beluga, bowhead whale, walrus, ringed seal and bearded seal). The fact sheet Includes key findings and maps from the report Potential Impact of noise form shipping on key species of marine mammals in waters off Western Greenland - case Baffinland. The report was developed by Henriette B. Schack and Juuso Haapaniemi for WWF-DK.

The full report can be downloaded from our website www.wwf.dk

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Cargo ship and icebergs, Ilulissat, Greenland. ©Clive Tesar, WWF Arctic Programme.