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DEVELOPMENT OF MEASURES TO REDUCE RISKS OF USE AND CARRIAGE OF HEAVY FUEL OIL AS FUEL BY SHIPS IN ARCTIC WATERS

Assessment of the benefits and impacts associated with a ban on the use and carriage of heavy fuel oil as fuel by ships operating in the Arctic

Submitted by Canada

SUMMARY

Executive summary:	This document contains an assessment of the expected benefits and impacts of a ban on heavy fuel oil (HFO) on Canadian northern, Indigenous and Inuit communities and economies in Canada. Canada is of the view that, when weighing action to reduce the environmental risks associated with the use and carriage for use as fuel of HFO in the Arctic, social, economic and other impacts on vulnerable Arctic communities must also be taken into account
Strategic direction, if applicable:	6
Output:	6.11
Action to be taken:	Paragraph 56
Related documents:	MEPC 71/14/4; MEPC 72/11/1; MEPC 73/9, MEPC 73/9/1, MEPC 73/9/2, MEPC 73/INF.19; PPR 6/12/4 and PPR 6/INF.24

INTRODUCTION

1 This document discusses the potential environmental, economic and social impacts on, and benefits to, northern Indigenous and Inuit communities and economies in Canada of a ban on the use and carriage of heavy fuel oil (HFO) for use as fuel by ships in Arctic waters. It concludes that a ban on HFO would have positive environmental benefits, but result in economic impacts on communities, industrial exports and industrial resupply. An understanding of these impacts must be considered to inform any decision making.

BACKGROUND

Defining the scope

2 At the sixth session of the Sub-Committee on Pollution, Prevention and Response (PPR), there was agreement on a draft methodology to analyse the impacts of a ban on HFO use and carriage as fuel by ships in Arctic waters. The goal of this methodology was to allow individual Member States to fully assess the positive and negative effects of such a ban in Arctic waters on their northern, Indigenous and Inuit communities and economies, along with coastal and marine ecosystems.

3 Canada has built upon this methodology to estimate the impacts of an HFO ban on its northern, Indigenous and Inuit communities and economies. Canada is committed to enhancing the protection of the Arctic environment, which includes mitigating the risks associated with the use and carriage of all fuels, including HFO, used in the Arctic, while taking into account potential impacts of a ban on northern, Indigenous and Inuit communities and economies.

Methodology of the impact assessment

4 The impact assessment uses publicly available information, engagement with Indigenous and Inuit partners, and data from federal government departments and industry stakeholders to assess the potential costs and benefits of implementing an HFO ban in the Arctic. The impact assessment also includes analyses conducted by consulting firms and academia. It identifies environmental, social and economic impacts and benefits to communities, industrial exports and industrial resupply in Canada's Arctic.

5 One of the challenges faced when undertaking the impact assessment is the uncertainty associated with the implementation of the global 0.50% m/m sulphur limit, which enters into force on 1 January 2020. To comply with the global 0.50% m/m sulphur limit, some ship operators (e.g. the international fleet) currently burning fuel types high in sulphur content, such as HFO, will either switch to compliant low-sulphur fuels (e.g. distillates or 0.50% m/m low sulphur fuel blends, that could be compliant with the HFO definition agreed upon at PPR 6) or install exhaust gas cleaning systems (EGCS), also commonly known as scrubbers. New fuel blends are currently being developed and marketed ahead of the enforcement of the global 0.50% m/m sulphur limit that will provide industry more options. Other ship operators (including the Canadian domestic fleet), who navigate in the North American Emissions Control Area and use HFO when operating up North, will likely move directly from HFO to distillate.

6 The industry response to the global 0.50% m/m sulphur limit (e.g. fuel switching vs. use of scrubbers) remains uncertain. The global 0.50% m/m sulphur limit will result in several changes to the fuel market in terms of prices, availability and properties of available fuels, both in terms of their use as propulsion fuels or if spilled in Arctic waters, which impacts the accuracy of our assessment (see the annex for a more detailed analysis).

ANALYSIS OF IMPACTS

Geographic, demographic and environmental snapshot of Canada's Arctic

7 The Arctic is an important part of the Canadian landscape, encompassing 39% of Canada's total land area at 3.5 million km^2, including over 36,000 islands, and over 2.1 million km^2 of maritime coverage. Home to a diversity of people, wildlife, natural resources and ecologically sensitive areas, Canada's Arctic is culturally, economically and environmentally valuable both nationally and internationally.

8 As shown in Figure 1, the Polar Code applies to Canadian waters located above the 60th parallel north.[1] Three territories – Yukon, the Northwest Territories and Nunavut – lie above 60° N and make up the vast majority of Canada's Arctic land. For a detailed analysis and overview of Canada's Arctic, see PPR 6/INF.24, *An overview of Canada's Arctic and role of maritime shipping*.

Figure 1: Map of Canada situating the Polar Code Limit

9 Figure 2 illustrates the communities in Canada whose costs would be affected by an HFO ban. In addition to communities in the Northwest Territories and Nunavut, parts of northern Quebec and northern Labrador and communities along Hudson Bay and James Bay would be affected. The majority of the population in these communities are Indigenous, primarily Inuit, Innu, and Cree. Inuit Nunangat is a term used by the Inuit to describe their homeland in Canada. It is the comprehensive area of the four Inuit Land Claim Agreements: Nunavik (northern Quebec); Nunatsiavut (northern Labrador); the territory of Nunavut; and the Inuvialuit Settlement Region (the northern Northwest Territories and Yukon North Slope). These Land Claim Agreements are protected under Canada's constitution and generally address a broad range of issues including political and environmental rights and concerns (such as water and environmental management regimes, wildlife management, harvesting rights, public sector employment and contracting). The Government of Canada has discussed the HFO ban with many communities to understand their concerns as part of the assessment conducted and will continue consulting with the communities going forward.

[1] International Maritime Organization, *International Code for Ships Operating in Polar Waters* (Polar Code).

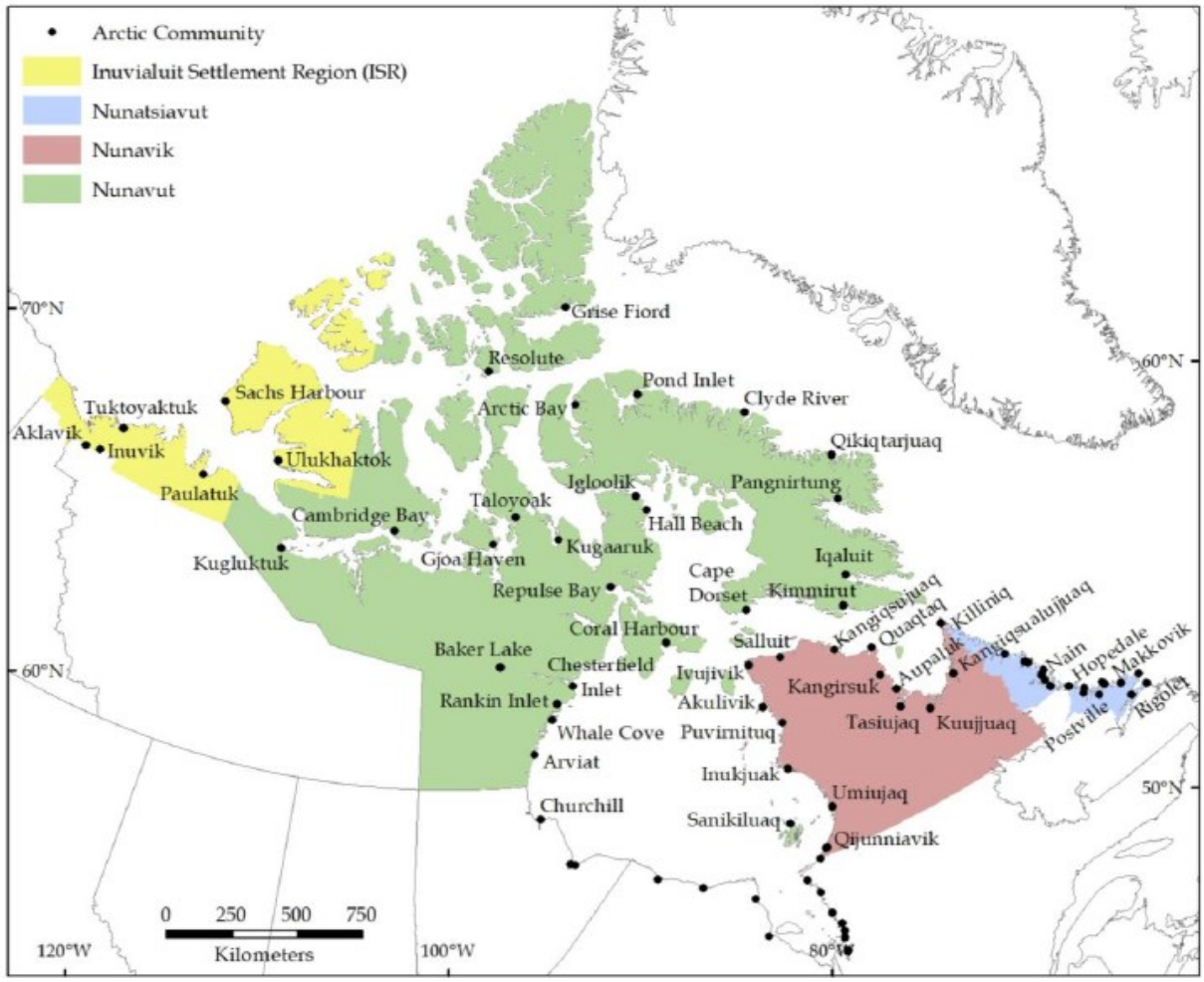

Figure 2: Map of Arctic communities in Inuit Nunangat

ENVIRONMENT

Spill impacts

10 Banning HFO in the Arctic would bring environmental benefits. HFO has a high viscosity and density and does not evaporate quickly. It is known as a persistent fuel that can stay in the environment for a long time.

11 The persistence of HFO means that there is a higher likelihood of physical fouling and ingestion of oil by marine wildlife. An HFO spill would also present possible shoreline contamination, threatening wildlife and traditional activities of Indigenous and Inuit populations, who may become exposed to the contamination directly or indirectly.

12 At freezing temperatures, oil behavior changes, and fuels will adhere to the ice surface more readily; it will then spread underneath the ice as temperatures increase. Because HFO does not evaporate as quickly as other fuels, it is more likely to be trapped in ice. Recovery of oil in ice-infested waters can make mechanical recovery difficult. It has also been estimated that the clean-up costs for an HFO spill in the Arctic could be more expensive.

13 Although other, lighter fuels (e.g. marine diesel) that could replace HFO have higher toxicity to marine life, they evaporate more quickly and are less persistent in the environment. Therefore, HFO presents a greater longer-term ecological risk compared to other marine fuels that are available, such as marine diesel and other distillate fuels.

14 The changes in fuel usage brought on by the global 0.50% m/m sulphur limit, wherein demand for lighter fuels are expected to increase and demand for HFO to decrease, will also reduce the likelihood of an HFO spill, but uncertainty remains regarding the full benefit given that physico-chemical information of new and incoming blends remains limited.

Spill response

15 Spill response capacity in the North was reviewed to establish a baseline of existing resources that could be used in the case of an HFO spill. The Canadian Coast Guard (CCG) has 20 caches of environmental response equipment designed for a small, non-persistent oil spill, as well as four depots with equipment designed for both persistent and non-persistent oil spills. Contractors in some communities also have marine spill response training and access to response equipment. Spill response equipment can be brought in from depots either by air (Hay River) or marine transit (Tuktoyaktuk, Churchill and Iqaluit).

16 If a spill occurs in a community with access to equipment suitable for that type of oil, and there are personnel with marine spill response training situated locally, then equipment could be mobilized immediately. Otherwise, depending on the proximity to an airport or marine base and availability of ships/helicopters, it may take days to transit resources for spill response.

17 Canada has also incorporated the "polluter pays principle" in legislation and requires polluters to pay for the cost of pollution damages and of clean-up. Under recent amendments to Canada's *Marine Liability Act* to modernize the Canadian Ship Source Oil Pollution Fund, the Fund's per-incident liability cap has been lifted, meaning eligible claims are now 100% compensable, regardless of the size of the spill.

18 Finally, in 2016, the Government of Canada launched the $1.5 billion Oceans Protection Plan (OPP), to enhance marine safety. The OPP includes Arctic-specific components that involve over $175 million in investments to enhance marine safety, environmental protection, search and rescue, and emergency response services, as well as Indigenous, Inuit and coastal community engagement.[2] These Arctic-specific measures, including land-based marine infrastructure, improved monitoring of vessel traffic, and improved hydrography and charting, are intended to strengthen the existing prevention measures, as well as spill response capability.

Air emissions

19 In light of the changes anticipated from the global 0.50% m/m sulphur limit, and based on the assumption that ships will comply with the new sulphur requirements, Environment and Climate Change Canada undertook an analysis to estimate the incremental impact of an HFO ban in the Arctic on air pollutant emissions for the year 2020.

20 This particular assessment of air emission impacts assumes that ships will be in compliance with the global 0.50% m/m sulphur limit, and considers the incremental benefits to the environment of a switch to distillate fuels under an HFO ban.[3] The analysis covers waters within the 200 nautical mile Canadian Exclusive Economic Zone above 60°N latitude and Hudson Bay. It captures emissions from all ships, including merchant bulk ships for mining and community resupply, which typically use HFO and therefore would be directly impacted by the HFO ban. Note that the assessment assumes that these ships would comply with the sulphur cap by using 0.5% sulphur Very Low Sulphur Fuel Oil (VLSFO). Under an HFO ban it is assumed that these sulphur cap compliant merchant bulk ships would need to switch from VLSFO to distillate fuel.

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2 Government of Canada, Transport Canada, Government of Canada Introduces New Measures to Protect the Marine Environment and Coastal Communities in Canada's Arctic.

3 For a detailed description of the Global Sulphur Cap please refer to the annex.

21 The assessment also includes tugs, cruise, and CCG ships, which typically already use distillate fuels and therefore would not be impacted by the HFO ban. These ships are assumed to continue to use distillate fuels under the HFO ban, with no associated air emission reduction impacts. Emissions of other key pollutants from marine fuels, such as carbon dioxide (CO_2), methane (CH_4) and nitrogen oxides (NO_x) are not considered, as the reduction in these pollutants due to a switch from HFO to distillate fuels is not estimated to be significant.

22 It is estimated that, in addition to reductions gained through the global 0.50% m/m sulphur limit with the expected use of VLSFO, a transition to distillate fuels under the HFO ban could further reduce emissions of sulphur oxides (SO_x), black carbon (BC), and fine particulate matter by up to ($PM_{2.5}$) by 80%, 23% and 31% respectively. The following paragraphs provide a summary of the incremental impact an HFO ban could have on each of these air pollutants.

Sulphur oxides emissions

23 An HFO ban could result in an 80% reduction in SO_x emissions compared to emissions under the global 0.50% m/m sulphur limit only. Sulphur oxides are emitted from ship engines when marine fuels containing sulphur, like HFO and other fuels derived from crude oil, are combusted. Once in the atmosphere, SO_x can lead to acid rain, with associated acidification and eutrophication impacts on sensitive Arctic aquatic and terrestrial systems.

Black carbon (BC) emissions

24 Black carbon (BC) is a component of particulate matter, with emission levels highly dependent upon fuels, engines, and operations. HFO is associated with roughly two thirds of BC emissions from shipping in the Arctic in 2015.[4] As the second most important atmospheric climate forcer, after CO_2, BC in the Arctic is of particular concern, due to its enhanced atmospheric and surface warming impacts. BC emitted within the Arctic has been estimated to have an almost five times larger surface temperature response (per unit of emitted mass) compared to emissions at mid-latitudes.[5] In the absence of an HFO ban, BC deposition to ice and snow is expected to roughly double from 2010 levels by 2030.

25 Under an HFO ban, BC emissions from all shipping in Canada's Arctic (including ships currently using distillate fuels) are estimated to be 23% lower than emissions under just the global 0.50% m/m sulphur limit, with an average reduction of 31% for ships switching from HFO to distillate fuels.

26 Research by the National Research Council of Canada supports these estimates. In this research, BC emissions were higher when fuels contained a fraction of residual fuel[6] compared to purely distillate fuels.

27 Although there is some uncertainty as to the exact mix of new compliant fuels that will become available in 2020, it is expected that the majority of new compliant VLSFO entering the market will meet the specifications of a residual fuel as opposed to a distillate fuel. As such, uptake of these fuels will not lead to a decrease in BC emissions under the global 0.50% m/m sulphur limit. In the absence of an HFO ban, reductions of BC emissions in the Arctic could be dependent upon the development of additional control measures for fuels.

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4 Comer, B.; Olmer, N.; Mao, X.; Roy, B.; Rutherford, D. "Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025." International Council on Clean Transportation. May 2017.

5 Sand, M., T. K. Berntsen, Ø. Seland, and J. E. Kristjansson (2013), "Arctic surface temperature change to emissions of black carbon within Arctic or midlatitudes," *Journalof Geophysical Research: Atmospheres*, 118, 7788–7798, doi:10.1002/jgrd.50613.

6 Residual fuels are the remaining fraction of crude oil that cannot be distilled (boiled off into lighter fuel products) at the refinery. They contain heavy, non-volatile carbon-based compounds, as well as high fractions of ash.

Particulate matter emissions

28 $PM_{2.5}$ is a complex and variable mixture of very small particles and liquid droplets that can contain BC, organic compounds, metals and acids such as sulphates. $PM_{2.5}$ is released in primary emissions from many combustion sources, including ships, and it is formed secondarily in the atmosphere from other air pollutant emissions. Particulate matter in the atmosphere contributes to local haze and has both direct (atmospheric forcing) and indirect (through clouds and precipitation) radiative effects. While the indirect effects are mostly thought to be cooling, the direct effects can be either warming or cooling, depending on the optical properties of the particles.

29 Under an HFO ban, it is estimated that reductions in $PM_{2.5}$ emissions from all shipping in Canada's Arctic would be 31%, with an average reduction for ships switching from HFO to distillate of 39%. These reductions are in addition to reductions in $PM_{2.5}$ emissions from the global 0.50% m/m sulphur limit.

Health Impacts

30 Ships' emissions of sulphur oxides (primarily sulphur dioxide) can have direct effects on human health, especially for those with pre-existing respiratory diseases (e.g. asthma). Sulphur dioxide is also transformed in the atmosphere to sulphate, which, like BC, is an important component of fine particulate matter ($PM_{2.5}$). $PM_{2.5}$ causes multiple adverse human health effects that are well recognized internationally. Health Canada has concluded that exposure to $PM_{2.5}$ increases the risk of cardiorespiratory mortality, asthma exacerbation and adverse cardiovascular outcomes,[7] and there is evidence it may be associated with other adverse health outcomes, such as diabetes and pre-term birth. About 9,700 premature deaths a year in Canada are attributable to $PM_{2.5}$ exposure.[8] Importantly, the evidence indicates that there is no exposure threshold: that is, any incremental reduction in exposure is associated with a reduction in risk. Canada's Air Quality Management System recognizes the importance of the principle of continuous improvement in air quality, given that there is no "safe" level of exposure.

31 An HFO ban could reduce the air pollution health risks of Arctic populations in areas with improved air quality resulting from the ban.

ECONOMIC CONSIDERATIONS

32 A ban on HFO in the Arctic would result in higher shipping costs, which, if passed through to end consumers by the shippers, will lead to higher prices at the consumer level. The higher shipping costs have two components:

.1 a fuel switch from HFO to lighter distillates, which cost more; and

.2 de-bunkering[9] and cleaning fuel tanks to eliminate HFO may be required, given that ships serving the Arctic also serve other regions for parts of the year.

7 http://publications.gc.ca/site/eng/447367/publication.html

8 http://publications.gc.ca/collections/collection_2019/sc-hc/H144-51-2019-eng.pdf

9 De-bunkering includes the shipboard logistics of unloading fuel from available tanks on ships, known as bunker tanks.

33 In order to understand the financial impacts of an HFO ban on the Arctic sealift program, it is important to understand the pricing of the community resupply program. Figure 3 illustrates how increase in fuel prices flow through to cost impacts on the sealift communities.

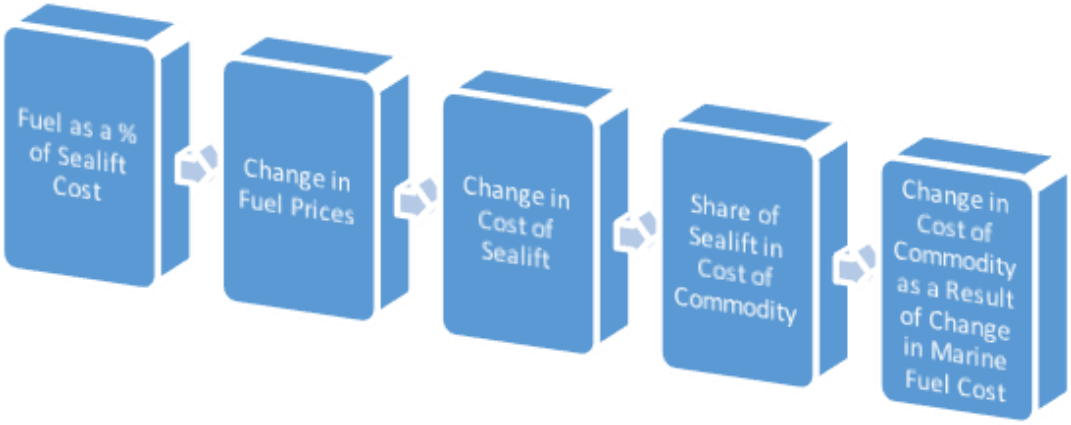

Figure 3: Flow through of fuel price increases to change in commodity prices

34 In the sealift program, yearly freight rates are established for communities that vary depending on the remoteness and accessibility of the community. Table 1 illustrates the freight rates that were in effect for the 2019 sealift season and vary based on distance.

Table 1: Shipping rates to Arctic communities (2019 data)

	Destinations	Northbound rate per revenue ton	Northbound 20' merchant container
Nunavik		$418	$6,432
Nunavut	Iqaluit	$275	$4,230
	High Arctic	$359	$5,536
	Foxe Basin	$360	$5,545
	South Baffin	$305	$4,702
	Kivalliq	$335	$5,158
	Kugaaruk	$417	$6,416
	Kitikmeot	$446	$6,870
	Sanikiluaq	$342	$5,268
	Kivalliq (loading in Churchill)	$242	$3,727

35 Table 2 provides the current breakdown of the distribution of costs that make up the shipping rates, normalized to 100 for the base case of using current HFO fuel. It shows the forecasted changes in the cost distribution resulting from the implementation of the global 0.50% m/m sulphur limit in 2020 through to the forecast with an HFO ban in place.

Table 2: Estimated distribution of costs that make up the shipping rates – normalized to 100 in considering projected use of fuels

	Type of fuel used	Crewing	Repairs, maintenance, capital costs, insurance	Fuel for propulsion	Management	Other	Overall cost index
Current	Current Marine Fuels, including HFO	37	37	13	10	3	100
Projected marine fuels with 0.50% m/m sulphur limit in Place	0.5% sulphur content – low price estimate	37	37	22	10	3	109
	0.5% sulphur content – high price estimate	37	37	25	10	3	112
Projected marine fuels (distillate) with HFO ban in place	Low price estimate	37	37	26	10	3	113
	High price estimate	37	37	33	10	3	120

Note: Cost distribution information based on interviews and then normalized.

36 For example, a Northbound 20' merchant container currently costing $5,000 to ship could cost $5,450-$5,600 after the implementation of the global 0.50% m/m sulphur limit in 2020, and could cost approximately $5,650-$6,000 under an HFO ban.

37 Based on interviews, including with retailers in the Arctic communities, and using the cost pass-through model as illustrated by Figure 3, the price increases from an HFO ban could result in additional product price increases for community resupply products in the range of 0.7% to 1.9%, as shown in Table 3. Extrapolating from household expenditure tables published by Statistics Canada for Nunavut and assuming a 100% pass-through of fuel cost increases, these fuel price increases could increase household expenditures by CAD$248-CAD$679 per household per year (see Table 3).[10] These estimates are based on the two distillate pricing scenarios shown in Table 2 (in green).

38 In the short term, Canada expects the global 0.50% m/m sulphur limit to drive distillate prices up as demand increases. As the fuel supply chain adapts, and those fuels become more readily available over a few years, these prices should moderate and be closer to the lower range of our estimates, as outlined in Table 2.

[10] The median annual household income for Nunavut Inuit is approximately CAD$24,768.

Table 3: Estimated annual end user price effects based on use of distillates – Nunavut with 2020 sulphur limit estimates as baseline

Range of estimate	Community resupply cost increase	Estimated end user retail effects – community resupply	Increased end user prices - Nunavut	Annual increase in end user prices per household
Low range	4%	0.7%	$2.2M	$248
High range	11%	1.9%	$6.1M	$679

39 As noted above, there is some uncertainty in predicting the incremental impact of the HFO ban, given uncertainties in fuel prices for both distillate and HFO, as a result of the global 0.50% m/m sulphur limit.

De-bunkering costs

40 A ban on HFO in the Arctic would also require de-bunkering and cleaning of fuel tanks prior to the shipping season in the Arctic for those ships that use HFO fuel when sailing in non-Arctic waters outside of the Arctic shipping season. The costs of de-bunkering and fuel tank cleaning (including time costs) have not been included in the estimates above, as there is a significant variability in costs ($50,000-$100,000 per ship per instance).

SOCIO-ECONOMIC (COMMUNITIES) – Impacts

41 Canadian Arctic communities are highly dependent on shipping for almost all commodities. In the Canadian Arctic, food security is an ongoing challenge for a population with a lower income compared with the rest of Canada. Furthermore, costs for food and other consumer goods are already high in the Arctic region relative to the rest of the country.

42 A pattern of income disparity exists for Indigenous and Inuit peoples living in the Arctic, who have lower average total incomes in all regions. As an example, the median income for Nunavut Inuit aged 15 years and over was CAD$24,768 compared with CAD$84,139 for non-Inuit living in Nunavut and CAD$53,625 for the average Canadian.

43 The combination of higher living costs, lower incomes and higher unemployment levels helps explain why many regions in the Arctic are experiencing a food security crisis. For example, 55% of adults aged 25 and over in Nunavik and Nunavut live in a household experiencing food insecurity. For Nunatsiavut and the Inuvialuit Settlement Region, the percentages are 42% and 33%, respectively.[11] Any increase in consumer goods costs (Table 3), even as low as 4%, will impact the purchasing power of already vulnerable communities.

44 In this context, a ban on HFO in the Arctic resulting in higher shipping costs passed on to the consumer would have a significant impact on households and communities. This could include direct and indirect effects on the health and quality of life of Indigenous and Inuit peoples living in the Arctic. For example:

.1 Food security would be impacted by an increase in shipping costs.

[11] Statistics Canada, Food Insecurity among Inuit Living in Inuit Nunangat, 1.

.2 Costs of all household items (e.g. furniture, refrigerators and stoves) would increase.

.3 Food harvesting could also be impacted due to the increased cost of shipping non-food items (e.g. firearms, ammunition, fuel and camping supplies). Many harvesters do not have additional sources of income, making them even more susceptible to increases in prices.

.4 The cost of housing would increase due to higher construction and material costs, which could lead to a reduction in the number of housing projects developed to address the current housing crisis in the Arctic.

.5 There would be increased costs to territorial governments, which import medical equipment along with other goods to meet the needs of communities.

.6 There would be an increase in electricity rates. For example, estimates based on the expected increase in fuel costs due to the global 0.50% m/m sulphur limit suggest an increase of about 1% at the consumer level. An increase in fuel costs of a similar magnitude due to an HFO ban could be expected to increase rates even further.

.7 Perishable products delivered by air would be impacted. The air resupply of perishable foods, in its current form, could not exist without the community resupply. For example, perishable foods are reliant on the cost of refrigerators, generators and low-sulphur diesel, all of which are delivered by sea due to the lack of road access in these communities.

45 It is also important to note that impacts on the mining sector (see below) could also affect the communities through the provisions of the Impacts and Benefits Agreements.[12] Any increase in freight costs that would impact mine sales revenues would have an adverse impact on the amount of the royalty payments paid to Indigenous and Inuit organizations. In addition, mining companies contribute support to, for example, youth recreation, cultural activities, day care centers, food banks and community programming. Such support could be affected by an increase in operating costs to the companies.

SOCIO-ECONOMIC (COMMUNITIES) - Benefits

46 In addition to the environmental benefits noted above, an HFO ban in the Canadian Arctic could contribute to socio-economic (community) benefits through:

.1 the avoidance of loss of marine and coastal natural resources important to food security;

.2 the avoidance of loss of culturally important subsistence activities; and

.3 the avoidance of adverse impacts to Arctic marine and coastal ecosystems resulting from an HFO spill.

[12] Agreements signed between natural resource development companies and regional Indigenous or Inuit organizations. These agreements help ensure local surrounding communities benefit from operations.

MINING AND AGRICULTURAL EXPORTS - Impacts

47 Mining activity in the Arctic could also be directly and indirectly affected by an HFO ban. Mines located in the Canadian Arctic are important for local economic development and for international markets that import these materials. The natural resources sector is one of the largest employers of Indigenous and Inuit peoples in Canada's Arctic, and accounts for one-sixth of all jobs in the North.

48 A proposed HFO ban, with a switch to the use of distillate fuels, would increase fuel costs and could translate into an increase cost of shipping ore by an estimated CAD$0.75 -CAD$1 per tonne of ore shipped, above any impacts from the global 0.50% m/m sulphur limit. This calculation does not take into consideration additional costs associated with increased costs of shipping equipment or material to the mine site, nor does it include costs associated with any de-bunkering and tank cleaning that might be required. As mining is a global industry, projects that are currently at the exploratory phase could become less attractive, and projects in operation may face a reduction in the number of ships available for chartering purposes.

49 Assuming cost increases are passed on to resource companies by shipping companies, this could affect the competitiveness of Canadian mining companies. Furthermore, when the de-bunkering costs and impacts on equipment and materials, along with the increased life costs for communities are added, this may make some mining projects at the exploratory stage less attractive than similar projects based in the South.

50 Although the focus of the impact assessment was on the Arctic region, the Port of Churchill would also be impacted. This is because ships transiting to and from the Port of Churchill must transit north of 60º N through the Hudson Strait. This implies that all ships transiting to and from Churchill would be subject to the HFO ban. This could potentially impact the economic viability of the newly re-opened port by increasing shipping costs.

51 The Arctic Gateway Group is currently owned by First Nations and communities, Fairfax and AGT Foods. It reopened the Port of Churchill in 2018 and has started shipping grain and specialty crops to both Europe (Antwerp and Murmansk) and Asia (Beijing). However, increased fuel rates passed through to the shippers of grain could threaten profitability of shipping grain via the Port of Churchill as an Arctic gateway, as other ports in Canada located south of 60º N (and not requiring a transit through Arctic waters and not impacted by the HFO ban) could allow shippers to ship grain at more competitive rates.

INDUSTRIAL RESUPPY – Impacts

52 Currently, data specific to industrial resupply is not collected, making a detailed analysis difficult. The information collected as part of Canada's impact assessment suggests, however, that there would be increased fuel costs for the industrial sector, translating into extra costs for materials and equipment, along with additional costs for electricity. In addition to dedicated supply ships, material and equipment for the industrial sector are sometimes carried on the same ships carrying cargo for community resupply. It can therefore be assumed that the cost increase impacts estimated for communities with respect to resupply cargo and commodities would also be felt by the industrial sector.

SUMMARY AND CONCLUSIONS

53 The impact assessment of the impact of an HFO ban on Canada's Arctic communities and economies shows both positive and negative impacts. A switch to distillates means any oil spill would be less persistent than an HFO spill (though possibility more toxicity for fish and other marine life). There are also estimated health benefits from a reduction in air pollutant emissions as a result of a shift from HFO to distillate fuel.

54 There are, however, also potentially significant economic impacts of banning HFO for use and carriage for use as fuel by ships, as the majority of northern coastal communities rely on marine transportation for community resupply. The size of these impacts depends of transitions that are happening in the coming years and linked to the global 0.50% m/m sulphur limit in 2020. Any projected increase in fuel prices that would result from a ban will be transferred to consumers, who already face very high prices for goods and store-bought foods.

55 In addition to the community impacts, the impact assessment suggests that the increased costs associated with the proposed HFO ban could impact the competitiveness of Canada's mining sector and Canada's only northern port shipping grain overseas.

ACTION REQUESTED OF THE SUB-COMMITTEE

56 The Sub-Committee is invited to note the information in this document.

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ANNEX

IMPACTS OF THE 0.50% M/M SULPHUR LIMIT IN 2020

1 On January 1, 2020, the global 0.50% m/m sulphur limit will enter into force. This global measure, which aims to reduce the sulphur content of marine fuels from 3.5% to 0.5%, will result in several changes to the fuel market in terms of prices, availability and properties of the fuels available. To meet these requirements, ship owners can either switch to more expensive lower-sulphur fuel (i.e. marine diesel or new blends that are currently entering the market for which limited information is available) or continue to use HFO but use emission abatement technology (e.g. scrubbers) on each ship.

2 Table 1 below presents the projected increase in average fuel prices (all fuels combined) for carriers immediately following the adoption of the global 0.50% m/m sulphur limit in 2020.

Table 1: Estimated average fuel price (all fuels combined) paid by carriers per metric tonne

Average fuel prices (all fuels combined) in metric tonnes	
Before the 0.50% m/m sulphur limit	CAD$591 *(per metric tonne)*
Following the implementation of the 0.50% m/m sulphur limit in 2020	CAD$985 - 1,115 *(per metric tonne)*

3 Although difficult to predict accurately ahead of implementation, estimated price increases to freight rates in the Canadian Arctic resulting from the coming into force of the global 0.50% m/m sulphur limit are estimated to increase community resupply costs by 9% to 12%, factoring the relationship between fuel prices and community resupply discussed in the body of the impact assessment paper. These estimates are based on an assumption that distillate fuel will be used to meet the global 0.50% m/m sulphur limit. Table 2 illustrates the corresponding impacts on households, which are estimated to range from CAN$535 to CAN$713 per household per year.

Table 2: Estimated annual end user price impacts of the global 0.5% m/m sulphur limit – Nunavut

Community resupply cost increase	Estimated end user retail effects – community resupply	Increased end user prices - Nunavut	Annual increase in end user prices per household
9%	1.5%	CAD$4.8M	CAD$535
12%	2.0%	CAD$6.4M	CAD$713

4 Globally, recent surveys[13] of plans to comply with the global 0.50% m/m sulphur limit indicate that less than 10% of the deep sea fleet plan to have scrubbers in place by January 2020, suggesting the majority will switch to lighter distillates, at least for the time being until there is more market certainty regarding fuel availability and pricing. While many are deferring final decisions on how to comply, it is clear that the global 0.50% m/m sulphur limit is driving a major shift to use lighter fuels instead of focusing on scrubbers only, due not only to the purchase and installation costs, but also operation and maintenance costs, including availability of spare parts. In addition, several port areas have started to ban washwater

[13] Ships over 100 GRT: see https://cdn.ihs.com/www/prot/pdf/0719/WorldFleetStatistics2018Report-LoRes.pdf .

discharges from open-loop scrubbers because of environmental concerns, creating uncertainty for ships operating globally, leaving hybrid and closed loop systems as the favoured options.

5 Trend analysis of fuel prices over the next four years, based on world fuel markets, suggests an increase in price of nearly 30% for HFO between now and January 2023, while alternate diesel fuels will decrease in price by nearly 8%. This trend supports the idea that, with the implementation of the global 0.50% m/m sulphur limit, ship owners will initially pay more overall for fuel. However, over time, the price of distillate will decrease, while the price of HFO will increase as the demand for HFO decreases and the fuel becomes scarce.

6 Table 3 below demonstrates price increases of HFO and alternate diesel fuels resulting from the 0.50% m/m sulphur limit.

Table 3: Price increases of HFO and alternate diesel fuels – global 0.50% m/m sulphur limit

	Heavy fuel oil (high sulphur fuel oil) (CAD$ per metric tonne)	**Ultra-low sulphur diesel (CAD$ per metric tonne)**	**Difference in price (CAD$ per metric tonne)**
November 2019	$387	$919	$532
January 2023	$505	$848	$343
Price change	+30.7%	-7.7%	

7 These figures are based on market and futures data, not actual prices paid by shipping companies.