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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

Impact Assessment Report

Submitted by the Russian Federation

SUMMARY

Executive summary:	The document contains the report on the impact assessment, carried out by the Russian Federation, with regard to the development of a ban to use and carry for use of HFO in Arctic waters
Strategic direction, if applicable:	6
Output:	6.11
Action to be taken:	Paragraph 4
Related documents:	PPR 6/20 and PPR 6/WP.6

Introduction

1 MEPC 72 instructed the PPR Sub-Committee to develop a ban on HFO for use and carriage for use as fuel by ships in Arctic waters, on an appropriate timescale, on the basis of an assessment of impacts.

2 PPR 6 invited submissions to PPR 7, especially those by Arctic States, containing impact assessments guided by, but not limited to, the methodology developed and agreed by PPR 6.

3 The Russian Federation has completed an impact assessment based on the above-mentioned methodology, and the short version of the report with its results is set out in the annex.

Action requested of the Sub-Committee

4 The Sub-Committee is invited to note the information provided.

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SHORT VERSION OF THE REPORT ON THE ASSESSMENT OF THE IMPACTS FOR THE RUSSIAN FEDERATION OF THE POSSIBLE ESTABLISHMENT OF A BAN ON THE USE OF HFO BY SHIPS AND CARRIAGE OF HFO AS FUEL IN ARCTIC WATERS

Contents

1 The Overall Number and Types of Ships Operating in Russian Arctic Waters. The Consequences of ban on HFO for use and carriage as fuel by ships in Arctic waters

The boundaries of Arctic waters are defined by regulation 1.3 of chapter XIV of SOLAS, their Russian segment includes the Northern Sea Route (hereinafter referred to as the NSR), as defined by the Federal Law No. 81-FZ of 04/30/1999 (as amended on 12/27/2018), part of the waters of the Barents and the Bering Seas and the circumpolar region north of those water areas.

At present and in the foreseeable future, in accordance with the national development plans, shipping will be mostly developed in the NSR, the Barents and the Bering Seas rather than anywhere else, therefore, the analysis of the consequences of a ban on HFO for use and carriage as fuel by ships in Arctic waters (hereinafter referred to as “the HFO ban”) was carried out mainly for those regions.

The boundaries of Arctic waters are within the red line in the Figure below (Figure 1).

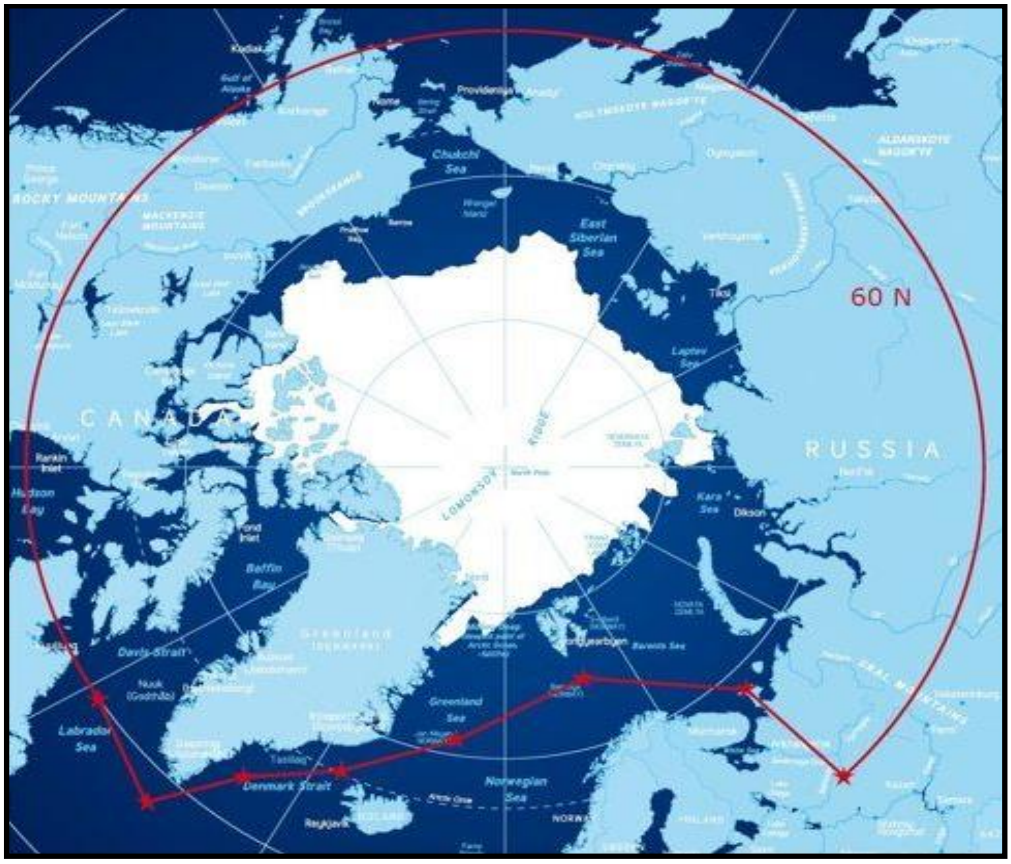


Figure 1 – Arctic waters boundaries

About 400 ships are constantly operating outside the NSR, in Arctic waters adjacent to the Russian Federation (up to 300 ships in the Barents Sea, up to 100 ships in the Bering Sea, about a third of which enter the NSR).

The boundaries of the NSR are within the green line in the Figure below (Figure 2).

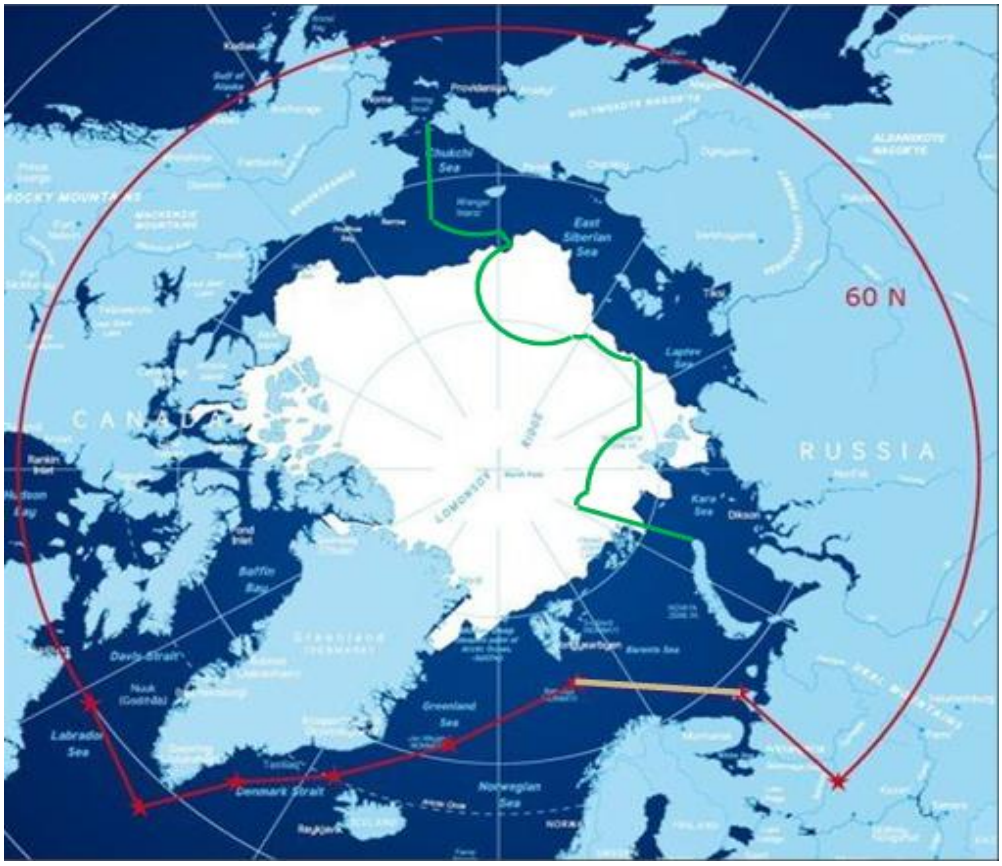


Figure 2 – The NSR boundaries

Consequently the Arctic waters off the coast of the Russian Federation can be divided into two parts. One part includes the NSR, the other part includes the northern parts of the Barents and the Bering Seas outside the boundaries of the NSR.

Annually around 600 ships operate in the NSR water area (Figure 3), owned by about 200 shipping companies, with about 80% of the fleet operating in the NSR waters each and every year, and 20% of ships make one time occasional voyages.

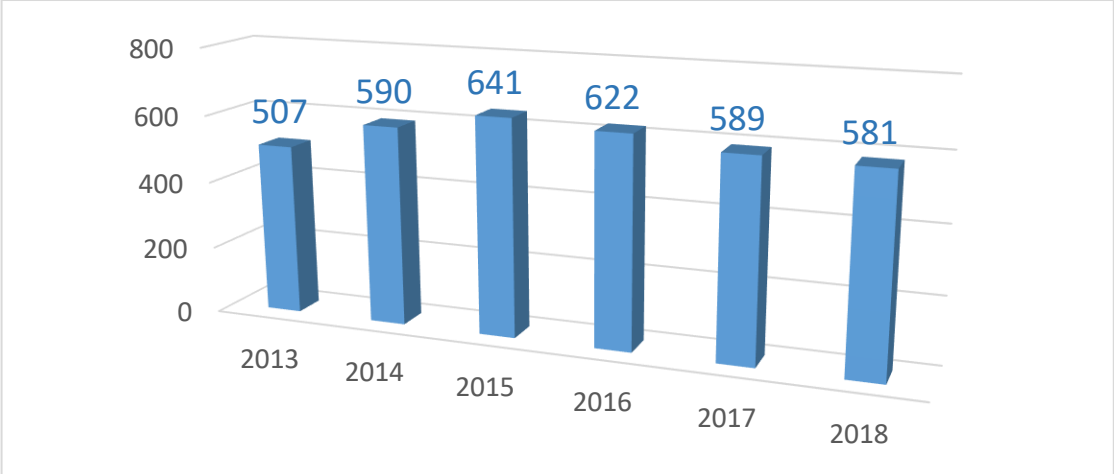


Figure 3 – Yearly distribution of the number of ships operating in the NSR 2013-2018

In 2016-2018 the share of ships under foreign flags was continuously decreasing and, according to in 2018 amounted to only 11%[1] in issued permits. At the same time, 90% of the cargo turnover is provided by only 100 ships. The vast majority of them can operate both on HFO and distillate fuel without retrofitting of the ship engine.

In recent years, the share of tankers and gas carriers has been growing in the Russian arctic fleet, the share has already reached 18% in the number of ships. In terms of gross tonnage, the tanker fleet exceeds the capacity of all other ships operating in the NSR by more than 3 times. All new tankers have the ability to use distillate fuel without retrofitting, while the tank cleaning for a tank with a capacity of around 500 tons is about 1 million RUB[2].

Part of the fleet built for operation in the Arctic waters (25 units), including tankers and auxiliary fleet, comply with Clause 1.2.1 of Part II – A of the Polar Code (structural requirements). In addition, some newly built ships for the Arctic (10 units) are not subject to the requirements of Clause II.1.1 of Part II – A of the Polar Code, , the probability of a spill by such ships is unlikely.

In summary, the HFO ban is not envisaged to affect dramatically on the gross volumes of cargo shipped via the NSR, although it will lead to an increase in their cost. However, it can have a significant impact on the delivery of life support goods, including the Northern Supply[3], such goods are relatively small in volume, but important for local communities (detailed assessment can be found below).

[1] 792 permits to enter the NSR were issued, 581 ships entered the NSR.

[2] All figures are given in the present Report in Russian Roubles (RUB).The yearly average exchange rate of RUB to USD for the first 11 Months of 2019 according to the Central Bank of the Russian Federation has been 64,8574 RUR to 1 USD.

[3] The “Northern Supply” is a comprehensive system of shipments by sea carried out on seasonal basis for the distant and isolated communities and industries (including raw materials, heating oil, diesel fuel, wood, commodities, food, industrial goods etc.) that can be supplied ultimately by the marine transportation.

1.1 Consequences of the HFO ban for ships of various ice classes

200 ships out of approximately 600 operating in the NSR have ice class Arc4[4] or higher, and the number of ships with higher ice classes (for example Arc7) is growing annually. Those ships are mainly operating in the Arctic area since the operation of such ships in ice-free water is not economically feasible due to the design particulars. However certain ships of ice classes Arc4 or Arc5 carry out occasional voyages to the Arctic, for those ships Arctic is obviously not the main region of economic activity (40-50 ships).

The ships with low or non-ice class would be able to change its area of operation if economic conditions deteriorate due to the HFO ban. However some of the ships which constantly operate in the estuaries of the Siberian rivers might be scrapped. Approximately one-third (130 ships) out of 400 ships with an ice class below Arc4 would need retrofitting.

In summary, for about 170 ships the HFO ban would mean either change of area of operation or scrap unless the operators would manage to transfer the rising costs to cargo owners. Since those are mostly ships not systematically serving Arctic projects, the HFO ban would lead to the increase in the cost of non-scheduled voyages (scientific, research, one-time shipments) and a reduction of the number of ships available for such voyages.

[4] Arc4 and other ice classes are given in accordance with the Classification Rules of the Russian Maritime Register of Shipping. HELCOM Recommendation No. 25-7 gives approximate comparison of the IACS polar classes and ice classes of IACS Members.

1.2 NSR routes and their shipping intensity

The NSR routes are a network of duly surveyed recommended routes for ship traffic, comprising of high-latitude (are primarily used for transit and for export of hydrocarbons eastwards) and coastal (used for the Northern Supply and export of mineral raw materials westwards).

High-latitude routes are intended for ships with a draft of up to 15 meters; there are no shallow areas there. The total length of the high-latitude route from Cape Zhelaniya to the Bering Strait is 2100 nautical miles, from Kara Gate to the Bering Strait – about 3500 nautical miles. The total length of coastal routes from the Kara Gate to the Bering Strait is about 8 600 miles.

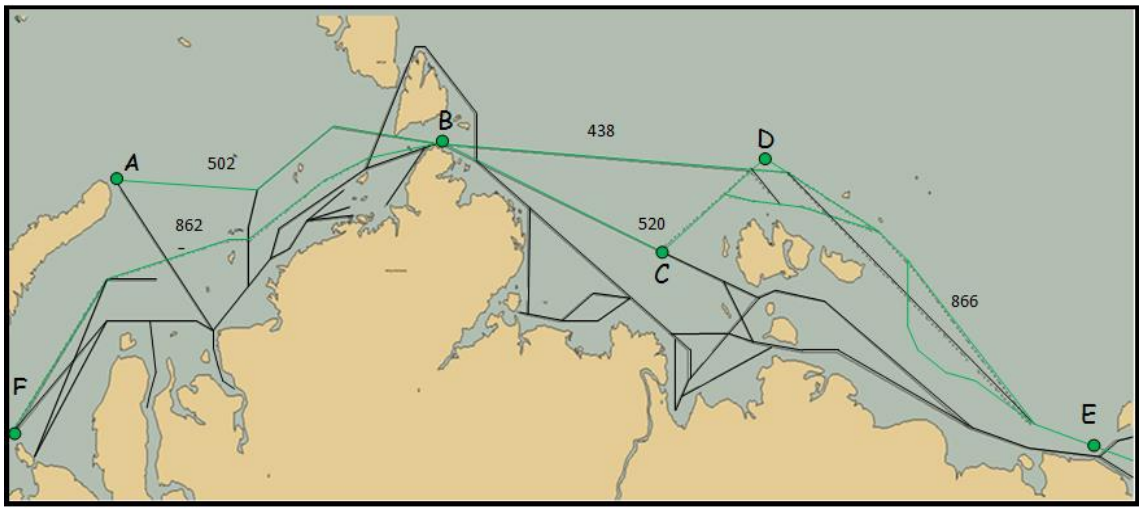


Figure 4 – The NSR routes layout

The traffic congestion of the NSR routes varies significantly depending on the time of the year, furthermore, the western part of the water area (west of the Yenisei estuary) is used much more actively. On average, there are 2,8 times more ships in the Kara Sea than in the seas east of the Yenisei estuary (the Laptev Sea, the East Siberian Sea, the Chukchi Sea). The highest intensity of ship flows and HFO consumption are observed in the central and south-western parts of the Kara Sea. A further increase in the intensity of traffic flows in the Kara Sea may be expected.

The intensity of shipping in Arctic waters within the Polar Code area has clear seasonal variability. Growing from late Spring till September, the shipping in the area gradually declines by late Autumn, leaving only certain single voyages or specific well-established regular voyages operated by high ice-class ships or ships under icebreaker escort.

Outside the NSR in Arctic waters within the Polar Code area adjacent to the Russian coast there are about 140 ships all year round in the Barents Sea, and about 110 ships in the Bering

Sea during summer and autumn navigation period, on the daily basis. Significant growth is not expected.

The overall intensity of ship traffic in all parts of Arctic waters, compared with other busy routes of the ocean, even with their projected future growth, will remain very low.

1.3 Arctic ports

There are 12 ports in the Russian part of Arctic waters within the Polar Code area, in addition, the ports of Murmansk, Arkhangelsk, Petropavlovsk-Kamchatsky, Nakhodka and Vladivostok, which are out of the Polar Code area, are directly interlinked with the shipping in the Arctic.

Only Sabetta and Dudinka ports are being actively developed, the number of ship calls over the past four years has increased up to 5 times (Figure 5, Figure 6). In 2018 Sabetta port turnover exceeded 10 million tons (due to major ship traffic related to the shipment of equipment and materials for the construction of LNG terminal).

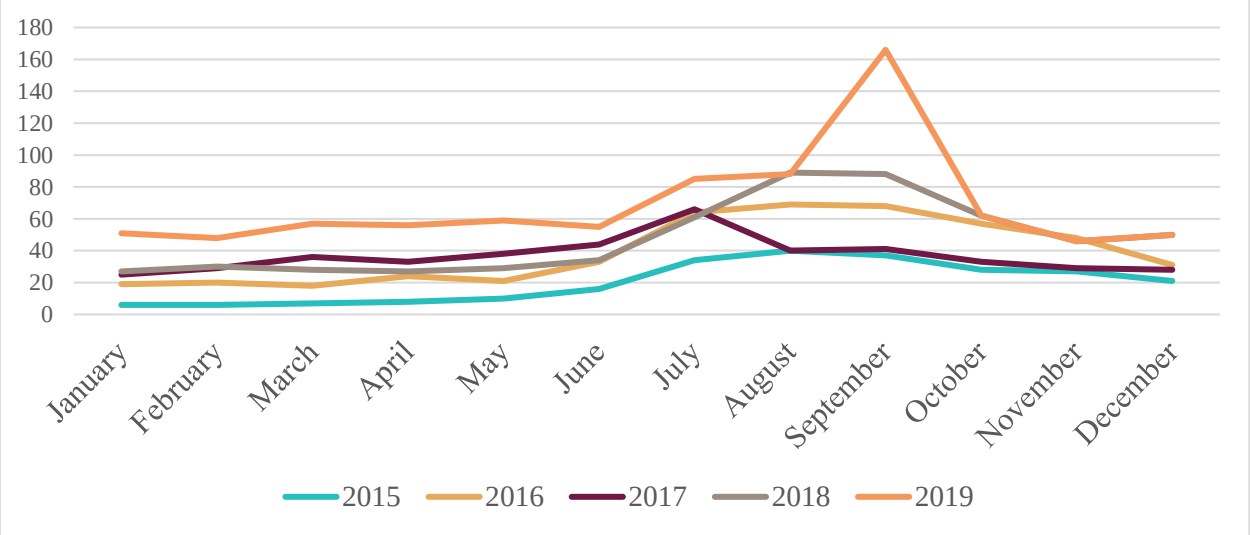


Figure 5 – Dynamics of changes in the number of calls to Sabetta port for 2015-2019

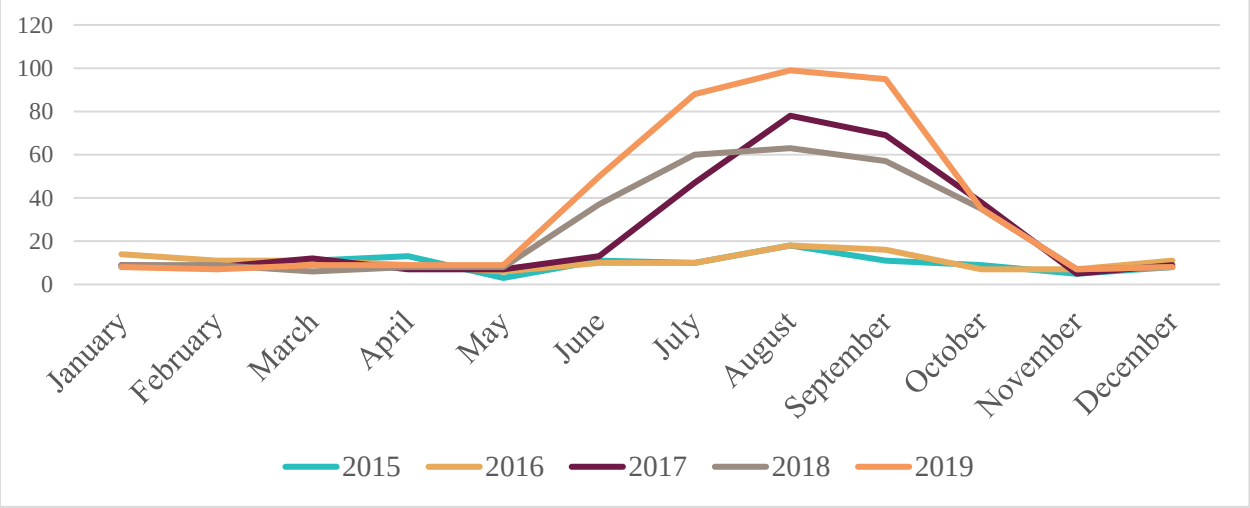


Figure 6 – Dynamics of changes in the number of calls at Dudinka port for 2015-2019

Although there is a slight overall increase in the number of ship calls in Murmansk, the number of tanker calls increases annually by 15-20%. Due to the large capacity of tankers with an increase in the number of calls in 2016-2017 by 8%, the port cargo turnover increased by 32%, exceeding 51 million tons in 2017. Thus, Murmansk more and more specializes in servicing Arctic export projects implemented in the areas within the Russian Federation area bounded by Arctic waters. Apart from Murmansk and Sabetta, the port in Arkhangelsk which is situated in the Barents Sea, adjacent to the Polar Code area, and where the cargo turnover and the number of ship calls there are stable, is of major economic importance. Remaining Arctic ports (Varandey, Dikson, Khatanga, Tiksi, Pevek, Provideniya, Egvekinot, Anadyr) are used almost exclusively for the support of the surrounding areas (Northern Supply), the total transshipment volume there does not exceed 250 thousand tons.

The HFO ban will discourage on the development of the ports infrastructure in the NSR. Although the bunkering of HFO in the Arctic ports is near zero, the HFO ban will limit the growth potential of cargo turnover.

1.4 Navigation conditions. Higher and lower risk areas

Navigation of ships in the Arctic waters is carried out either in open water or in ice conditions. Depending on the season, ship's ice class and particular area of navigation, the national navigation regime applicable for the NSR provides various conditions for navigation, i.e. operation of specific ships is allowed with or without icebreaker assistance, or is prohibited.

According to Rostransnadzor[5], over the past thirteen years, 34 accidents have occurred in the NSR. The vast majority of accidents, more than 60%, were related to the ships impacting each other in convoys during icebreaker assistance in severe ice conditions. In two cases ships touched the ground. Two cases were associated with a violation of the Navigation Rules along the water area of the NSR, when ships did not comply with its allowed area of navigation corresponding to ice class. The remaining incidents were related to violation of occupational safety requirements, violations of technical regulations and regulations for cargo carriage. There was no single case of an HFO spill. Apart from impacts during convoys, which is quite unique for the Arctic, the number of incidents in the water area of the NSR is practically negligible. The annual share of ship loss in the NSR does not exceed 0,04%, which is about ten times less than the similar index of the world fleet. Thus, in spite of severe weather conditions, which form a potentially high-risk environment, in real practice, the application of the comprehensive national measures to ensure and enhance the safety of navigation and protection of marine environment, the risk of accidents, including those involved fuel spills, along the NSR becomes

[5] Federal Transportation Inspection Service of the Russian Federation, www.rostransnadzor.ru

lower than the worldwide average. Due to the small number of accidents, the categorization of Arctic areas by accidents is extremely hypothetical.

Currently, all-year-round polar shipping is carried out only in the southwestern part of the Kara Sea, including the Gulf of Ob and the Yenisei Gulf, the Pechora Sea and the non-freezing northeastern part of the Barents Sea, in the remaining Arctic seas navigation is carried out only in clear water in the summer and autumn seasons. In such a way, in the eastern part of Arctic waters, including the northeastern part of the Kara Sea, 8 months a year there is no risk of spilling HFO because there are no ships there. It means that during winter navigation these areas can be considered as zones with lower risk.

The approaches to the port of Sabetta often experience severe ice conditions, however the combination of safety measures (VTS, surveyed shipping routes, deep channel connecting the port to the sea, SAR and pollution prevention resources, icebreaker assistance etc.), in particular during winter navigation ensure the lower risk for ships operating in the area.

During summer navigation, although the intensity of shipping increases in the Arctic waters, the absence of ice and extended day time makes the navigation along the NSR routes and adjacent waters easier, thus decreasing the risks of accidents.

Moreover, it should be noted that the small number of accidents involving ships in the area and the complete absence of accidents involving HFO spills in recent decades confirm that risk control measures already implemented in accordance with the SOLAS, the Polar Code and national legislation of the Russian Federation, including the special navigation regime on the NSR, deployment relevant resources and development of infrastructure, prove the overall effectiveness and adequacy. Thus, the introduction of the HFO ban for areas with lower risk will not lead to actual increase of the level of environment protection and would represent an excessive measure.

2 Risks of HFO spills from fuel tanks in an emergency

As mentioned above, between 2006–2019 there were 34 incidents in the Russian Arctic (involving 52 ships, including 5 ships under foreign flags), 9 of them with tankers. Damages to the fuel tanks were not recorded, the ballast tank was damaged in 1 case, any spills from fuel or ballast tanks were not recorded.

Between 2013 and 2019 in total 4 745 ships operated in the water area of the Russian Arctic, for that period there were 18 accidents, involving 23 ships (including 5 ships under foreign flags). The Figure below shows the dynamics of accidents in the Arctic zone (Figure 7).

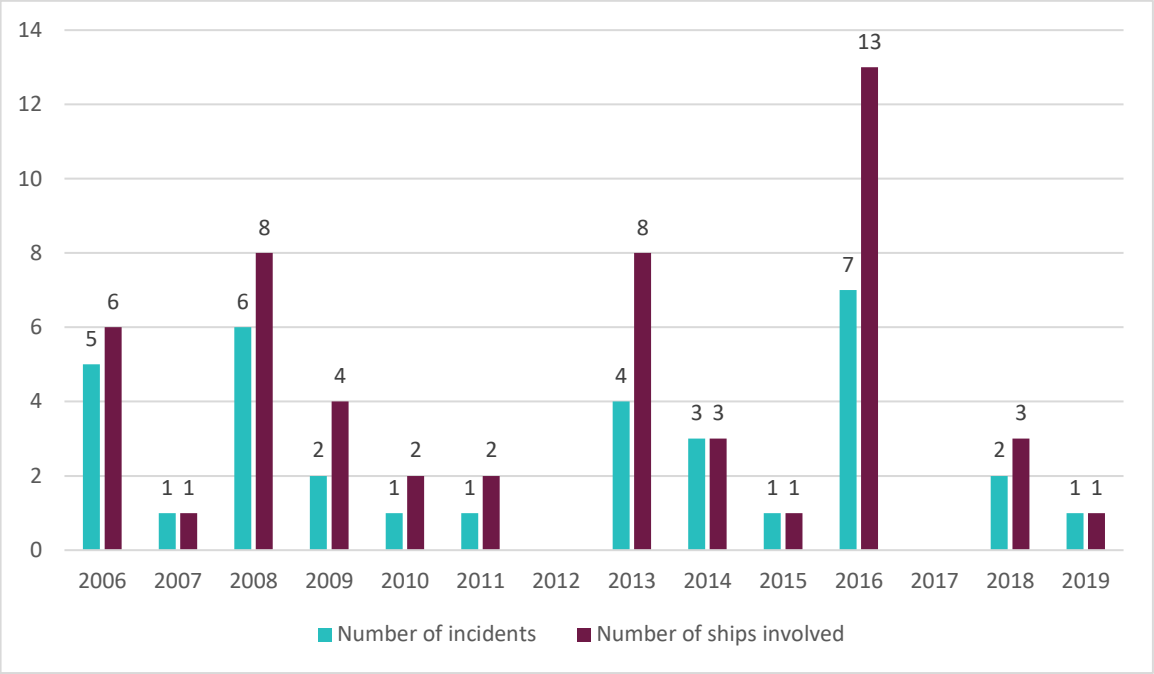


Figure 7 – Incidents in the Russia Arctic

Thus, the number of ships involved in incidents is less than 1% of the total number operating in the water area of the Russian Arctic. Even taking into account the forecasted increase of shipping in the Arctic and in particular on the Northern Sea Route, the potential statistical increase of incidents will still remain at a negligible level.

In addition, it is worth mentioning that the current international and Russian national regulations provide for all necessary measures to respond to oil and oil products spill: availability of emergency plans on ships and offshore units, authorities and operators responsible for sea ports and oil handling facilities. Furthermore the national legislation contains a requirement for operators to have own specific emergency rescue unit in order to provide response to spills or an conclude agreements with a professional duly certified organization. In the Russian Federation it is a prerogative of the federal budgetary institution “Marine Rescue Service”.

3 Economic losses related to the investments already made by the Russian Federation into the Arctic infrastructure, aimed at reducing or eliminating the risks of HFO spills

The modernization of the Arctic infrastructure carried out by the Russian Federation included the establishment of marine rescue coordination center (MRCC) and maritime rescue sub-centers (MRSC) network of "Marine Rescue Service". By now the MRCCs have been established at Murmansk and Dikson ports, as well as at Arkhangelsk, Tiksi and Pevek ports.

"Marine Rescue Service" also launched emergency and rescue units at Murmansk, Arkhangelsk, Kandalaksha, Dikson, Varandey, Dudinka, Sabetta, Pevek, Tiksi and Provideniya ports.

Certain equipment that was purchased and deployed at the MRCC and MRSC aims to combat specifically HFO spills at low temperature conditions, "Marine Rescue Service" Federal State purchased emergency and rescue equipment at the amount of 241 million RUB. The price of emergency and rescue equipment has been taken into account as the Arctic infrastructure modernization potential loss in case of the introduction of HFO ban which would made such equipment unclaimed.

4 The fleet's ability to switch from HFO to distillate or other fuel

All ships considered within the framework of the current impact assessment were divided into 3 groups depending on the workload required to switch to distillate fuel.

In 2018-2019 744 ships entered the water area of the NSR. In case of the HFO ban 235 of those ships would require the retrofitting of the fuel system (Group 3, total costs would be 4,935 billion RUB), for another 46 – cleaning of the main HFO tanks (Group 2, total costs would be 46 million RUB). These are mainly ships with the age of 5 to 15 years.

The capacity of ships requiring retrofitting is on the average 2,3 times lower than ships which do not need it, that is to say, retrofitting is usually required by small ships.

463 ships would not need any retrofitting (Group 1), those are either new ships up to 5 years or to a great extent these are sea-river ships using distillate fuel with the capacity of less than 3 MW of various age.

Cleaning the tanks would cost about 1 million RUB per ship. If a ship continues to use HFO outside the Arctic waters, the cleaning will need to be carried out each time before entering the Arctic waters.

The cost of replacing of the fuel preparation system varies depending on the engine power and the type of engine, and in the average amounts for 20 million RUB, plus losses due to ship's downtime for 20-30 days. More accurate retrofitting cost can only be determined during the development of a technical project. for ships older than 10 years the cost of fuel systems retrofitting would be 25% higher.

Based on the above estimates, the total one-time costs that shipowners might incur in case of the HFO ban will amount to about 5 billion RUB (Table 1). Meanwhile some shipowners may prefer to stop operating in the Arctic waters.

In addition, the ban will affect the operation costs for ships which work partly in the Arctic waters due to the need to clean tanks each time before a entering into the Polar Code area.

The most significant losses would be associated with the increase of fuel costs Additional annual costs shipowners should incur would amount to 30 billion RUB (Table 1).

Table 1 – One-time and annual additional costs for groups of ships to switch from the HFO to distillate fuels, billion RUB

Types of ships in the group and their characteristics	The number of ships	Costs for switching to distillate fuels, billion RUB		
		Engineering	Replacement of Fuel preparation system	Increase of fuel price
Group 1				
LNG-Tanker YamalMax	13	Not required	Not required	10,06
42K Arctic Shuttle Oil Tanker	6			2,29
«Mikhail Uliyanov» Tanker	5			1,91
Oil Tanker (freight)	10			0,37
LNG Tanker (freight)	6			0,81
Product Tanker (chemical carrier)	9			0,00
General cargo and bulk ships	16			1,00
Diesel-electric Icebreakers	8			0,00
Diesel Powered Ships (fishing, auxiliary, scientific and research)	390			0,00
Total	463	0	0	16,44
Group 2				
“Arctic Express” Ships	6	0,006	Not required	1,15
Arc 4,5 Tankers	10	0,010		0,53
Tankers with no ice class	10	0,010		0,53
General cargo and bulk ships	20	0,020		0,64
Total	46	0,046	0	2,85
Group 3				
Arc4,5 Tankers	60	0,06	1,20	3,18
Tankers with no ice class	100	0,10	2,00	5,30
General cargo and bulk ships	75	0,075	1,50	2,40
Total	235	0,235	4,70	10,88
TOTAL		**0,281**	**4,70**	**30,17**

Fuel bunkering is not performed in the ports of the NSR. Distillate fuel bunkering is possible only in the ports of Murmansk, Arkhangelsk and Petropavlovsk-Kamchatsky (all three are outside of the polar waters as defined in the Polar Code). The only port where LNG can potentially be bunkered is the port of Sabetta. Since there is no HFO bunkering network in the Arctic, there are no risks associated with the HFO bunkering.

5 The difference of the transportation costs of mineral resources when switching from HFO to other types of fuels

At the moment a number of companies implement projects related to the export of mineral resources from the Arctic area via the NSR: PJsc Gazprom Neft (Prirazlomnoye and Novoportovskoye oil fields), PJSC NOVATEK (Yamal LNG project) and PJSC Nornickel (North Siberian nickel fields). The forecast traffic volume in 2019 is shown in the Figure below (Figure 8).

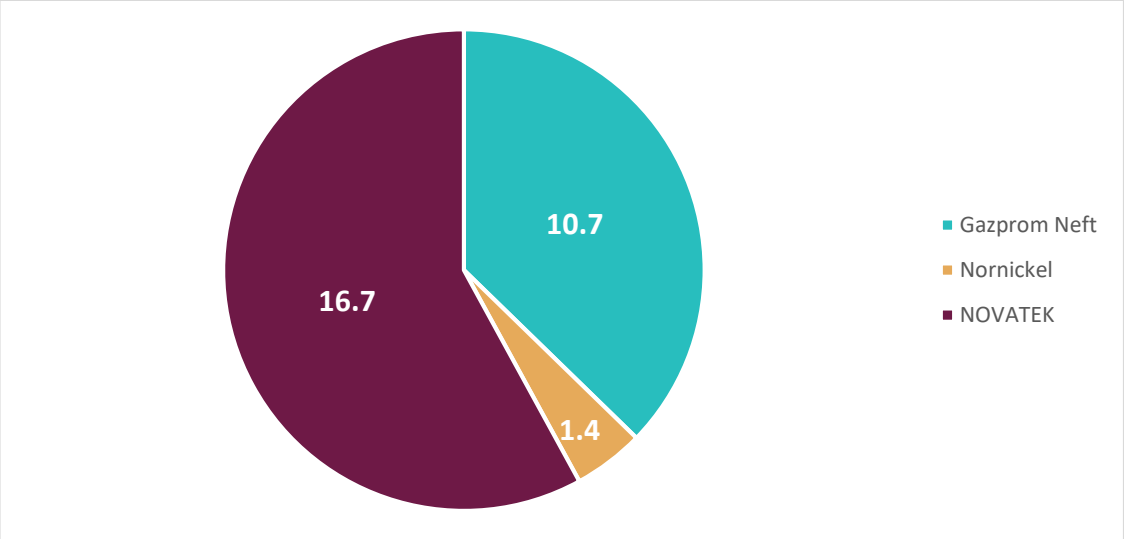


Figure 8 – The forecasted traffic by major extracting companies in 2019, million tones

1 ton of fuel is required for shipping of 55 tons of crude oil from Novoportovoye oil field and 1 ton of fuel is required for shipping of 147 tons of crude oil from Prirazlomnoye oil field. Based on the forecast of crude oil production in 2019 Novoportovoye oil field will produce the amount of 7,5 million tons and Prirazlomnoye oil field – the amount of 3,241 million tons. The forecast traffic volume using HFO is shown in the Figure below (Figure 9).

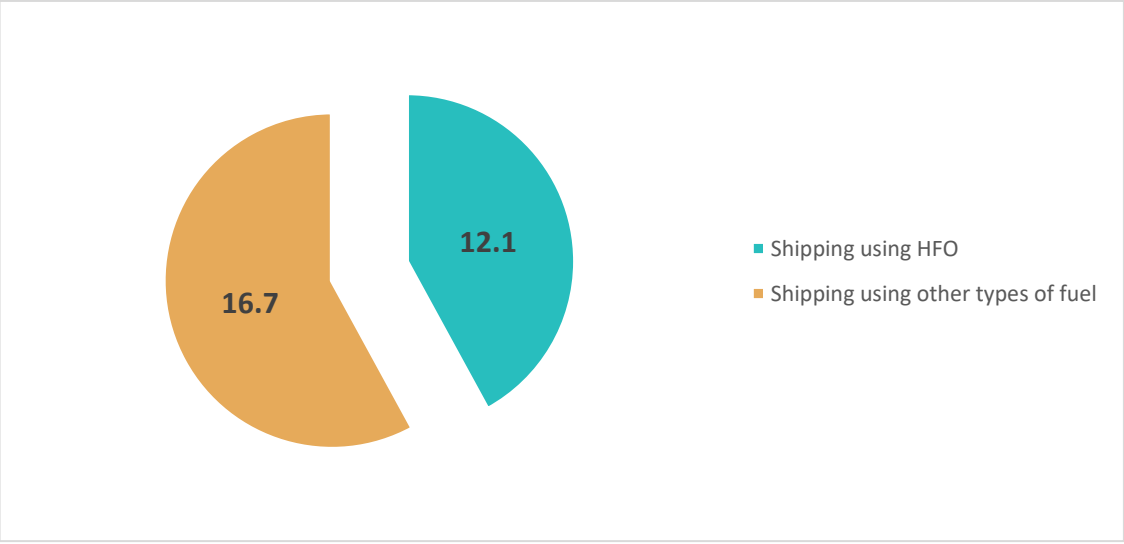


Figure 9 – The forecast traffic volume using HFO, million tones

With fuel price growth from around $380 per ton of HFO to $612 per ton of MGO (on condition of bunkering at Murmansk port, as of 17 September, 2019) the cost of fuel per ton of crude oil shipped from Novoportovoye oil field will increase by 235,6 RUB (from 444,6 RUB to 680 RUB), and per ton of crude oil shipped from Prirazlomnoye oil field – by 79,9 RUB (from 176,6 RUB to 257 RUB).

In general, the cost of crude oil shipping for PJSC Gazprom Neft from both oil fields will increase by 2,03 billion RUB a year (from 3,33 billion RUB to 5,1 billion RUB from Novoportovoye oil field and from 0,57 billion RUB to 0,83 billion RUB from Prirazlomnoye oil field).

The second most significant mineral resources cargo carrier in the Northern Sea Route is Nornickel PJSC. With fuel price growth from around $380 per ton of HFO to $612 per ton of MGO (on condition of bunkering at Murmansk port) the cost of fuel per ton of fuel will be 15 080 RUB (an increase of $232 per ton x 65 RUB for $1). In absolute terms, the increase of fuel costs will be around 475 million RUB (15 080 RUB x 31 500 tons). The Figure below shows the increase in the cost of transporting resources (Figure 10).

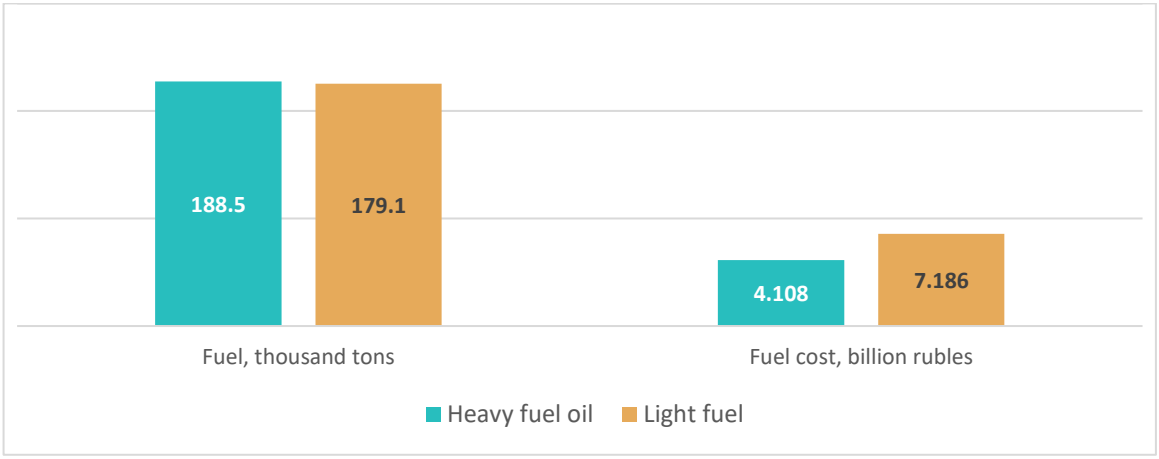


Figure 10 – Comparison of annual fuel costs for raw materials transportation

The total growth in oil shipment cost will amount to 2,03 billion RUB, while the growth of nickel ore shipment cost will increase by 475 million RUB. The resulting economic losses will amount to 2,51 billion RUB per year.

6 The impact of the HFO ban on implementation of a Comprehensive Plan of Modernization and Expansion of the main infrastructure for the period until 2024

“The Comprehensive Plan of Modernization and Expansion of the Main Infrastructure for the Period until 2024” includes the following projects:

- Construction of the Terminal named “Utrenniy” (NOVATEK PJSC Arctic LNG-2 project) – at the port of Sabetta;
- Construction of a water terminal at Sever bay for oil shipment from Payakhskaya oil fields (Neftegazholding JSC) – at the port of Dikson;
- Construction of Chaika coal terminal at the port of Dikson for handling of coal (Vo stokUgol-Dikson JSC);
- Construction of the sea coal terminal on the basis of Syradasaysky coal field (Severnaya Zvezda LLC) – at the port of Dikson.

In order to ensure the timely completion of the projects above the transportation by sea of 1,4 million tons of different cargo would be required, which would need around 7 560 tons of HFO (70 ship voyages x 108 tons per 1 ship voyage).

Taking into consideration the average price of 1 ton of HFO (if bunkering is in Murmansk port) at around $380 per ton, the price of fuel will be around 185 million RUB.

When switching to distillate (“distillate”) fuel, taking into account the energy intensity index of 4%, the volume of fuel for cargo transportation would be 7 258 tons (7560 tons x (1-4%)). Bearing in mind the price of 1 ton of distillate fuel (if bunkering is at Murmansk port) at around $ 612 per ton, the price of fuel will amount to 300 million RUB.

“The Comprehensive Plan of Modernization and Expansion of the Main Infrastructure for the Period until 2024” implies the construction of icebreaking, emergency response, hydrographic and buoy fleets.

With the price of around $380 per 1 ton of the HFO and around $612 per 1 ton of the distillate fuel (on conditions of bunkering at Murmansk port), the price of fuel would increase from 0,98 million RUB ($380 per ton x 64.85 RUB for $1 x 40 tons) up to 1,5 million RUB ($612 per ton x 64.85 RUB for $1 x 40 tons x (1-4%)).

The fuel costs for icebreakers would increase by 55% per day, taking into account the average operating time of the port icebreaker from 140 to 160 days, the amount of fuel costs would

increase from 138-158 million RUB to 214-244 million RUB. The Figure below shows the number of ships being built under the Comprehensive plan (Figure 11).

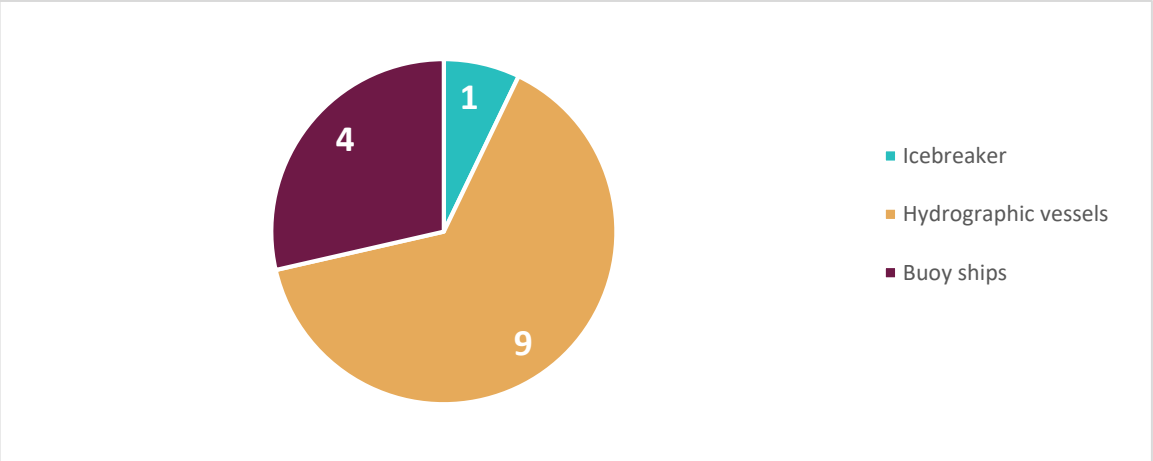


Figure 11 – The number of ships being built under the Comprehensive plan

It is also planned to build 4 hydrographic ships of Arc7 ice class, 5 hydrographic ships of Ice 3 class, 4 buoy ships of Ice3 ice class. As the ships are supposed to be used in the Arctic waters within the Polar Code area (on the Northern Sea Route), the period of use is limited by the duration of navigation on average 100 days a year.

The volume of fuel for the operation of 9 hydrographic ships and 4 buoy ships will be around 23 818 tons (30 liters per day x 100 days x 4 ships + 9 liters per day x 100 days x 5 ships + 18 liters per day x 100 days x 4 ships).

Taking into account the price of HFO of $380 per ton (on conditions of bunkering at Murmansk port), the cost of buoy and hydrographic ships will amount to 588 million RUB ($380 per ton x 65 RUB for $1 x 23 818 tons).

In terms of the price of $612 per ton of distillate fuel (on conditions of bunkering at Murmansk port), the fuel costs for those buoy and hydrographic ships will amount to 947,5 million RUB ($612 per ton x 65 RUB for $1 x 23 818 tons). In other words, the fuel costs will amount to 359 million RUB. The Figure below shows the increase in fuel costs for ships under construction (Figure 12).

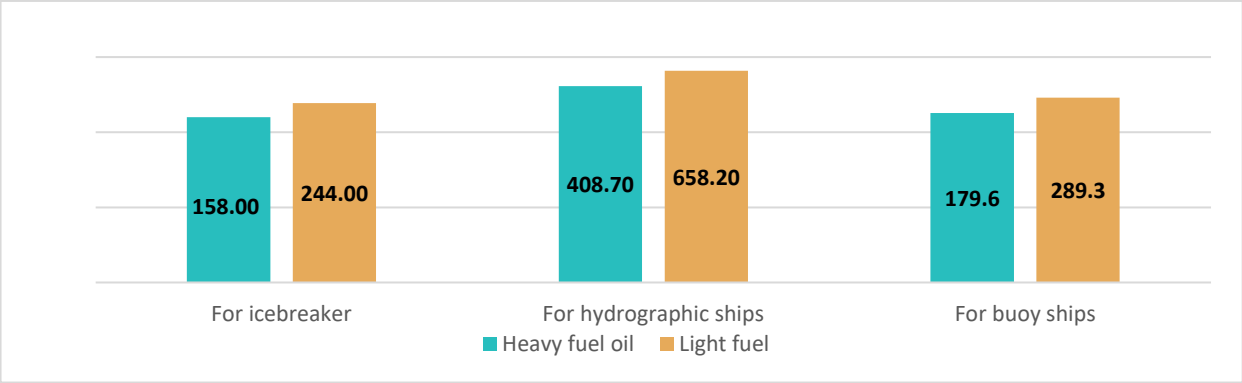


Figure 12 – The increase in fuel costs for ships under construction, million RUB

In total, the HFO ban will increase the cost of fuel for ships under construction within the framework of the Comprehensive Plan of Modernization and Expansion of the main infrastructure for the period until 2024 to 559,5 million RUB or 60%, including the costs of the shipment of construction and other cargoes for the mineral resources exploration projects and fuel costs increase for icebreaking, hydrographic and buoy ships.

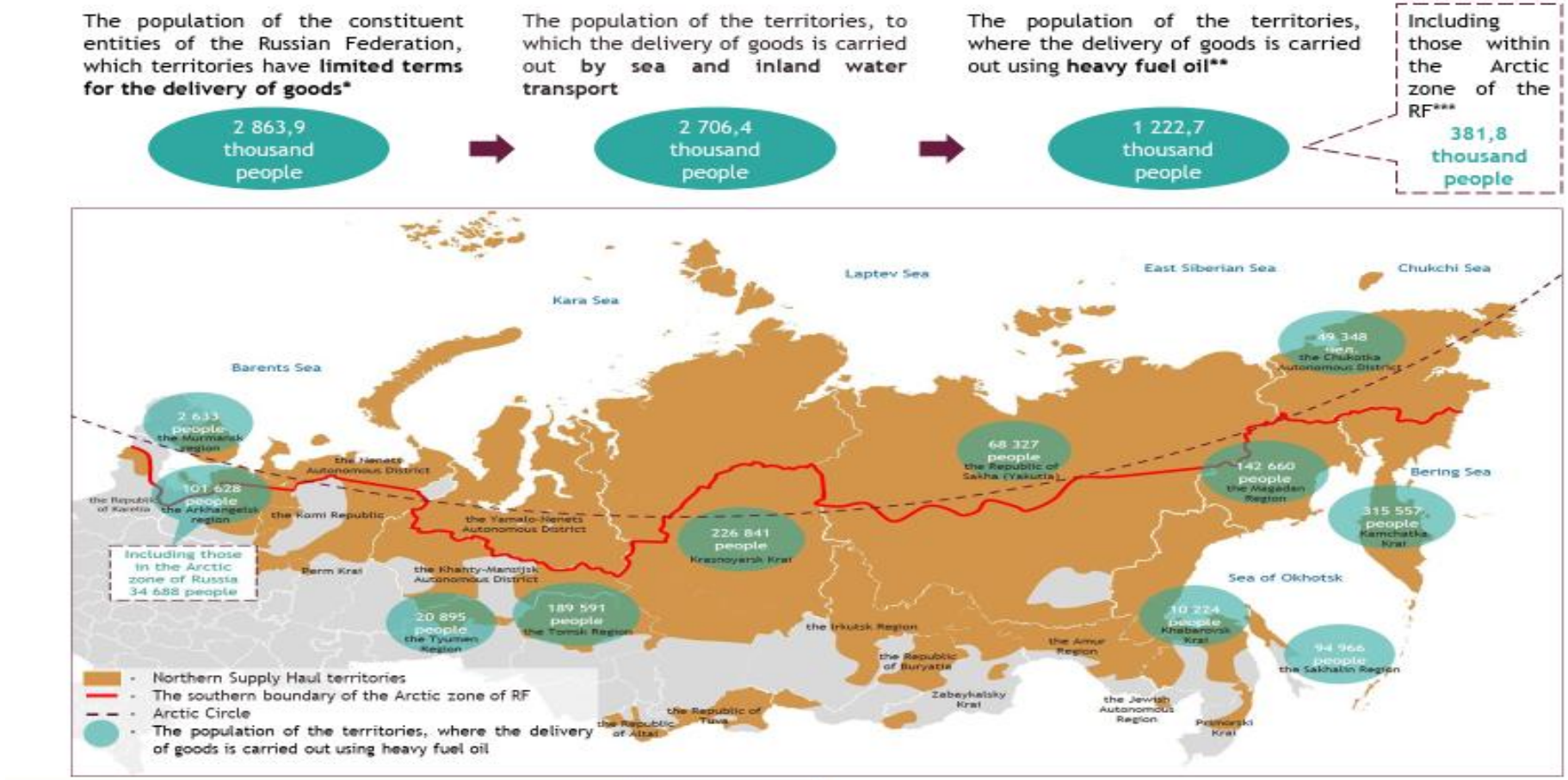
7 The impact of the HFO ban on the local population and industries

7.1 The local population dependent on the Northern Supply and regional distribution

The Northern Supply is aimed at ensuring the livelihoods of the population living in geographically isolated and almost inaccessible areas, implying poorly developed road infrastructure dependent on weather conditions and the availability of seasonal river passages. The Northern Supply provides a centralized supply of fuel and energy resources (including coal, crude and heating oil, petrochemical products etc.), food products, as well as industrial goods.

According to the Federal Statistics Service, 25 Federal Regions (constituent entities) of the Russian Federation (out of 85) are provided with shipments within the Northern Supply. The total number of people dependent on the Northern Supply is about 3 million (2 863,9 thousand people) (Figure 13).

The majority (about 95% - 2.7 mln people) of the total population dependent on the Northern Supply is the population of coastal territories and territories for which inland water transport is used to provide shipments. The cargo within the Northern Supply is delivered to those territories via through sea and river ports. At the same time, cargo delivery using HFO is carried out for Federal Regions of the Russian Federation (dependent population is 1,2 million people), 5 of them, namely Arkhangelsk and Murmansk Regions, Krasnoyarsk Region, the Republic of Sakha (Yakutia), Chukotsky Autonomous Area, are partly included in the Arctic zone of the Russian Federation (the number of dependent population is 381,8 thousand people) (Table 2).



*Activities aimed at providing goods and products to the territories with limited delivery times - Northern Supply Haul
** Territories of 11 constituent entities of the Russian Federation
*** Territories of 5 constituent entities of the Russian Federation

Figure 13 – The population dependent on the Northern Supply

Table 2 – The number of local population dependent on Northern Supply and regional (ports) distribution

№ п/п	Federal Region (Constituent entity) of the Russian Federation	Main ports	Population dependent on Northern Supply		
			Total	The Arctic zone of the Russian Federation, including the NSR	Coastal maritime territories and territories for arranging the Northern Supply on which inland water transport is used
1	2	3	4	5	6
1	The Republic of Altai	-	70363		-
2	The Republic of Buryatia	River ports: Ulan-Ude, Ust-Barguzin, Nizhneangarsk	57969		57969
3	The Republic of Karelia	River ports: Petrozavodsk, Kondopoga, Medvezhyegorsk, Nadvoitsy, Segezha, Shoksha	7240	0	-
4	The Republic of Komi	Pechora river port	97589	0	97589
5	The Republic of Tuva	-	33994		-
6	The Republic of Sakha (Yakutia)	Tiksi sea port; river ports: Yakutsk, Belogorsk, Zyryanka, Lensk, Nizhneyansk, Nyurba, Olyokminsk	875574	68327	875574
7	Zabaykalsky Krai	Sretensk river port	8171		-
8	Kamchatka Krai	Petropavlovsk-Kamchatsky sea port	315557		315557
9	Krasnoyarsk Krai	Sea ports: Dudinka, Dikson, Khatanga; Lesosibirsk river port	359568	226841	359568

Continuation sheet of Table 2

1	2	3	4	5	6
10	Perm Krai	River ports: Perm, Berezniki, Chaykovsky	27994		-
11	Primorsky Krai	Sea ports: Vladivostok, Nakhodka, Zarubino, Posyet, Vostochny	26985		26985
12	Khabarovsk Krai	Sea ports: Vanino, Sovetskaya Gavan, Nikolayevsk-on-Amur, Okhotsk; river ports: Komsomolsk-on-Amur, Khabarovsk	10224		10224
13	Amur Oblast	River ports: Zeya, Blagoveshchensk, Poyarkovo, Svobodny	50738		50738
14	Arkhangelsk Oblast	Arkhangelsk sea port; Kotlas river port	101628	34688	101628
15	Irkutsk Oblast	River ports: Irkutsk, Baikal, Listvyanka, Kultuk, Bratsk, Kirensk, Osetrovo (Ust-Kut), Svirsk	50758		50758
16	The Magadan Region	Magadan sea port, Seymchan river port	142660		142660
17	The Murmansk Region	Sea ports: Murmansk, Kandalaksha, Mezen	2633	2633	2633
18	The Sakhalin Region	Sea ports: Korsakov, Nevelsk, Shakhtersk, Kholmsk	94966		94966

Continuation sheet of Table 2

1	2	3	4	5	6
19	The Tomsk Region	River ports: Tomsk, Belyay, Kolpashevo	189591		189591
20	The Tyumen Region	River ports: Tobolsk, Tyumen	55178		55178
21	The Nenets Autonomous District	Sea ports: Naryan-Mar, Amderma, Varandey	43997	43997, including the NSR 1177	43997
22	The Khanty-Mansijsk Autonomous District – Yugra	River ports: Nefteyugansk, Nizhnevartovsk, Serginsky, Khanty-Mansyisk	131587		131587
23	The Chukotka Autonomous District	Sea ports: Pevek, Anadyr, Provideniya, Egvekinot, Beringovsky	49348	49348	49348
24	The Yamalo-Nenets Autonomous District	Sabetta sea port; river ports: Salekhardsky, Urengoisky, Labytnangi, Nadym	49881	49881	49881
25	The Jewish Autonomous Region	Pokrovka river port	9708		-
	Total		2 863 901	475 715	2 706 431

Thus, the population dependent on Northern Supply appears to be significant and is an important social factor when it comes to the assessment of the consequences of the HFO ban.

As an example, below is the information on activities within the Northern Supply for one of the Federal Regions of the Russian Federation, namely the the Republic of Sakha (Yakutia).

The population in the Republic of Sakha (Yakutia), dependent on Northern Supply and living in the territories bordering the Arctic waters is 68 327 people (altogether 875 574 people depend on Northern Supply in the Republic of Sakha (Yakutia) or 91% of the population).

During 2018, 1 254,8 thousand tons of various cargoes worth 35 billion RUB, including 133,5 thousand tons shipped by sea transport, were delivered to the Republic of Sakha (Yakutia) as a part of Northern Supply. The cost of delivered goods per 1 person for the Republic of Sakha (Yakutia) population living in the territories bordering the Arctic waters amounts to 54 498 RUB.

19 ship voyages with a deadweight of 7 thousand tons would be required for the transportation of 133,5 thousand tons. The average fuel consumption per day per ship would be 30 tons, and taking that into account, the fuel consumption for navigation period would be 13 318 tons.

Considering the price of $380 per ton of HFO (on conditions of bunkering at Murmansk port), the cost of fuel in the amount of cargo in the calculation of supplies to the entire population dependent on Northern Supply and living in the territories bordering the Arctic waters, the Republic of Sakha (Yakutia), will amount to 328,9 million RUB (Figure 14).

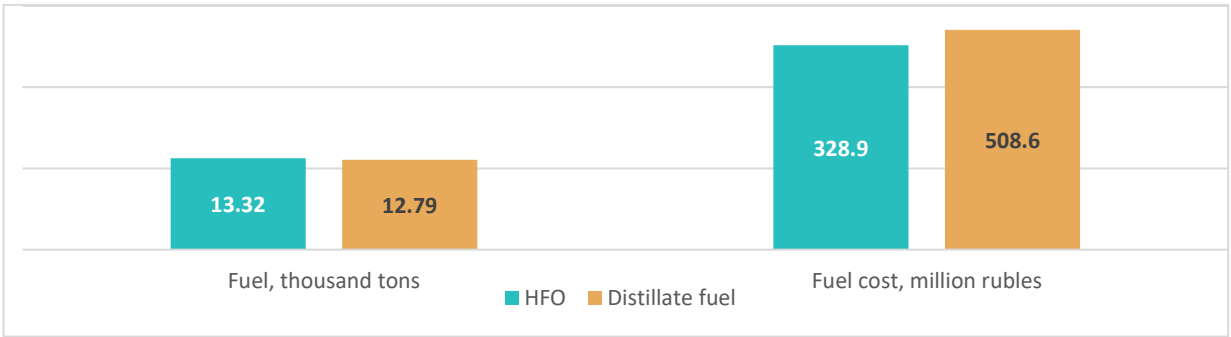


Figure 14 – Increase in Northern Supply cost for the Republic of Sakha (Yakutia)

Thus, the cost of fuel in the volume of transported goods will be 2 464 RUB. The cost of fuel in the volume of goods in the calculation of supplies per 1 person will be 4 814 RUB.

When switching to distillate fuel, taking into account the energy intensity index of 4%, the volume of fuel for the supply of goods by sea within the Northern Supply will be 12 785 tons. The fuel costs, taking into account the price of $612 per ton of distillate fuel (on conditions of bunkering at Murmansk port), will amount to 508,6 million RUB.

The cost of fuel in the volume of transported goods will be 3 810 RUB. The cost of fuel in the volume of goods in the calculation of supplies per 1 person will be 7 443 RUB (Figure 15).

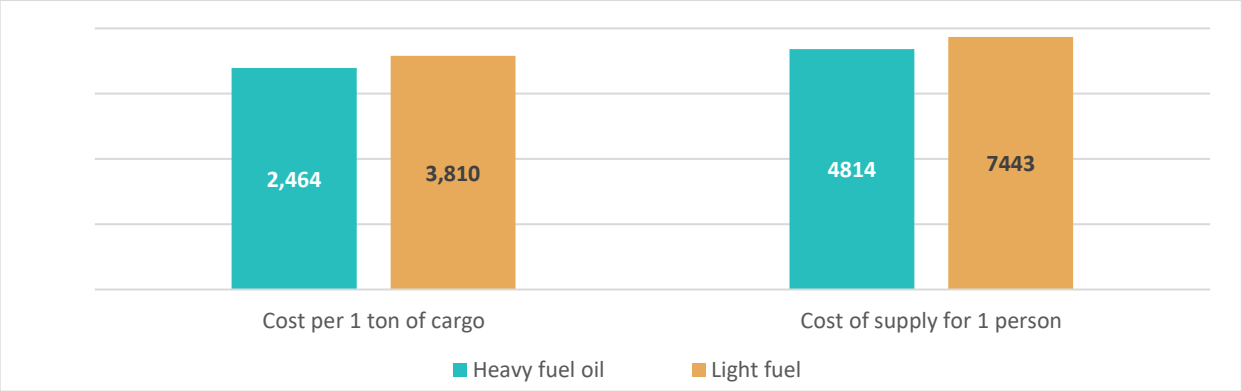


Figure 15 – The increase in fuel cost in the volume of goods

The difference in the fuel cost in the volume of goods in the calculation of deliveries per 1 person, when switching from HFO to distillate fuel, will be 2 629 RUB and for the entire population dependent on Northern Supply and living in the territories bordering the Arctic waters, the Republic of Sakha (Yakutia), will amount to 179,6 million RUB. The increase in the cost of the Northern Supply is shown in the Figure below (Figure 16).

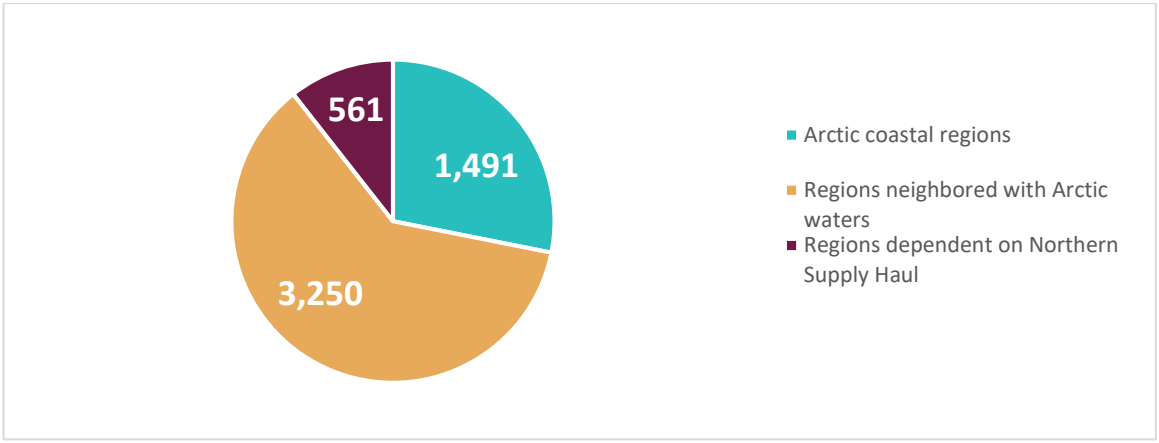


Figure 16 – The increase in the cost of the Northern Supply, million RUR

In total, the population of Federal Regions dependent on the Northern Supply reaches 1 222 670 people. The average cost increase will amount up to 16% of the minimum monthly wage. With an inflation forecast of 4,58%, the cost increase is significant. In absolute terms, the cost increase of goods delivered estimates to be from 4,2 to 5,3 billion RUB.

7.2 The local industries (excluding the export of mineral resources) dependent on the Northern Supply

In 25 Federal Regions of the Russian Federation served by the Northern Supply local industries operate in the following sectors:

- Extraction of mineral resources;
- Manufacturing;
- Supply of electrical power, gas, steam, hot water and air conditioning;
- Construction
- Agriculture;
- Forestry;
- Hunting;
- Fishing and fish farming.

As an example of one of the Federal regions, the Republic of Sakha (Yakutia), there are 85 diesel (DPP) and 9 solar power plants with a total capacity of 157 MW operating in the Arctic zone therein. The annual electric power output of 7 plants to which the delivery of fuel is carried out by sea, is 128 505 kWh.

According to carriers operating ships within the Arctic zone of the Taimyr Dolgano-Nenets municipal district of Krasnoyarsk Region, the HFO ban will negatively affect social and economic situation of the region. Currently, there are 16 boiler stations operating in that district which provide centralized heat supply services, as well as 27 autonomous diesel power plants. Furthermore, the main consumer of the HFO is a commercial fleet, which is registered in Arkhangelsk port (outside the Polar Code area) and performs regular voyages into the Arctic waters. The HFO ban would significantly reduce the ability of those ships to participate in goods delivery in the Arctic, including the Northern Supply.

It should be noted that the Northern Supply is carried out in relation to goods and services, centralized deliveries and provision of which are necessary to ensure the survival. In that regard, the activities of organizations providing public services to the population, as well as organizations of the public sector, directly depend on it. At the same time the Northern Supply may provide for the delivery of goods for the needs of other economic entities of the region. The introduction of the HFO ban can have an extremely negative impact on the fuel sector, production and distribution of heat and electricity, as well as on the mining industry and relevant enterprises (mining of coal, gold, diamonds and others) as well as the enterprises engaged in geological surveys.

7.3 The ships involved in Northern Supply, the structure of fuel consumption

The total number of ships involved in the Northern Supply is 23 (5 tankers, 12 general cargo ships and 6 ships for general and container cargo transportation), 19 of them have different ice classes (2 tankers and 2 general cargo ships do not have ice class).

The age of the ships involved in Northern Supply is as follows: 14 ships with more than 20 years of age, 7 ships with the age close to 20 years and 2 ships of 7 years of age (Figure 17).

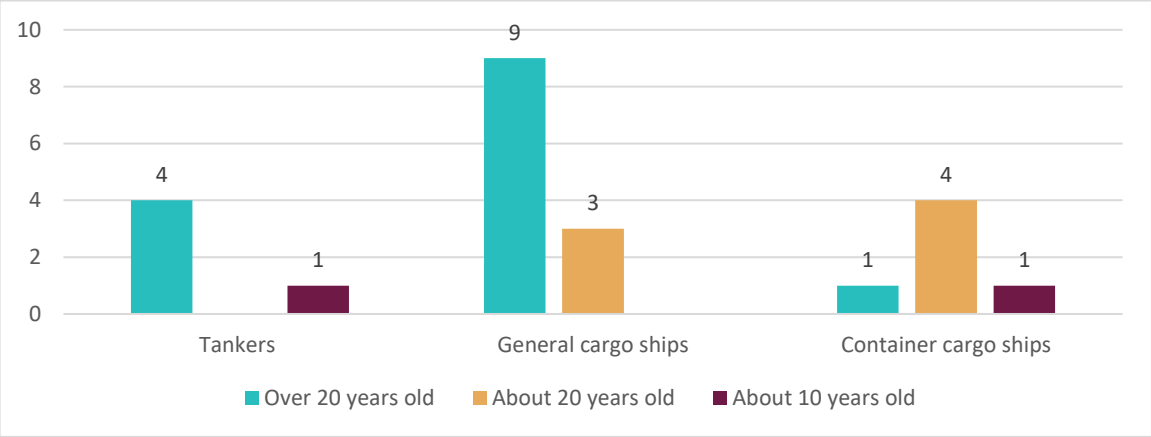


Figure 17 – The age of the ships involved in the Northern Supply

According to the deadweight the ships involved in the Northern Supply are divided into the following groups: 13 ships with a deadweight of up to 9 thousand tons and 10 ships up to 18 thousand tons (Figure 18).

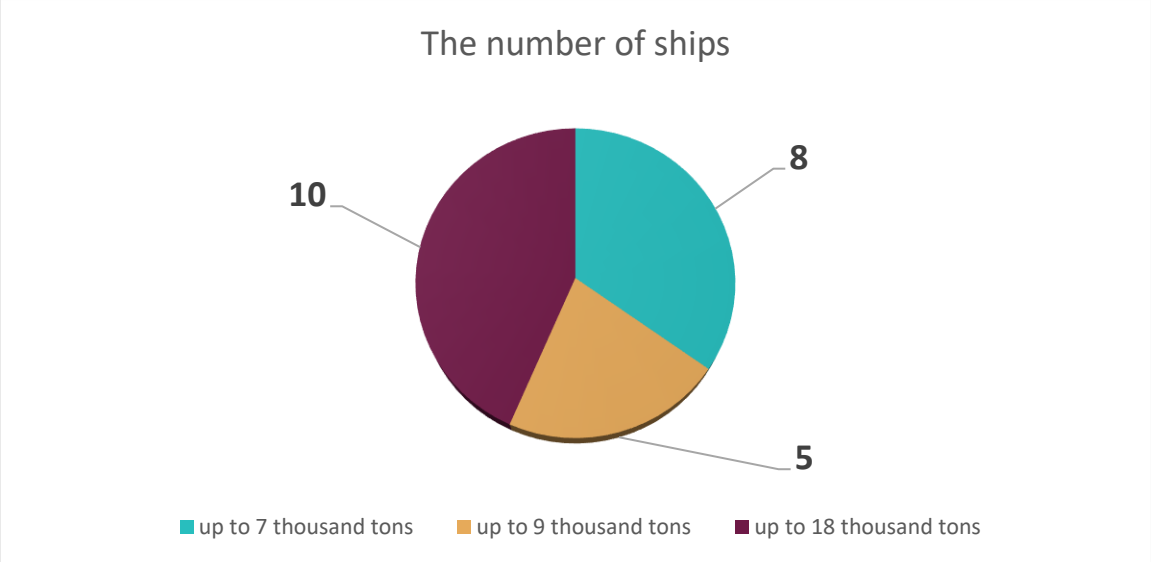


Figure 18 – Deadweight of ships involved in the Northern Supply

As per the type of fuel used, the ships can be grouped as follows: 6 ships are able to use HFO only and 17 ships are able to use both HFO and distillate fuel.

Traditionally in order to reduce the cost of cargoes shipped as part of the Northern Supply the HFO is used by the ships involved.

In summary, the fleet involved in providing the Northern Supply consists mostly of old small-capacity ships, and if a ban is introduced, 35% of those ships would to be retrofitted, which would be economically unfeasible in most cases, or decommissioned. There would be no possibility to replace the fleet with new ships at once.

7.4 The impact of the HFO ban on the indigenous population

Representatives of the indigenous ethnic groups who have been living in the Arctic territories for a long time are one of the main focuses of the impact assessment. They are the bearers of a unique culture, they have accumulated native knowledge and skills of interaction with their natural and harsh environment. Indigenous ethnic groups living in the Arctic for many generations are much vulnerable to both economic and environmental changes in the Arctic.

The list of indigenous ethnic groups has been determined by the Government taking into account their settlement in the Federal Regions of the Russian Federation[6]. The total number of indigenous ethnic groups in the Arctic territories that are dependent on the cargo transportation by sea by ships using HFO within the framework of the Northern Supply is about 148 thousand people. 76,1 thousand representatives of indigenous ethnic groups live on the coastal areas bound by Arctic waters within the Polar Code area, which is 25% of the total population of those areas. There are no medium or large towns in the Arctic coastal areas, and in some areas there are no even any urban settlements, but indigenous villages only, which directly affects the relatively high proportion of the indigenous population in the structure of total population, in some areas exceeding 50% (Figure 19).

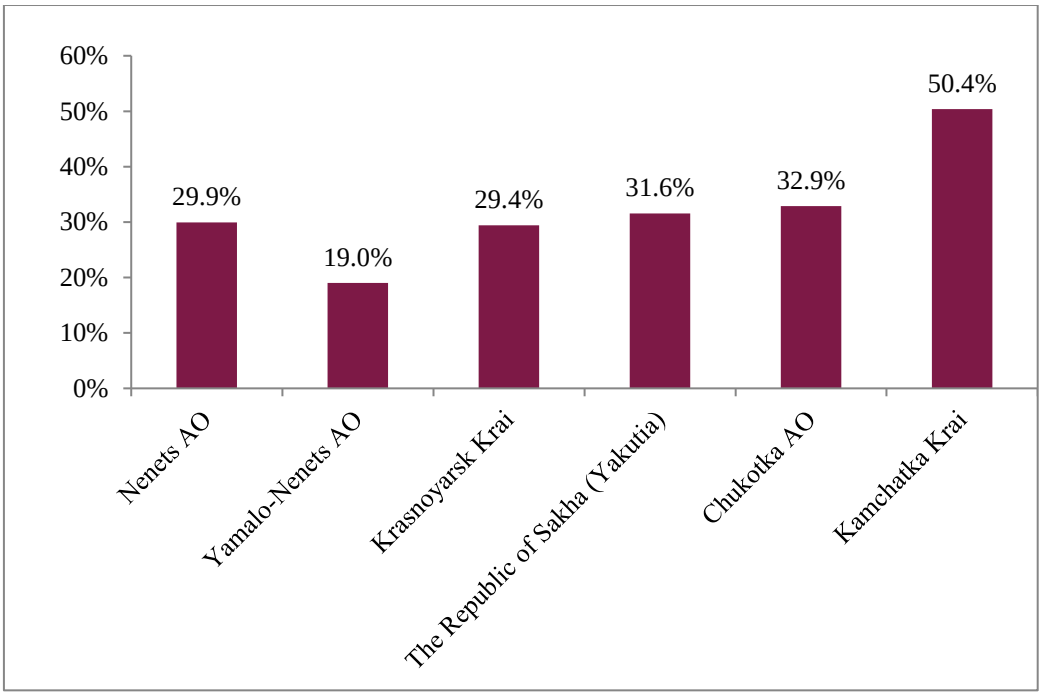


Figure 19 – The share of Small Indigenous Peoples of the North in the total population of Arctic coastal areas within the Polar Code,% (according to Russian Census in 2010)

In total around 13,8 thousand people of indigenous ethnic groups in the Arctic region are engaged in fishing and catching of other aquatic bioresouces both on the rivers / lakes and

[6] Decree of the Russian Federation No. 255 of 03/24/2000 (as amended on 08/25/2015)

at sea, while 5.9 thousand of them do catch bioresources at sea. Within the territory of the Russian Federation bound by the Arctic waters within the Polar Code these numbers are 10,7 thousand and 5,3 thousand people, respectively.

Thus, the share of the indigenous ethnic groups engaged in the fishing and catching of aquatic bioresources is less than 14% of the total number of the indigenous population in the overall Russian Arctic zone, while about 6% of them are engaged in sea fishing and catching. For the territories bound by the Arctic waters within the Polar Code area that figures are 14,1% and 7%, respectively.

Consequently, about 93,5 thousand indigenous people in the Arctic zone of the Russian Federation and, among them, 70,5 thousand indigenous people at the coastal territories within in Polar Code area are not engaged in fishing or catching of sea bioresources in order to maintain traditional way of life and to traditional economic activities, which represents 93- 94% of the total indigenous population of those areas (Figure 20).

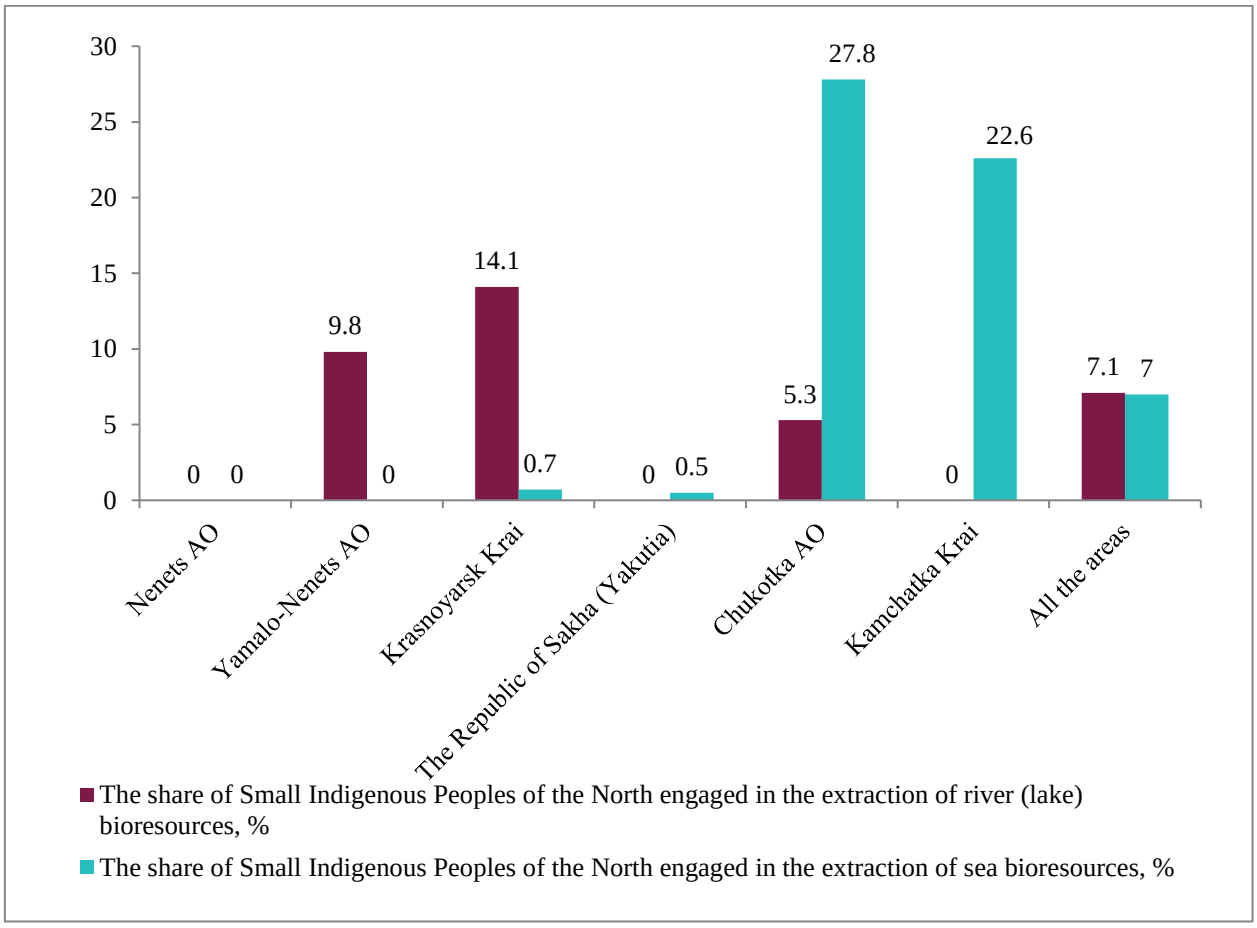


Figure 20 – The share of Small Indigenous Ethnic Groups of the Arctic engaged in the catching of aquatic bioresources for subsistence traditional activities in the coastal Arctic regions within the Polar Code area,%

In some Federal Regions a number of indigenous communities are involved in commercial fishing rather than traditional ways of fishing for subsistence. For instance, in the Republic of Sakha (Yakutia) in 2019, 73 tribal indigenous communities received quotas for the catch of aquatic biological resources as part of the ordinary commercial fishing activities.

In summary, the majority of the indigenous ethnic groups of the Arctic are not engaged in traditional fishing and catching of marine bioresources for subsistence and maintaining traditional way of life. Consequently the majority of indigenous communities are highly dependent on the shipment of goods within the Northern Supply and the increase of shipping costs would inevitably and dramatically affect the native communities.

According to calculations, for around 148 thousand people, the cost increase of goods shipped will amount to 0,442 billion RUB and the average cost increase will amount to 16% of the minimum monthly wage.

8 Main conclusions and assessments

The assessment of the impact of the HFO ban includes the review of the number of ships using HFO, the increase in fuel costs (when switching from HFO to distillate or other types of fuel), the assessment of the impact of rising fuel costs on the cost of freight.

The ban will have impact on the following areas:

- additional charges for retrofitting of ships;
- change of current fuel costs (taking into account its availability) and consequently – the change of transportation costs, including transportation of mineral raw materials;
- cost increase for emergency response (in terms of marine fuel for the needs of the Federal State Budgetary Institution "Marine Rescue Service");
- change of fuel delivery cost in the framework of the Northern Supply;
- changes of cargo transportation costs related to the activities within the “The Comprehensive Plan of Modernization and Expansion of the Main Infrastructure for the Period until 2024”.

The cost increase in respect of transportation of mineral raw materials and domestic shipment depends on the ships used (deadweight and ship type), as well as the specific type of cargo transported. The resulting economic losses due to the increase of cost of mineral resources transportation will amount to 2,51 billion RUB per year.

There are 463 ships operating in the Arctic waters within the Polar Code area for which engineering and replacement of the fuel preparation system are not required. For these ships, the increase in fuel costs will be 16,44 billion RUB. For 43 ships some engineering work required in the amount of 46 mln RUB, and for these ships, the increase of fuel costs will be around 2,85 billion RUB. 235 ships would require some engineering and replacement of the fuel preparation system in the amount of 4,94 billion RUB, while the cost of fuel for these ships will increase by 10,88 billion RUB. The total increase in the fuel cost will amount to 30,17 billion RUB, and the cost of ships retrofitting will amount to 4,98 billion RUB.

Within the Northern Supply shipments are provided for 1 222 670 people (t*he indigenous population of these regions is 148 693 people).*

In the case of the HFO ban the average cost increase will be 16% of the minimum monthly wage. With an inflation forecast of 4,58%, the cost increase is significant. In absolute terms, there the cost increase of imported goods would amount to 4,3 to 5,3 billion RUB. The

increase in the cost of imported goods for the indigenous population will amount to 442 mln RUB.

Due to the introduction of the HFO ban, there will be an increase in the cost of purchasing marine fuel for the needs of "Marine Rescue Service": currently, some of the ships in commercial contracts consume HFO. In accordance with current procurement plans, the cost increase will amount to 135 mln RUB per year.

To eliminate the potential spills of HFO at low temperature conditions, the "Marine Rescue Service" purchased emergency and rescue equipment equal to 241 mln RUB, which can be included in the economic losses related to the modernization of the Arctic infrastructure.

The total increase in fuel and cargo costs as part of “The Comprehensive Plan of Modernization and Expansion of the Main Infrastructure for the Period until 2024” will amount to 559 mln RUB.

Table 3 – The costs the Russian Federation will incur if the HFO ban is introduced

Type of Costs	Cost increase (billion RUB)
One-time costs	
Ship retorfitting costs	4,98
Economic losses due to investments into Arctic infrastructure	0,24
Total one-time costs	5,22
Annual costs	
Fuel costs increase (including purchasing marine fuel for the needs of "Marine Rescue Service"	30,30
The increase in the cost of mineral resources transportation	2,51
The increase in the cost of goods importation for the population (Northern Supply)	5,3
Increased costs for the construction and operation of the Arctic infrastructure and fleet	0,56
Total annual costs	38,67
GRAND TOTAL	43,89

Thus, the overall increase in costs for the Russian Federation in case of the introduction of the HFO ban will amount to one time costs of 5,22 billion RUB (80.48 mln USD) and subsequently 38,67 billion RUB (596.23 mln USD) annually, meaning in total 43,89 billion RUB (676.71 mln USD) for the first year.