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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

An overview of Canada's Arctic and the role of maritime shipping in Arctic communities

Submitted by Canada

SUMMARY

Executive summary:	This document provides a summary of the findings of a report undertaken by Canada entitled "An Overview of Canada's Arctic and the Role of Maritime Shipping in Arctic Communities". The full report is included in the annex
Strategic direction, if applicable:	6
Output:	6.11
Action to be taken:	Paragraph 10
Related documents:	MEPC 69/20/1, MEPC 69/21; MEPC 70/17/4, MEPC 70/17/9, MEPC 70/17/10, MEPC 70/17/11, MEPC 70/18; MEPC 71/14/4, MEPC 71/16/4, MEPC 71/16/8, MEPC 71/17; MEPC 72/11/1, MEPC 72/11/2, MEPC 72/17 (paragraphs 11.1 to 11.11); MEPC 73/9, MEPC 73/9/1, MEPC 73/9/2, MEPC 73/INF.19, MEPC 73/17 (paragraphs 9.1 to 9.9); and PPR 6/12/4

Introduction

1 This document provides the key findings of a report entitled "An Overview of Canada's Arctic and the Role of Maritime Shipping in Arctic Communities". The full report is included in the annex.

2 At its seventy-first session, the Marine Environment Protection Committee (MEPC) agreed to include a new output to develop measures to reduce risks of use and carriage of heavy fuel oil (HFO) as fuel by ships in Arctic waters in the 2018-2019 biennial agenda of the Committee and assigned the Sub-Committee on Pollution Prevention and Response (PPR) to complete the work on the development of such measures.

3 At its seventy-second session, MEPC considered several documents[1] on the development of measures to reduce risks of use and carriage of HFO as fuel by ships in Arctic waters with the view to determining the scope of work to be undertaken by the PPR Sub-Committee. In the ensuing discussion the Committee approved the following scope of work:

.1 develop a definition of HFO taking into account regulation 43 of MARPOL Annex I;

.2 prepare a set of Guidelines on mitigation measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters, taking into account document MEPC 72/11; and

.3 on the basis of an assessment of the impacts, develop a ban on HFO for use and carriage as fuel by ships in Arctic waters, on an appropriate timescale.

4 At its seventy-third session, MEPC considered several documents (MEPC 73/9, MEPC 73/9/1, MEPC 73/9/2, MEPC 73/9/3 and MEPC 73/INF.19) on an appropriate impact assessment methodology process and agreed to forward the documents to the PPR Sub-Committee and to instruct the PPR Sub-Committee to finalize the impact assessment methodology. MEPC 73 also invited Member Governments and international organizations to submit any further proposals on an appropriate impact assessment methodology process, and the results of any impact assessments undertaken, to PPR 6 for consideration and advice to the Committee.

5 In order to support this work, Canada has submitted this study in an effort to highlight the unique circumstances of Arctic communities in Canada and to identify potential areas of impact of a ban on the use and carriage for use as fuel of HFO in the Arctic. This study is not intended to provide a policy position relative to a potential HFO ban in the Arctic. The findings of this study are intended to contribute to the existing body of knowledge and support an understanding of the complex conditions faced by the culturally and geographically diverse communities in Canada's Arctic in order to provide context to and better inform the work the Sub-Committee has undertaken related to the use of HFO in the Arctic.

6 A potential ban on HFO in the Arctic would have a direct impact on these communities, as shipping in the Arctic plays a role in sustaining communities through the resupply of consumer goods and non-perishable food items as well as natural resources development (e.g. mining), an economically critical sector for northern residents.

7 Currently, sealift in the Canadian Arctic supports over 50 communities by delivering necessities such as non-perishable food and fuel (for vehicles and power generation) to areas that have no road access, and would otherwise have to depend on more costly, and less environmentally sustainable, delivery by air. These communities already experience an extremely high cost of living due to their remoteness, often coupled with low socioeconomic status, making access to sealift services crucial to their well-being and food security. The importance of sealift operations was highlighted this season when Paulatuk (a community located in the Northwest Territories) did not receive its annual resupply, resulting in airlift operations to address the expected shortages in food and fuel.

[1] MEPC 72/11, MEPC 72/11/1, MEPC 72/11/2, MEPC 72/11/3, MEPC 72/11/4, MEPC 72/11/5, MEPC 72/11/6 along with MEPC 72/INF.14, MEPC 72/INF.18 and MEPC 72/INF.20.

8 Arctic shipping also contributes to the local and global economies by supporting natural resource development, which is expected to continue to expand. Such natural resource development projects provide a source of income to neighboring communities by providing both employment opportunities but also additional benefits through initiatives aimed at empowering local communities.

9 A proposed ban on HFO in the Arctic must consider the potential impacts on Arctic communities, as outlined in the report attached. In addition, it is important to consider that, regardless of the type of fuel used in the Arctic, measures to mitigate the risks of potential spills should be undertaken.

Action requested of the Sub-Committee

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

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REPORT ON CANADIAN ARCTIC COMMUNITIES:

An Overview of Canada's Arctic and the Role of Maritime Shipping in Arctic Communities

Context

The purpose of this report is to characterize Canada's Arctic communities and to identify the potential impacts of a ban on the use and carriage for use of heavy fuel oil (HFO) as fuel in Arctic shipping.

Following the proposal of a 'ban HFO use and carriage for use as fuel by ships in Arctic waters' (MEPC 72/11/1), discussions at MEPC 72 identified the need to determine the impact on communities and economies in the context of assessing the impacts of such a ban.

In Canada's north, such a ban would have both direct and indirect impacts on stakeholders, as Arctic shipping plays an important role in delivering necessities to Arctic communities and supporting natural resources development such as mining. In addition to shipping, other marine industry stakeholders such as cruise lines would be affected by an HFO ban in the Arctic. This report will focus on Canada's Arctic communities and provides a basis for understanding the potential impacts of the proposed ban on these communities.

Contents

Definitions

Country Food	Traditional foods consumed by Indigenous peoples by means such as hunting, fishing and gathering.
First Nations[1]	Indigenous peoples in Canada who are not Métis or Inuit. They are the original inhabitants of Canada's land.
Food Insecurity (Moderate)	Individuals or households having to consume lower quality, less variety, or less desirable foods.
Food Insecurity (Severe)	Individuals or households having to skip means or limit regular consumption of foods.
Indigenous[2]	Belonging to a locality. Indigenous peoples in Canada refers to First Nations, Métis and Inuit peoples.
In-migrant	A person moving into a province/territory from another province/territory.
Inuit[3]	Indigenous peoples in Canada, mostly inhabiting Canada's northern regions.
Métis[4]	Indigenous peoples in Canada of mixed European and Indigenous ancestry.
Out-migrant	A person moving out of a province/territory into another province/territory.
Revised Northern Food Basket	A compilation of 67 food items developed by (formerly) Indian and Northern Affairs Canada, used to monitor and compare food prices in northern communities.

[1] The Canadian Encyclopedia, “First Nations”.
[2] Merriam-Webster, “Indigenous”.
[3] The Canadian Encyclopedia, “Inuit”.
[4] The Canadian Encyclopedia, “Métis”.

PART I: Overview of Canada's Arctic

Introduction

The Arctic is a significant part of the Canadian landscape, encompassing 39% of Canada's total land area at 3.5 million km^2 and over 2.1 million km^2 of maritime coverage.[5] Home to a diversity of individuals, wildlife, natural resources and ecologically sensitive areas, including over 36,000 islands, Canada's Arctic is culturally, economically and environmentally valuable both nationally and internationally.

There is a renewed focus on Canada's Arctic as a result of increasing pressure to address the impacts of climate change and the resulting political considerations. Notably, the reduction of Arctic sea ice has increased the possibility of Arctic transit shipping alternatives, attracting international interest. Resulting implications, such as increased shipping in the Arctic, pose a threat on northern communities that are disproportionately vulnerable to social and environmental change.[6]

Further, current scientific knowledge about the Arctic is not necessarily comprehensive as studies are generally taken over short periods of time and under ideal weather conditions. With centuries' worth of experience in the harsh climate and traditional knowledge, inhabitants of these regions can contribute to better-informed decision-making about policies[7], including a potential ban on HFO in the Arctic. The proposed HFO ban would directly and indirectly affect those living in the north, where Arctic shipping is crucial to the annual resupply of essential goods as well as materials for industry. A crucial initial step in understanding the impact of a potential HFO ban is to better understand the communities themselves through an in-depth look at demographics, socioeconomic conditions and living conditions.

Geography

Arctic waters in Canada are defined by the Arctic Waters Pollution Prevention Act (AWPPA) as those waters located above the 60th parallel north and out to the extent of the Exclusive

[5] Statistics Canada, 2016 Census Highlights Table; Arctic Council, AMSA 2009 Report, 112.
[6] Government of Canada, Canadian Polar Commission, The State of Northern Knowledge in Canada, 14.
[7] Government of Canada, Fisheries and Oceans Canada, Conversations with Nunavut Communities…, 13.

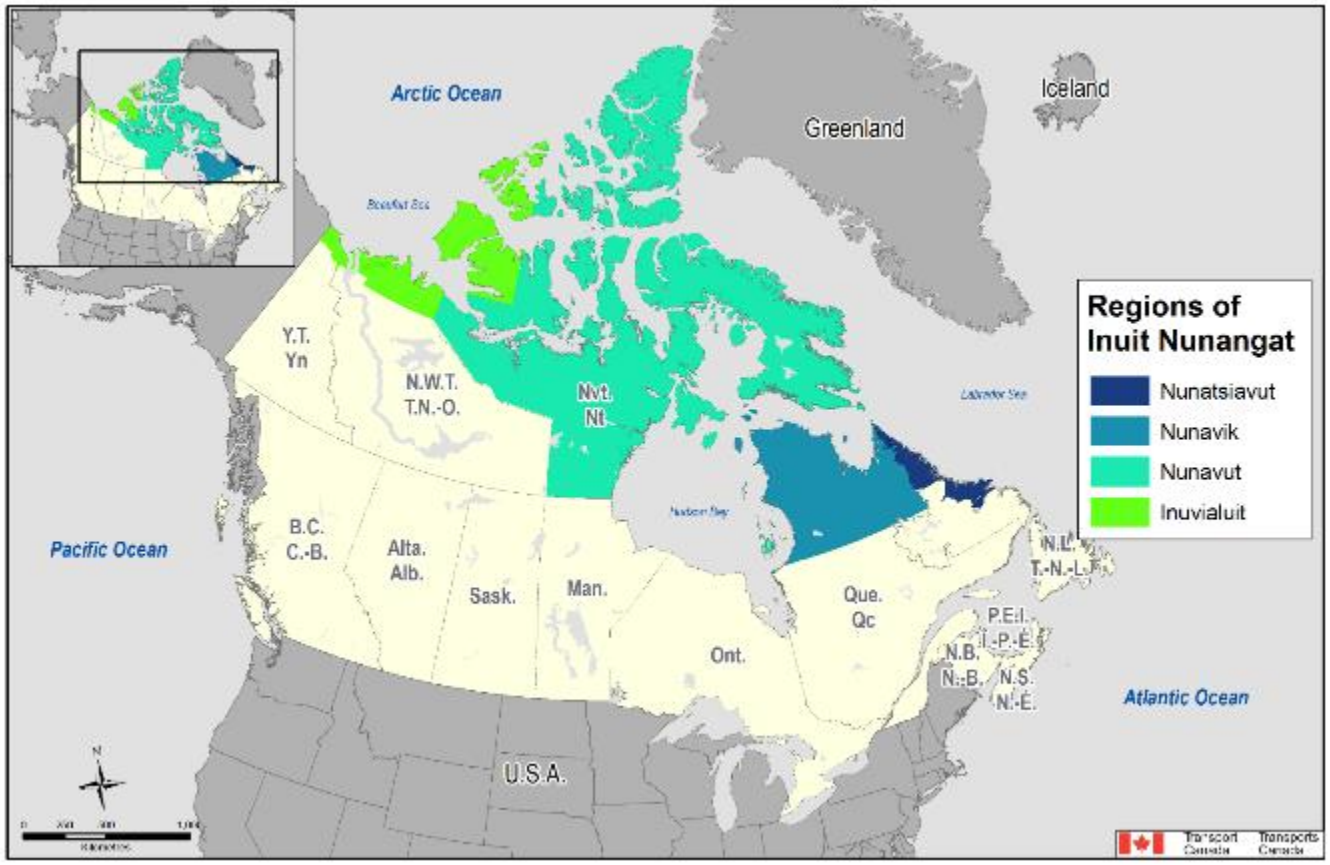
Economic Zone[8]. The three territories – Yukon, Northwest Territories and Nunavut – lie above 60°0'N and make up the vast majority of Canada' s Arctic land (**Figure 1**).

Figure 1: Map of Canada – Arctic boundaries

Additionally, parts of northern Quebec and northern Labrador, located in Inuit Nunangat, lie within the boundaries of the Arctic. Inuit Nunangat is a term used by Inuit to describe their homeland in Canada, and is the comprehensive area of the four Inuit Land Claims Agreements, encompassing not only land but also water and ice across Canada's Arctic: Nunavik (northern Quebec); Nunatsiavut (northern Labrador); the territory of Nunavut; and Inuvialuit (northern Northwest Territories) (**Figure 2**).

[8] https://laws-lois.justice.gc.ca/eng/acts/a-12/

Figure 2: Map of Inuit Nunangat



Some areas below 60°0'N will also be impacted by the proposed ban, notably communities located along the coast of Hudson Bay,James Bay, and Ungava Bay, including Churchill,Manitoba and Inuit and Cree communities in Quebec. All marine transportation entering this region must pass through Arctic waters, so these communities are impacted by any changes that affect Arctic shipping. Hence, these regions will also be considered in the report.

Discussions of demographics, socioeconomic conditions and living conditions in this report are focused on Canada's three territories as their land cover in its entirety are within Arctic boundaries. Information regarding other northern regions not part of the territories is more limited. However, more specific discussions on Indigenous communities are focused on the four regions of Inuit Nunangat, which are most directly impacted by Arctic shipping.

Demographics: Who Lives in the Canadian Arctic?

The Territories

Population Characteristics

The population of 121,470 in the territories make up less than 1% of Canada's total population, and is distributed across the region as the following:

Figure 3: Population by Territory

Population			Population Growth	
Territory	**Population**	**Territory Size (km^2)**	**2011-2016**	**2018-2023 (expected)**
Yukon	38,630	47,4713	5.8%	13.5%
Northwest Territories	44,597	1,143,794	0.8%	0.5%
Nunavut	38,243	1,877,779	12.7%	10.5%
Total	121,470	3,496,286	5.0%	6.0%
Total Canadian Population	36,963,854	8,965,589		

Adapted From: Statistics Canada, 2016 Census Profiles; Yukon Bureau of Statistics; Northwest Territories Bureau of Statistics; Nunavut Bureau of Statistics; Conference Board of Canada, Territorial Outlook.

Fewer than 90 communities span all three territories, resulting in an average population density of 0.04 residents/km^2, compared to the Canadian population density of 3.92 residents/km^2. [9] The largest city in the territories is Yukon's capital, Whitehorse, with a population of approximately 30,000. [10] Apart from a select few population centres[11], including Whitehorse, most communities have a population of less than 1,000.[12] It is to be noted that these small numbers may have a large impact on percentages in subsequent sections of this report (i.e., demographic statistics).

The three territories show different dynamics in terms of population numbers (**Figure 4**).[13] The crude birth rate (number of live births per 1,000 people) in 2016 between the three territories shows that Nunavut's population is growing more than Yukon and the Northwest Territories.[14] The total fertility rate (number of live births per 1,000 women), is below the replacement rate of 2.1 live births per woman[15] for Yukon and Northwest Territories and above the replacement rate for Nunavut. This suggests that whereas Yukon's and Northwest

[9] Statistics Canada, 2016 Census Profiles.
[10] Yukon Bureau of Statistics, 2017 Fourth Quarter Population Report.
[11] A *Population Centre*, as defined by Statistics Canada, is an area with a population of at least 1,000 and no fewer than 400 persons/km^2. Source: Statistics Canada, Census Dictionary, "Population Centre".
[12] Statistics Canada, 2016 Census Profiles.
[13] Statistics Canada, Table 17-10-0008-01 Estimates of the components of demographic growth.
[14] Statistics Canada, Table 13-10-0418-01 Crude birth rate, age-specific fertility rates and total fertility rate.
[15] United Nations, Total Fertility Rate.

Territories' populations are aging, the proportion of Nunavut's young population is increasing.

Figure 4: Components of Population Change (2016-2017)

	Yukon	Northwest Territories	Nunavut
Births	401	666	933
Crude Birth Rate	11.6	14.4	24.3
Total Fertility Rate	1.6	1.8	3.0
Deaths	242	219	216
Net Migration	230	224	32
Immigration	233	227	36
Emigration	3	3	4
Interprovincial Migration			
In-migrants	3,340	4,093	2,433
Out-migrants	3,009	5,327	2,595

Adapted From: Statistics Canada, Table 17-10-0008-01; Statistics Canada, Table 13-10-0418-01; Statistics Canada, Table 07-10-0020-01.

Compared to Yukon and Northwest Territories, the net migration[16] was relatively lower in Nunavut but still contributed to population growth. Yukon and Northwest territories' net migration played more of a role than birth rate in their population growth. Interprovincial migration[17] varied between the territories. Looking at data collected quarterly from Statistics Canada, the total amount of in-migrants from other provinces was greater than out-migrants from Yukon between 2016 and 2017. For Northwest Territories and Nunavut, there were more out-migrants than in-migrants in the same years.[18]

All territories are distinguished by a younger population when compared to Canada's median age of 41. The median ages of Northwest Territories and Nunavut are much younger at 34 and 25 respectively, while Yukon's median age of 39 is closer to the Canadian median.[19]

[16] Net migration = immigrants – emigrants (international).
[17] Interprovincial migration = in-migrants – out-migrants (between provinces/territories in Canada).
[18] Statistics Canada, Table 17-10-0020-01 Estimates of the components of interprovincial migration.
[19] Statistics Canada, 2016 Census Profiles.

Indigenous Presence in the Territories and other Impacted Communities

One particular characteristic of Canada's Arctic is the prominent Indigenous presence, including in northern Quebec and northern Labrador (**Figure 5**). All Indigenous communities in Canada's Arctic are coastal or on waterways, as the marine environment provides a means of transportation, communication and subsistence.[20] Beyond geographic territorial and provincial boundaries, First Nations, Métis and Inuit make up a complex network of communities in the North.

Figure 5: Aboriginal Population Breakdown in Northern Canada

Territory	Total Population	Aboriginal Identity (single Aboriginal responses)	First Nations	Métis	Inuk (Inuit)
Yukon	35,110	7,930	6,690	1,015	225
Northwest Territories	41,135	20,650	13,185	3,390	4,080
Nunavut	35,580	30,490	190	165	30,140
Northern Quebec (Census Division)	44,561	29,210	16,755	575	11,880
Northern Labrador (Census Division)	2,558	2,350	25	35	2,290

Adapted From: Statistics Canada, 2016 Census Profiles.

Inuit Nunangat

The majority of Canada's approximately 60,000 Inuit live in Inuit Nunangat, making up over 50 communities that altogether spread across 35% of Canada's landmass and 50% of Canada's coastline.[21] The territory of Nunavut is by far the largest region, with 26 of the communities located here and the majority of Nunavut's population being Inuit (**Figure 6**). The second largest region is Nunavik, which has 15 communities along the coast of James Bay and Hudson Bay, and is also mostly populated by Inuit. Similarly in Labrador, most people living in Nunatsiavut are Inuit and live in five communities in the region. Finally, Inuit in the Inuvialuit Settlement Region, although a small proportion of Northwest Territories' population, live in six communities in the northern coastal region.

[20] Arctic Council, AMSA 2009 Report, 113.
[21] Inuit Tapiriit Kanatami, About Canadian Inuit.

Figure 6: Inuit Nunangat Regions and Population

Region	# of Communities	Inuit Population
Nunavik	15	10,855
Nunatsiavut	5	2,310
Nunavut	26	30,140
Inuvialuit	6	4,080
Total	52	47,385

Adapted From: Inuit Tapiriit Kanatami, About Canadian Inuit; Statistics Canada, 2016 Census Profiles.

First Nations and Métis in the Arctic

Although First Nations and Métis make up less of the population in Canada's Arctic than Inuit, they nonetheless make up a significant proportion of the population in the region. Yukon's and Northwest Territories' First Nations and Métis comprise of a variety of different groups, predominantly the Tlingit and Dene.

There are also some First Nations and Métis living in Inuit Nunangat, including Nunavut. In the other communities below 60°0'N that are considered in this report, Churchill and surrounding areas are mostly populated by First Nations peoples (**Figure 7**). In Quebec, along James Bay, Cree communities are divided into nine villages on Eeyou Istchee (the James Bay territory). The total population in this region is 30,000, of which 15,000 are Cree.[22]

Figure 7: Churchill (Census Division) Aboriginal Population Breakdown

Total Population	8,971
Aboriginal Population	7,540
First Nations	7,040
Métis	430
Inuk (Inuit)	50

Source: Statistics Canada, 2016 Census Profiles.

Indigenous peoples in Canada's Arctic have a deep connection to the land, which has been their homeland for thousands of years. They rely on the land and its natural resources not only physically, but spiritually as well.[23] These land use activities include hunting, gathering

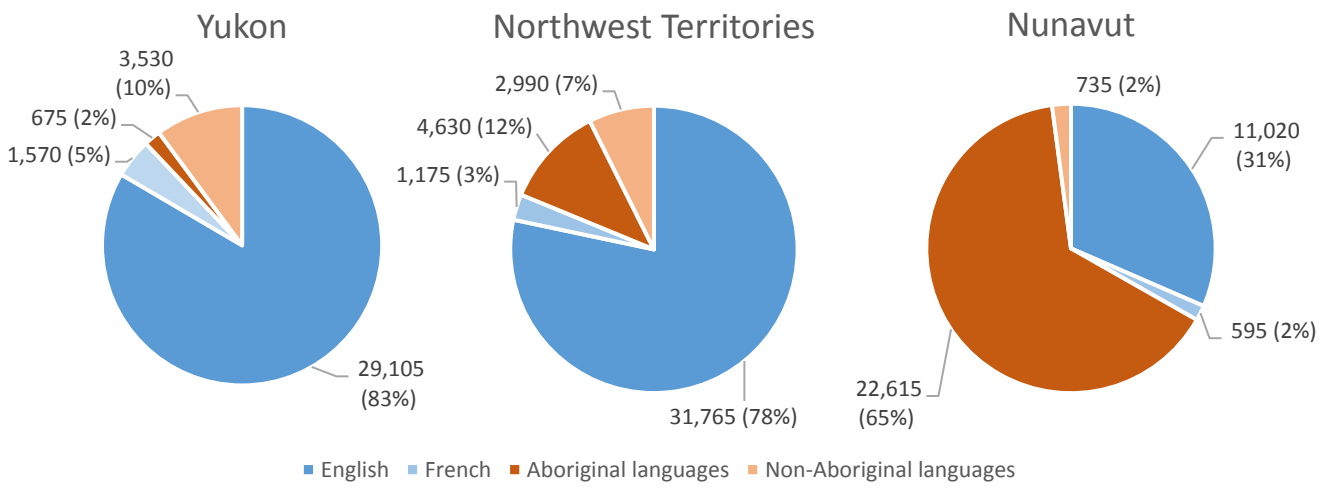
[22] Cree Hunters and Trappers Income Security Board, Cree Communities of Northern Quebec.
[23] Library of Parliament, The Arctic: Northern Aboriginal Peoples.

and fishing to transportation and leisure activities. As the original inhabitants of Canada's north, land and water, which are seen as one, are a part of their culture, daily lives and their identity.[24]

Languages

The language profile of Canada's northern communities are representative of the cultural diversity in the territories. Looking at mother tongue languages reported in Statistics Canada's 2016 National Census, the prevalence of Canada's official languages (English and French) and non-official languages (Aboriginal and non-Aboriginal) differs across the territories (**Figure 8**).

Figure 8: Mother Tongue Language in the Territories



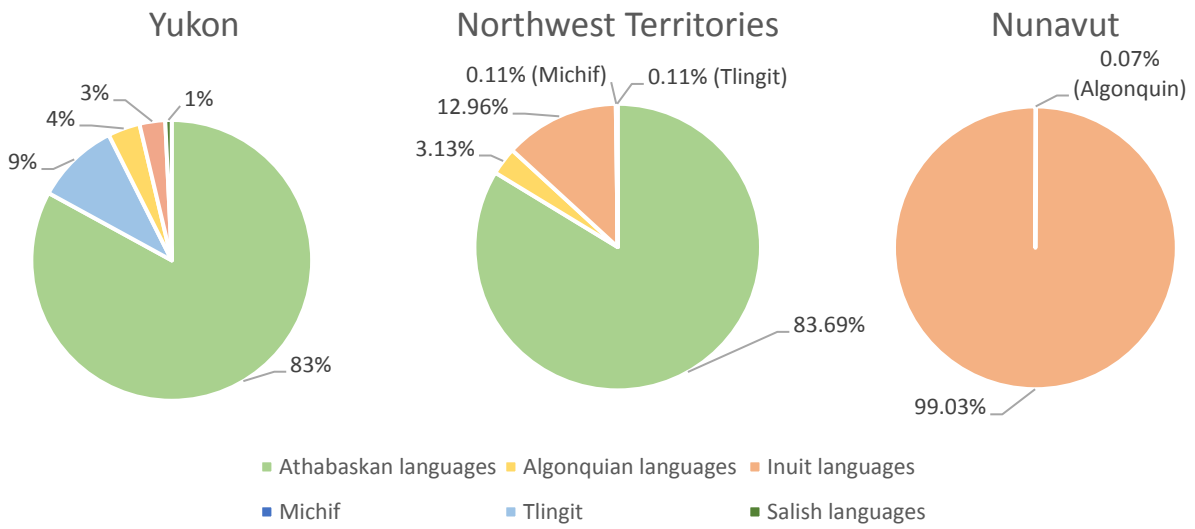
Adapted From: Statistics Canada, 2016 Census Profiles.

The share of different Aboriginal languages as a mother tongue in each territory reflects the different Indigenous[25] groups residing in the territory (**Figure 9**).

[24] Arctic Council, AMSA 2009 Report, 113; Inuit Tapiriit Kanatami, Nilliajut 2, 4.

[25] The term "Indigenous" will be used for this report. However, when referral is being made to Statistics Canada data, the term "Aboriginal" will be used, as this is the term used in their data sets.

Figure 9: Aboriginal Mother Tongue Language Breakdown



Adapted From: Statistics Canada, 2016 Census Profiles.

Yukon, with its 14 First Nations, has a wider range of Aboriginal language groups as a mother tongue prominent in its language profile.[26] In comparison, Northwest Territories only has three major groups and Nunavut only has one. In both Yukon and Northwest Territories, the First Nations language family, Athabaskan, is the predominant mother tongue; there are over 30 languages in the Athabaskan language family, which originate and are used across Alaska, Northwestern Canada and the Pacific Coast of the United States.[27] The proportion of Inuit languages increases from Yukon to Northwest Territories. Northwest Territories is also unique in that, on top of Canada's two official languages, there are nine Aboriginal official languages in the territory (**Exhibit 1** (Appendix II)).[28] In Nunavut, almost 100% of Aboriginal mother tongue languages are within the Inuit language family, called Inuktut, representing the largely-Inuit population.

In Inuit Nunangat, the prominence of Aboriginal languages is higher than in other Indigenous regions around Canada, with 83% of Inuit able to hold a conversation in an Aboriginal language.[29] The most common of these are Inuktitut, Inuvialuktun and Inuinnaqtun, which are all part of Inuktut. More individuals were able to hold a conversation in an Aboriginal language than individuals who reported an Aboriginal language as a mother tongue; this suggests that they were learned as a second language. The learning of Aboriginal languages

[26] Statistics Canada, 2016 Census Profiles.
[27] Hargus, Athabaskan Language Family.
[28] Prince of Wales Northern Heritage Centre, Official Languages of the Northwest Territories.
[29] Statistics Canada, Fact Sheet for Inuit Nunangat, 4.

as a second language, especially in such a young population, shows the importance of preserving languages to these communities and to Inuit culture.[30]

Additional details about demographics in the territories can be found in **Appendix I**.

Governance Structure

The diverse populations of Canada's Arctic and the wide spread of communities throughout create unique implications on the governance structure. The role of the federal government, territorial/provincial governments and regional organizations vary with each region and each corresponding Land Claims Agreement. Land Claims Agreements are significant political agreements the federal government has engaged in since the 1970s. Comprehensive Land Claims Agreements address Indigenous rights to lands and natural resources, and involve harvesting rights, co-management of land and wildlife and financial compensation (provided by the federal/territorial governments and usually to cover expenses and support agreement implementation). In addition, Self-Government Agreements can occur and be negotiated simultaneously with Comprehensive Land Claims Agreements, and involve transferring law-making authority to the Indigenous signatory (the respective Indigenous organization representing the residents of the Land Claims region), allowing them to pass and enforce laws.[31]

Appendix I illustrates the Comprehensive Land Claims Agreements and Self-Government Agreements signed in First Nations, Métis and Inuit communities in the territories and other northern regions.

Under the terms of each Comprehensive Land Claims Agreement and/or Self-Government Agreement, the regional organizations are the legal representatives of the respective Indigenous groups, and are responsible for carrying out and implementing their signatory duties in the agreements. They are also responsible for ensuring that other signatories (the corresponding territorial/provincial government and the federal government) meet their obligations according to the agreement. As part of their signatory duties, these organizations, on behalf of the individuals they represent, are given their inherent rights to lands and natural resources. They are also the recipients of the monetary settlement payments by the federal government and sometimes receive royalty payments from sources

[30] Statistics Canada, Fact Sheet for Inuit Nunangat, 4.
[31] Inuvialuit Regional Corporation, Self-Government.

such as resource development on Crown land. This money is managed autonomously and the organizations are responsible for distributing it.

These Land Claims Agreements and Self-Governments that introduced regional Indigenous organizations to the governance structure have resulted in unprecedented changes, relying on collaboration between all levels of government and Indigenous organizations. This co-management of the geographically dispersed communities in Canada's Arctic not only adds a layer of complexity to the governance structure but also creates administrative and logistical challenges that all parties must face collectively.[32]

Socio-Economic Conditions

Economy

Amongst the territories, the real Gross Domestic Product (GDP) in 2017 (in 2007 dollars), was the highest in Northwest Territories at $4.2 billion (**Figure 10**).[33] Five-year projections by the Conference Board of Canada indicate both Yukon's and Nunavut's GDP are forecasted to increase to above $3 billion by 2023. On the other hand, Northwest Territories' GDP, although still the highest compared to the other territories, is expected to decrease by approximately $200 million by 2023.

Figure 10: GDP by Territory, recent and projected (Millions, 2007 dollars)

Territory	2017	2023
Yukon	$ 2,308.05	$ 3,202.22
Northwest Territories	$ 4,202.05	$ 4,060.78
Nunavut	$ 2,159.28	$ 3,040.20

Adapted From: Conference Board of Canada, Territorial Outlook, GDP by Industry.

GDP was broken down by the North American Industry Classification System (NAICS)[34] to ensure standardization and comparability. The most significant contributor to Yukon's 2017 real GDP was Public Administration and Defence, making up 22% of the real GDP at $498 million (**Figure 11**).[35] In Northwest Territories, Mining and Oil and Gas Extraction made up

[32] Coates et al., The Role of the Public Sector in Northern Governance, iii.
[33] Conference Board of Canada, Territorial Outlook, GDP by Industry.
[34] NAICS is the classification standard used by Federal statistical agencies in North America. Source: United States Census Bureau.
[35] Conference Board of Canada, Territorial Outlook, GDP by Industry.

33% of the real GDP, while Non-metallic Mineral Mining and Quarrying made up 27% of the real GDP, adding up to over $2 billion altogether. Nunavut's real GDP also relied on natural resources; 20% of the real GDP was from Metal Ore Mining, while another 19% was from Mining and Oil and Gas Extraction.

Figure 11: Top GDP Contributor(s) by Industry (Expenditure Based) (2017)

Territory	Industry	GDP By Industry (Millions, 2007 dollars)	% of Total GDP in Territory
Yukon	Public Administration and Defense	$498.59	22%
Northwest Territories	Mining and Oil and Gas Extraction	$1367.52	33%
	Non-metallic Mineral Mining and Quarrying	$1143.89	27%
Nunavut	Metal Ore Mining	$432.78	20%
	Mining and Oil and Gas Extraction	$400.34	19%

Adapted From: Conference Board of Canada, Territorial Outlook, GDP by Industry.

A breakdown of the top six contributors of real GDP in the three territories can be seen in **Exhibit 2** (Appendix II). Looking forward, natural resource development is expected to continue to play a role in the territories' overall GDP growth. In Yukon and Nunavut, this is largely due to the growing metals market, supporting the mining and oil and gas extraction industry; gold output is expected to quadruple with improvements in mining capacity, especially in Nunavut.[36] On the other hand, in Northwest Territories, diamond production has been completed at Gahcho Kué and there are no new diamond mines expected to operate in the next 10 years. This contributes to the expected decrease in revenue in the non-metallic mineral mining industry, resulting in the projected overall decrease of GDP in Northwest Territories.[37]

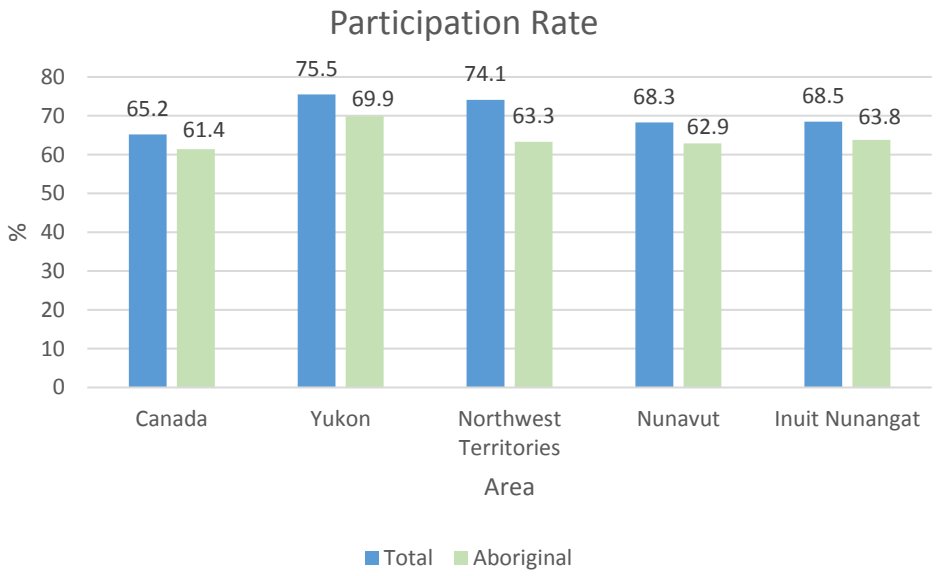
Labour Force

The participation rate across Canada's territories and other northern areas indicates the relative size of the labour force compared to the population above age 15. In the territories

[36] The Conference Board of Canada, Territorial Outlook Economic Forecast: Spring 2018.
[37] Ibid.

and Inuit Nunangat, the labour force participation rate was higher than Canada's overall participation rate of 65.2% (**Figure 12**).[38] The same applies to Churchill, which had a participation rate of 72.6% in 2016. The Indigenous populations' participation rates shown in the chart were all lower than the total populations' participation rates.

Figure 12: Participation Rates in Canada, the Territories and Other Northern Areas (2016)



Adapted From: Statistics Canada, Catalogue no. 98-400-X2016175, 2016 Census.

When broken down by industry according to the North American Industry Classification System, the greatest share of the labour force in the territories worked in the Public Administration industry.[39] This is also true for the census division of Northern Labrador. In the census division of Northern Quebec, the greatest share of the labour force worked in the health care and social assistance industry. Both of these industries included a high proportion of the labour force across all regions. Mining, quarrying, and oil and gas extraction was also an industry with a relatively high share of the different regions' labour forces. Other common industries across the regions were retail trade, educational services, transportation and warehousing and construction. **Exhibit 3** (Appendix II) shows the breakdown of labour force by industry for the territories. Tourism is also amongst the top 10 industries by labour force, and is important to note in the context of Arctic shipping since

[38] Statistics Canada, Catalogue no. 98-400-X2016175, 2016 Census.
[39] Statistics Canada, 2016 Census Profiles.

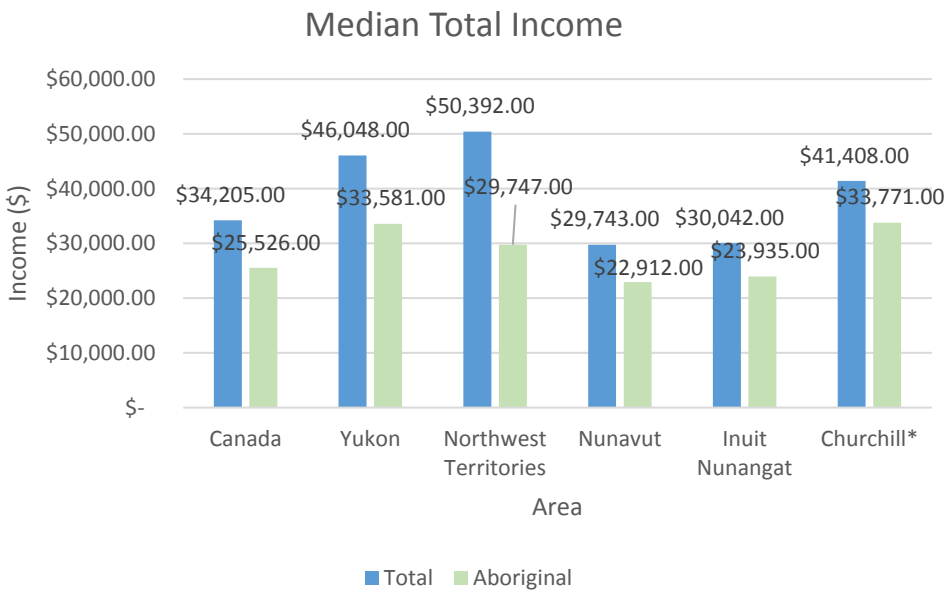
cruise ships and other tour operators bringing tourists into communities can help support the local economy, such as with the selling of local arts and crafts.

Income and Employment

Income

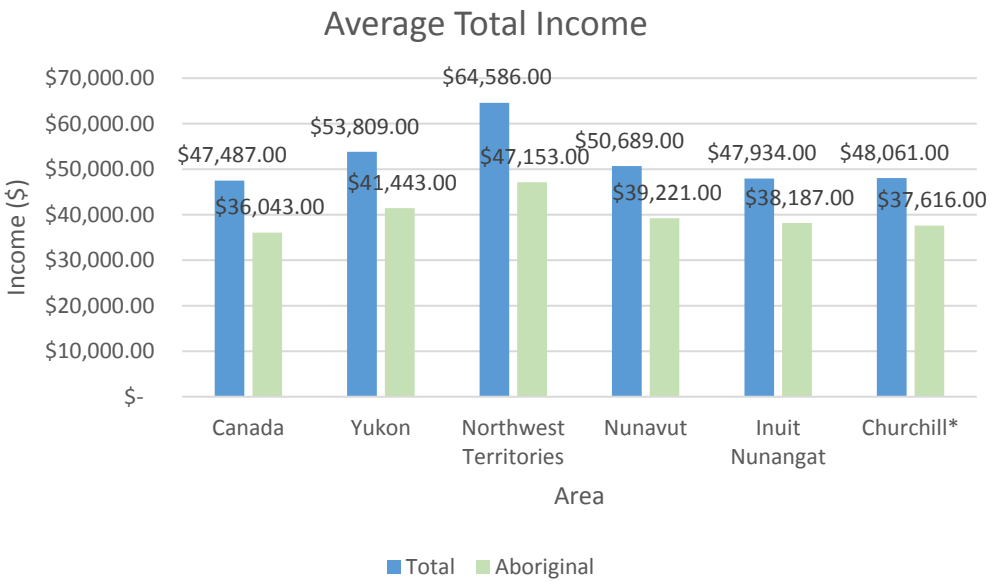
Canada's median total income in 2015 according to Statistics Canada's 2016 Census was $34,205, and the average total income was $47,487.[40] Compared to the territories, this is lower than the median and average total income of Yukon and Northwest Territories (**Figure 13**). Nunavut's median total income is lower than Canada's, while the average total income is higher. The same applies to all of Inuit Nunangat. In Churchill, both median and average total income are higher than Canada's. All three territories' higher total average income than Canada's can be attributed to employment in natural resource development, particularly mining. For example, in Northwest Territories, a strong diamond, oil and gas base has led its income per capita to being higher than any Canadian province or territory.[41]

Figure 13: Median and Average Total Income for Canada, the Territories, and Other Northern Areas (2015)



[40] The median total income is the amount that divides the income distribution of the population group into two halves, and the average total income is calculated by dividing the aggregate income of a group by the number of people in the group. Source: Statistics Canada, Catalogue no. 98-400-X2016171, 2016 Census.

[41] Conference Board of Canada, Income Per Capita: Provincial and Territorial Ranking.



Adapted From: Statistics Canada, Catalogue no. 98-400-X2016170, 2016 Census.
**Churchill's Aboriginal data is based on 2011 Census results.*

A pattern of income disparity exists for Indigenous peoples, who have lower median and average total incomes in all the regions. Many lower-paying service jobs are currently held by Indigenous peoples, contributing to this income gap.[42] Lack of education is seen as a main cause of this disparity, and will be discussed later in this section.

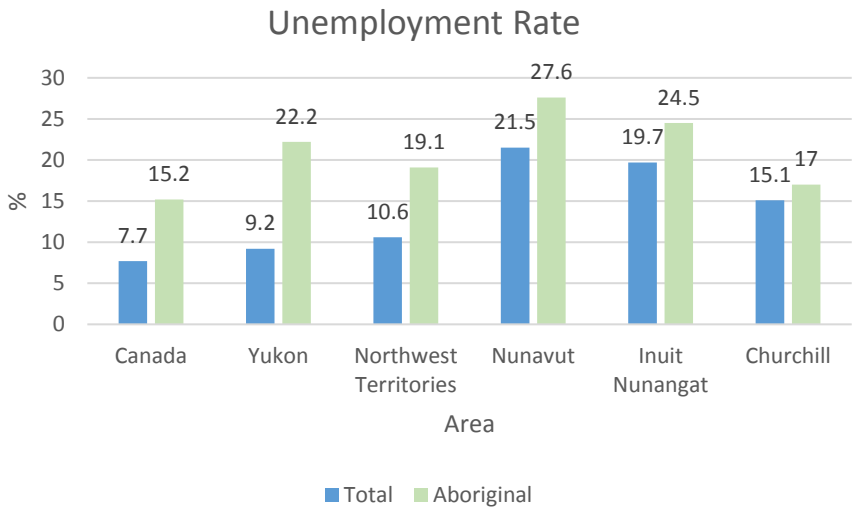
Employment

Canada's unemployment rate[43] in 2016 was 7.7%, lower than all the unemployment rates in Canada's Arctic regions (**Figure 14**). Whereas Yukon's unemployment rate of 9.2% was the lowest amongst these regions, Nunavut had the highest unemployment rate of 21.5%.[44] Across Canada and all the regions, the unemployment rate of Aboriginal populations was higher than the general population. The Aboriginal population in Nunavut had the highest unemployment rate of 27.6%, contributing to Inuit Nunangat's second highest Aboriginal unemployment rate.[45] Even though Yukon had the lowest unemployment rate out of these regions for total populations, their Aboriginal population's unemployment rate of 22.2% showed the greatest gap with a 9% difference.[46] Northwest Territories' unemployment rate difference between total and Aboriginal population was similarly high, while the town of

[42] Government of Canada, Indigenous and Northern Affairs Canada, A New Shared Arctic Leadership Model, by Mary Simon.
[43] Calculated by Statistics Canada as a percentage of the labour force.
[44] Statistics Canada, Catalogue no. 98-400-X2016175, 2016 Census.
[45] Ibid.
[46] Ibid.

Churchill demonstrated the smallest gap in unemployment between the total and Aboriginal population.

Figure 14: Unemployment Rates in Canada, the Territories and Other Northern Areas (2016)



Adapted From: Statistics Canada, Catalogue no. 98-400-X2016175, 2016 Census.

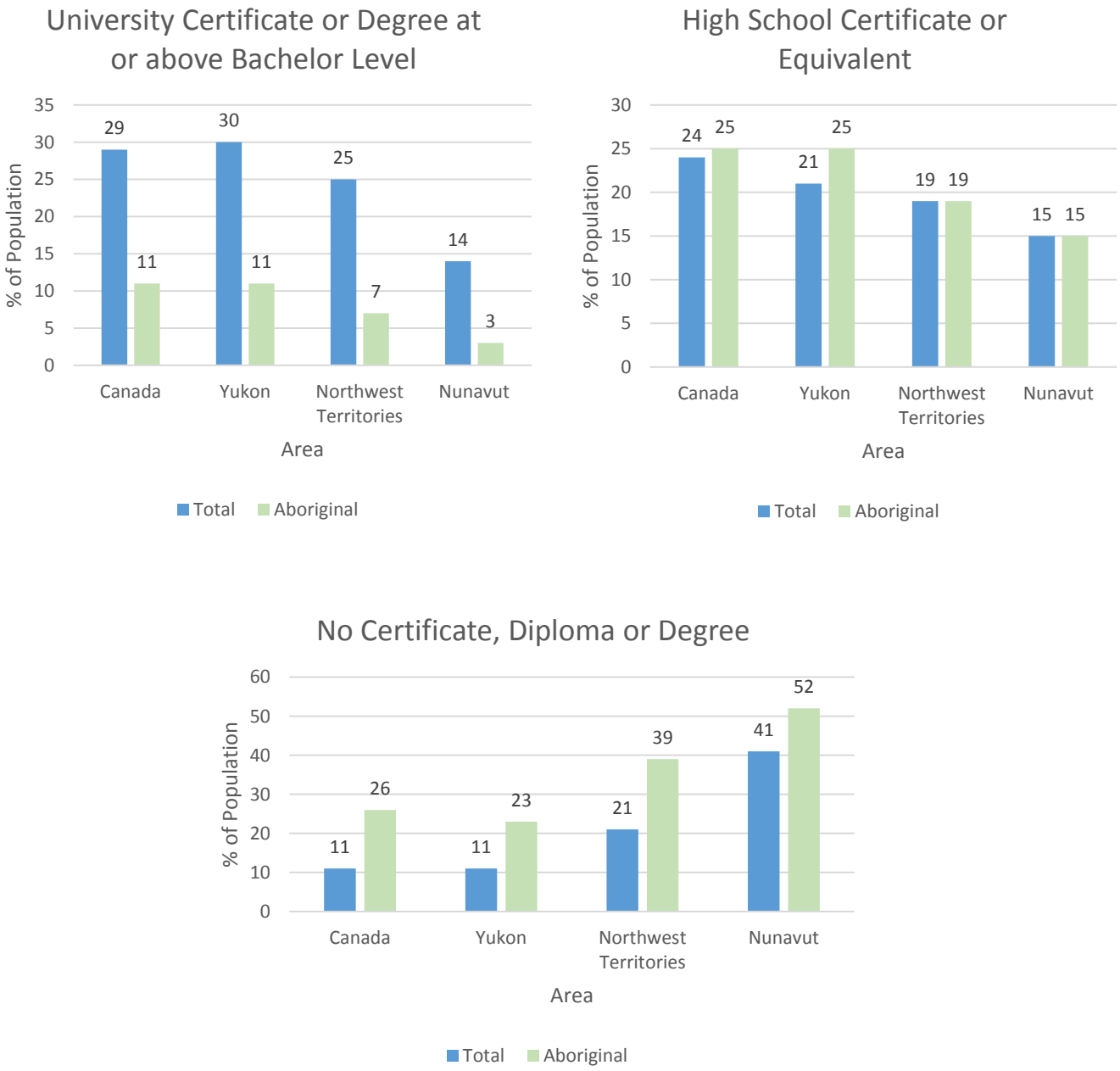
The higher unemployment rates for Indigenous peoples in Canada's Arctic and in Inuit Nunangat is a result of jobs being filled by highly-skilled workers from the south.[47] Although job availability is high, the supply of local labour is still low due to an education and skills gap.

Education

Looking at the proportion of the population aged between 25 and 64, the highest level of education attainment in the territories vary. In Canada, 29% of this population completed a university-level education, 24% completed a high school-level education, and 11% completed no certificate, diploma, or degree (**Figure 15**).[48] While Yukon had similar levels of highest education for no certificate, diploma, or degree and high school-level completion, it has higher university-level education completion than the overall percentages in Canada. Northwest Territories experienced less university-level and high school-level completion, and had almost double the proportion at 21% with no certificate, diploma, or degree.[49] Nunavut had the lowest education levels among all three indicators compared to the territories, with 14% of the relevant population completing education at the university-level, and 41% receiving no certificate, diploma, or degree.

[47] Conference Board of Canada, Unemployment Rate: Provincial and Territorial Ranking.
[48] Statistics Canada, Table 37-10-0099-01 Distribution of the population… by highest certificate, diploma, or degree.
[49] Ibid.

Figure 15: Distribution of the Population (aged 25 to 64) by Highest Level of Education (resulting in a certificate, diploma, or degree) (2016)



Adapted From: Statistics Canada, Table 37-10-0099-01 Distribution of the population… by highest certificate, diploma, or degree.

A similar disparity to that seen in other socioeconomic indicators exists with education in the territories and in Canada as a whole. Most notable was the Indigenous population in Nunavut, of which over half of the relevant population's highest level of education resulted in no certificate, diploma, or degree. Additionally, only 3% of Nunavut's Indigenous population completed a university-level education.

Within the Aboriginal population aged 25 to 64 in Churchill and Inuit Nunangat, low levels of education are also consistent. In the town of Churchill, 48% of this population received no certificate, diploma, or degree, and 0% had completed a university-level education.[50] In Inuit Nunangat, 56.4% of this population received no certificate, diploma, or degree, while 2.3% had completed a university-level education. Breaking down this 2.3%, 11% of First Nations peoples attained a university-level education and only 1.8% of the Inuit population attained a university-level education.[51]

The generally lower levels of educational attainment in Canada's Arctic, especially within the Indigenous population, is a complex issue with which education policy is continuing to struggle.[52] Beginning in the 1950s, Indigenous children in the northern territories were separated from their families and sent to residential schools.[53] While this lasted for a shorter period of time in the north compared to the rest of Canada, the intergenerational trauma of residential schools has had a lasting impact on the social and educational structures of Arctic Communities. This legacy continues to have negative impacts Indigenous languages and cultures throughout Canada, including in the Arctic, as struggles to "reclaim a sense of identity and self-worth" continue to be felt through generations.[54] As the process of reconciliation continues, territorial governments continue to work to provide culturally relevant and flexible education programs that incorporate Indigenous languages and traditional knowledge.[55]

Another cause of the lower levels of education in Canada's Arctic is the lack of accessibility. Canada is the only circumpolar nation without a university physically located in the Arctic. For the academic institutions that do exist, lack of accessibility hinders the attainment of education. This applies particularly to small or remote communities, which may be located far away from physical institutions, and where broadband connectivity is not adequately available to participate in online education resources.[56] Other socioeconomic factors, such as low income resulting in poor living conditions, also play a role in the lower levels of

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[50] Statistics Canada, 2016 Census Profiles.

[51] Statistics Canada, Fact Sheet for Inuit Nunangat, 5.

[52] Government of Canada, Indigenous and Northern Affairs Canada, A New Shared Arctic Leadership Model, by Mary Simon.

[53] Mcgill-Queen's University Press, Canada's Residential Schools: The Inuit and Northern Experience.

[54] Government of Canada, Indigenous and Northern Affairs Canada, A New Shared Arctic Leadership Model, by Mary Simon.

[55] Ibid.

[56] Conference Board of Canada, Education and Skills in the Territories.

education. For example, a lack of adequate nutrition or rest can have negatively impact learning and success.[57]

The lower education levels in the territories and other northern regions of Canada is a barrier for employment and income. One exception can be seen with natural resource developments that have Impact and Benefit Agreements. These are contracts signed between the natural resource development companies (e.g., a mining company) and the regional Indigenous organization, which help ensure local surrounding communities benefit from operations. Benefits are thus localized, and typically include commitments to local skills training, recruiting, retention and advancement.[58] However, for the most part, as the higher-paying available jobs require more skilled labour, companies are not able to hire locals for higher-paying jobs due to certification and union regulations.[59] This contributes to the lower employment and income levels for Indigenous peoples and why they tend to be employed in lower-paying service jobs. It follows that education, or the lack thereof, restricts economic development in Canada's northern communities.[60]

Living Conditions

Infrastructure

Canada's Arctic faces a significant infrastructure deficit in terms of transportation, energy and communication, which is a major barrier to both economic development in the region and improving the quality of life.[61] As climate change was not a consideration for existing infrastructure, warming temperatures causing the melting of permafrost has caused issues of soil stability; this has threatened the structural integrity of existing infrastructure. [62] Given the unpredictable and harsh climate of Canada's northern regions, infrastructure that is reliable and able to withstand these conditions is important for the development of the north. Future projects should also take into consideration potential impacts of climate change. Other considerations associated with infrastructure in the north are higher costs than the south, limited top-quality construction/maintenance contractors and the need to

[57] Government of Canada, Indigenous and Northern Affairs Canada, A New Shared Arctic Leadership Model, by Mary Simon.
[58] Ibid.
[59] Ibid.
[60] Government of Canada, Indigenous and Northern Affairs Canada, Canada's Arctic Policy Framework: Discussion Guide.
[61] Ibid.
[62] Government of Canada, Canadian Polar Commission, The State of Northern Knowledge in Canada, 13.

engage with Indigenous communities (to balance the infrastructure requirements with preserving culture and the environment).[63]

Transportation

Due to the northern environment and dispersed geography, transportation infrastructure is necessary to ensure the movement of people, goods and necessities.

Yukon is more developed in terms of transportation infrastructure. It has a road network including a 4,820 km all-season highway, with all but one community (Old Crow) being accessible by road.[64] In the Northwest Territories, more than half of the communities are only accessible by air, water in summer months, or ice-roads in winter months. Nunavut's communities are the least accessible, as all rely on either air or marine transportation in the warmer months.[65] Nunavik, Nunatsiavut and Churchill also do not have access to all-season roads. Nunatsiavut has access to a ferry connecting its communities to Happy Valley-Goose Bay, and Churchill has access to southern Manitoba with a railway.

Remote communities, especially those not connected by road infrastructure, depend on air and marine transportation for delivery of goods and basic necessities. This dependence means adequate air and marine transport infrastructure is important. Currently, a few airport runways are paved, but most are gravel; although gravel is sturdier to adapt to changes in permafrost, no modern aircrafts are fitted for gravel runways, suggesting a lack of infrastructure that can support current and future air transportation.[66] Additionally, there are only a few communities with small craft harbours, while most communities, including those that rely on sealift services for necessities, have no harbour facilities at all.[67] Not only does the lack of infrastructure hinder air and marine transportation services, the infrastructure that does exist can be deteriorating and may need repairs or maintenance. A significant cause of these challenges is the impact of climate change on existing infrastructure.[68] For example, due to the melting permafrost as a result of warming weather in the Arctic, many runways are experiencing deterioration, requiring repairs.[69] Failure or

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[63] Markovich, P3's and Transportation Infrastructure: Experience and Opportunities for Canada's North, 3.
[64] Ibid.
[65] Government of Canada, Indigenous and Northern Affairs Canada, A New Shared Arctic Leadership Model, by Mary Simon.
[66] Government of Canada, Natural Resources Canada, Climate Risks and Adaptation Practices for the Canadian Transportation Sector 2016, 33.
[67] Ibid.
[68] Ibid.
[69] Bennett, How Researchers Are Saving Northern Runways.

delays in repairs become a safety risk for passengers and aircraft operators as well as limiting the amount of fresh food a community can receive due to delayed deliveries. The spread and low density of the population further add to the challenges with developing and maintaining infrastructure in the north, making it difficult to provide adequate levels of transportation services across the entire region.[70]

Energy

Currently, Canada's territories are not connected with the North American Power Grid. This means that instead of receiving electricity through a network that delivers electricity from generating stations to customers, the Arctic must independently produce locally-generated electricity.[71] While Yukon's independent electricity system is primarily hydroelectric, Nunavut currently depends entirely on fossil fuels. Northwest Territories has some hydroelectric facilities but also primarily relies on fossil fuels to generate electricity. Nunavik and Nunatsiavut are also isolated from any regional energy grid.[72] These communities typically use diesel- or fuel oil-powered generators (not including HFO).[73] Due to the lack of road access in these communities, this fuel must be transported to the local power generators during the seasonal sealift resupply services. This process is expensive as it requires storing large reserves of fuel; since there are no backup sources of electricity, fuel must be stored for emergency purposes, in addition to the estimated annual supply needed by communities. The independent nature of these power generating plants also make it expensive as economies of scale are unattainable. Substantial financial risk is taken on each year when securing fuel purchase agreements due to the price volatility of fuels like diesel, especially given the variance of electricity demand (high variance of peak and trough demand of communities at a given time).[74] This often results in some generators operating below capacity while others have to be cut off as capacity is reached.

Another challenge facing the communities in Canada's Arctic is the cold, harsh climate that requires durable infrastructure and makes it difficult for electricity generation technologies to operate.[75] Power-generating structures are beginning to age or have already surpassed

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[70] Markovich, P3's and Transportation Infrastructure: Experience and Opportunities for Canada's North, 18.

[71] Canadian Electricity Association, North American Power Grid.

[72] National Aboriginal Economic Development Board, Recommendations on Northern Infrastructure to Support Economic Development, 12.

[73] Knowles, Power Shift: Electricity for Canada's Remote Communities, 5.

[74] Knowles, Power Shift: Electricity for Canada's Remote Communities, 5.

[75] Ibid.

their life expectancy, which is increasing maintenance and operating costs.[76] In Northwest Territories, Nunavut and Inuit Nunangat, organizations are increasingly focused on developing opportunities for newer, sustainable and reliable electricity-production methods. For example, in Nunavut, the first Inuit-owned clean energy developer has been mandated to partner with communities in the Qikiqtani region (consisting of 13 communities) to advance clean energy projects such as solar energy.[77]

Communication

In addition to the lack of transportation and energy infrastructure and other high costs of operating services in the north, there is also a lack of communication infrastructure, particularly for internet broadband connection. In addition to communicating with distant family and friends and allowing businesses to access opportunities and resources, broadband connection can provide a way to access education and medical support without having to leave home. In an area where physical access to such resources is limited, broadband connectivity can play a large role in social and economic development.[78] For example, telemedicine, which offers long-distance diagnoses, live medical monitoring, and secure information exchange, could be developed and delivered via broadband to remote communities who otherwise would not have access to health care services.[79]

Access to broadband connection in Canada's northern communities is uneven between rural and urban communities and Indigenous and non-Indigenous populations.[80] Overall, 99% of Canadian households have access to broadband connection, whereas 50% of remote northern communities still rely on satellite internet instead of having a terrestrial backbone (land-based infrastructure). [81] In Yukon, 93% of communities have access to a terrestrial backbone for broadband connection, and 69% of communities in Northwest Territories have access. In Inuit Nunangat, 35% of Nunavik's communities have access to such connection and 100% of Nunatsiavut's communities have access.[82] On the other hand, no communities

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[76] Ibid.

[77] Senate of Canada, The Special Committee on the Arctic, Transcript from committee meeting on June 11, 2018.

[78] Government of Canada, Industry Canada, Connecting Canadians: Digital Canada 150.

[79] Arctic Economic Council, Arctic Broadband: Recommendations for an Interconnected Arctic, 10.

[80] Fiser, Mapping the Long-Term Options for Canada's North: Telecommunications and Broadband Connectivity, 15.

[81] National Aboriginal Economic Development Board, Recommendations on Northern Infrastructure to Support Economic Development, 3; Arctic Economic Council, Arctic Broadband: Recommendations for an Interconnected Arctic, 17.

[82] National Aboriginal Economic Development Board, Recommendations on Northern Infrastructure to Support Economic Development, 3.

in Nunavut have access to a terrestrial backbone for broadband connection. Indigenous communities in Canada's north have less access to terrestrial backbone broadband connection than non-Indigenous communities. [83] This is a result of limited infrastructure, especially for more remote and smaller communities where costs are higher for service providers, as costs increase with less users. Socioeconomic factors, such as limited income, also can limit adoption of broadband connectivity services in households and communities.[84]

Housing

Suitable housing, according to National Occupancy Standard (NOS) requirements set out by the Canadian Mortgage and Housing Corporation (CMHC), is defined as having enough bedrooms depending on the make-up of resident households.[85] *Unsuitable* housing on the other hand can be defined when overcrowding is experienced, where the number of persons per room surpasses NOS requirements of what is suitable. In Canada, the proportion of the population living in unsuitable housing is 4.9%. The rate of people living in unsuitable housing differs among the territories. Yukon's rate of unsuitable housing is slightly lower at 4.8%, Northwest Territories' is 10.5%, and Nunavut's unsuitable housing rate is by far the highest at 30.9%.[86] This reflects the differences in living conditions among non-Indigenous and Indigenous populations, as northern Indigenous peoples face disproportionately high rates of crowding.[87] For example, in Inuit Nunangat, 4.2% of the non-Indigenous population lives in conditions classified as crowding, while for the First Nations and Inuit population, the rate of crowding is 14.8% and 38.7%, respectively.[88]

This difference also applies to individuals living in homes in need of major repairs in Inuit Nunangat. While 35.1% of the Indigenous population in Inuit Nunangat lived in such housing, the percentage of the non-Indigenous population in Inuit Nunangat living in homes in need of major repairs was 15.7%.[89] Major repairs include housing conditions that affect the health and safety of residents, for example plumbing, electrical wiring, and structural repairs.

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[83] Fiser, Mapping the Long-Term Options for Canada's North: Telecommunications and Broadband Connectivity, 40.

[84] Ibid.

[85] Canadian Mortgage and Housing Corporation, Housing in Canada Online.

[86] Statistics Canada, Catalogue no. 98-400-X2016224, 2016 Census.

[87] Government of Canada, Indigenous and Northern Affairs Canada, Canada's Arctic Policy Framework: Discussion Guide.

[88] Statistics Canada, Fact Sheet for Inuit Nunangat, 4.

[89] Ibid.

Lack of suitable housing can be attributed to many factors. The overcrowding in housing that Canada's north faces is an indicator and effect of the high costs of living, lack of affordable housing options, and the limited availability of land for housing development in some cases. The limited availability of land for housing development, despite the Arctic's large area, can be a result of insufficient land use planning capacity.[90] There are also complex issues surrounding land tenure, given the different regulatory bodies resulting from Land Claims Agreements, which result in lengthy and costly development processes.[91] The high costs of living and lack of affordable housing can be associated with not only high construction costs but also high maintenance costs regarding repairs and utilities, such as electricity. Overcrowding also has implications on the health of inhabitants, for example increasing the risk of respiratory illnesses and mental health issues.[92]

Food Security

According to the United Nations' *World Food Programme*, food security is when one has "adequate access at all times to sufficient, safe, nutritious food to maintain a healthy and active life".[93] For Canada's Arctic, food security has been discussed for years as a major issue that inhabitants face.[94] Compared to the rest of Canada, the territories experience more prevalent food insecurity (moderate and severe food insecurity). While the Canadian average of total food insecurity in households is approximately 8%, Yukon's is close to 10%, while Northwest Territories is above 10%. Notably, over 20% of households in Nunavut experience food insecurity, and at a more severe level than any other province or territory.[95]

Factors affecting food security are the ability to afford food, accessibility to physical food resources, availability of nutritious food and cultural preferences of food.[96] These factors are relevant across all of Canada's Arctic and play a role in food security in the communities. For example, communities that have higher incomes and road accessibility experience higher levels of food security compared to more isolated communities with lower incomes. Communities with better access to nutritious foods and culturally appropriate foods will also experience higher levels of food security than those that do not.

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[90] Government of Canada, Canadian Polar Commission, Housing in the Canadian North, 2.
[91] Pulla, Framing Sustainable Options for Housing in Canada's North.
[92] Pulla, Framing Sustainable Options for Housing in Canada's North.
[93] United Nations, World Food Program, "What is Food Security?".
[94] Inuit Circumpolar Council Canada, Food Security Across the Arctic, 2.
[95] Le Vallée et al., Canada's Food Report Card 2016.
[96] Howard, Edge, Enough for All: Household Food Security in Canada, 12.

These factors also explain why levels of food insecurity are higher amongst the Indigenous population than the non-Indigenous population. In the Arctic, this is especially true in Inuit Nunangat. In Nunavik and Nunavut, 55% of adults aged 25 and over live in a household experiencing food insecurity. For Nunatsiavut and Inuvialuit, the percentage is 42% and 33%, respectively.[97] Social, economic and environmental changes in Canada's Arctic Indigenous communities have played a role in the high food insecurity, both in terms of access to sufficient food and adequate nutrition.

Research has shown that country foods, in addition to being culturally important for preserving traditional ways of living, are nutritiously valuable; availability of country foods leads to both better health and more food security.[98] Although a significant number of Indigenous peoples in the Arctic still practice traditional methods for accessing country food, such as hunting, fishing and gathering, it is becoming increasingly difficult to do so. One reason is that shifts to a wage economy, especially in some larger communities, limits the availability of time to participate in these activities.[99] Social changes, such as technological advances, have also changed the nature of these activities. For example, snowmobiles and boats are now considered standard equipment for modern hunting and fishing; these tools generally rely on fuel imported from the south, causing these activities to have higher costs than before.[100] Finally, climate change and naturally-induced changes, such as fluctuations in caribou herd populations, have led to limited availability of country foods.[101] As a result, reliance on imported food from the south is increasing, as individuals and communities depend more on grocery stores to access food.

The increased reliance on grocery stores makes the already high costs of living in the north even more challenging for communities that face relatively high amounts of poverty.[102] Food prices in Canada's Arctic communities and other remote areas are much higher than those of southern and more urban cities, mostly due to higher transportation costs. For example, in accordance with the Revised Northern Food Basket[103], providing a family of four in an

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

[98] Collings et al., Country Food Sharing Networks, 30.

[99] Ibid.

[100] Nutrition North Canada, Northern Food Retail Data Collection & Analysis.

[101] Ibid.

[102] Exner-Pirot, Addressing Northern Food Insecurity.

[103] Contains perishable and non-perishable food items in the following groups: Dairy products, eggs, meat, poultry, fish, meat alternatives and meat preparations, grain products, citrus fruit and tomatoes, other fruit, potatoes, other vegetables, oils and fats, and sugar.

isolated Inuit community with adequate nutritious foods costs around $400 a week, compared to around $200 in a city like Ottawa.[104] This price difference can be illustrated looking at individual products as well (**Figure 16**):

Figure 16: Price Comparison of Food Items in Nunavut and Canada (2017)

Food Item	Average Price in Nunavut	Average Price in Canada
2% Milk, 1L	$3.29	$2.48
Large Eggs, dozen	$4.20	$3.08
Smooth Peanut Butter, 500g	$6.48	$3.43
White Bread, 675kg	$4.88	$2.81
White Sugar, 2kg	$9.14	$2.83
Potatoes, 4.54kg	$12.85	$6.58
Whole Chicken, per kg	$13.54	$7.17

Source: Nunavut Bureau of Statistics

There are negative health effects that come with food insecurity. There has been an increased availability of foods that are processed, high in fat or sugar, or low in nutrients as these foods are convenient for transportation and storage purposes (i.e., they tend to be non-perishable). The increased availability of these foods and the lower awareness of nutritional values in many northern communities have consequently caused an increase in consumption of these foods. However, consumers may not be aware of the negative health implications associated with these foods. Consuming more of low-nutrient foods and less nutritious foods (such as country foods or fresh vegetables) leads to poor health and is associated with rising rates of obesity, obesity-related diseases (especially type 2 diabetes) and other chronic illnesses in the communities.[105]

In order to target food insecurity associated with high costs of food in northern and remote communities, Nutrition North, a Government of Canada program implemented in 2011, subsidizes certain items that are delivered by air to these communities, such as perishable foods like fruits and vegetables. The subsidy is given to retailers and is designed to be passed on directly to end-consumers. For other food items that are non-perishable, communities

[104] Statistics Canada, Food Insecurity among Inuit Living in Inuit Nunangat, 2.

[105] Collings et al., Country Food Sharing Networks, 32; Nutrition North Canada, Northern Food Retail Data Collection & Analysis; Howard, Edge, Enough for All: Household Food Security in Canada, 7.

rely heavily on seasonal sealift resupply services, as it is the cheapest and at times the only means of accessing these goods. It is to be noted that Nutrition North currently exclusively subsidizes food items delivered by air, and not by sealift.

Health

Additional to the aforementioned health issues faced in Canada's Arctic due to the widespread food insecurity, northern communities also face other health concerns. There is a discrepancy in health status when northern inhabitants are compared to Canadians in general, and between Indigenous and non-Indigenous populations.[106] In Canada, the average life expectancy at birth is 81.7 years, higher than any of the territories. While Yukon and Northwest Territories' life expectancy at birth is similar at 78.7 and 77.7 respectively, Nunavut's is around 10 years lower at 71.6.[107] The average life expectancy at birth in Inuit Nunangat is 69.5, with the lowest of the four regions being Nunavik at 66.8 years.[108] Despite the differences between areas within Canada's north, some of the common leading causes of death are cancer, cardiovascular diseases, chronic lower respiratory diseases, infectious diseases and suicide.[109] Infant mortality rates in Canada's Arctic similarly show discrepancies. For example, the Canadian infant mortality rate (per 1,000 live births) is 4.5, while in Nunavut it reaches 12.8.[110]

This discrepancy with respect to the health indicators in Canada's Arctic compared to Canada as a whole and within Canada's Arctic communities can be attributed to several factors. Along with food insecurity, living conditions such as unsuitable housing (e.g., crowding or housing in need of repairs) increases the likelihood of contracting diseases.[111] Inadequate health and well-being services in northern communities further impair the health of inhabitants. This is especially true for smaller communities outside of population centres, where there is a greater lack of proximate health resources; individuals must travel far distances to access such resources, costing time and money.[112] Lower education levels are seen as a barrier to health literacy, contributing to overall decreased health. This is

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[106] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 2.
[107] Statistics Canada, Table 39-10-0007-01 Life expectancy and other elements of the life table.
[108] Statistics Canada, Table 13-10-0403-01 Life expectancy, at birth and at age 65, by sex, five-year average, Canada and Inuit regions.
[109] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 3.
[110] Statistics Canada, Table 13-10-0368-01 Infant mortality, by birth weight.
[111] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 3.
[112] Ibid., 2.

especially true for lifestyle habits such as excessive alcohol consumption, resulting in higher amounts of substance abuse.[113]

There has also been an increasing concern regarding mental health issues in Canada's Arctic, as it is a significant issue in many northern areas. In addition to living conditions and socioeconomic factors that contribute to poor health overall, Indigenous peoples face intergenerational trauma from residential schools. In Canada's Arctic starting in the 1950s, there were only six residential schools, meaning that children had to travel long distances and often did not see their parents for years. This has resulted in long-lasting effects on individuals and families, who indirectly or directly suffered through institutionalized neglect as well as sexual and physical abuse.[114] The recent history of the northern residential schools means the intergenerational trauma is still felt in Canada's Arctic, and has been shown to have impacts on mental health and substance abuse issues.[115]

The trend of youth suicide in the Arctic has also been of rising concern. This trend is especially prominent within the Indigenous population and more specifically for male Inuit youth. In Inuit Nunangat, the suicide rates in the four regions are five to 25 times higher than Canada's suicide rate, and the youth suicide rates are amongst the highest in the world.[116] Studies have shown that mental health issues are related to suicide in the north, as well as physical, sexual and emotional abuse.[117] This is an issue many households face and that still needs research to understand the factors affecting such behaviour and to find adapted solutions.

Changing socioeconomic and environmental conditions may further contribute to the mental health challenges faced by Canada's Arctic communities, including high suicide rates. For example, a study in Nunatsiavut found that a sense of connection to culture, community and nature were factors that have a protective role against mental health issues and suicide. These factors are affected by accessibility to traditional practices, such as hunting. However, due to the impact of shifts to a wage economy, climate change, and other development, the

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[113] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 2; Statistics Canada, Table 13-10-0113-01 Canadian health characteristics.

[114] Mcgill-Queen's University Press, Canada's Residential Schools: The Inuit and Northern Experience.

[115] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 2.

[116] Government of Canada, Health Canada, National Aboriginal Youth Suicide Prevention Strategy; Inuit Tapiriit Kanatami, National Inuit Suicide Prevention Strategy.

[117] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 13.

ability to engage in these activities is compromised.[118] It is also becoming more difficult to interact with family and friends in other communities, due to restricted travel as a result of changing ice conditions. Limited access to traditional practices and restricted travel are creating disconnect between individuals and their culture, communities and environment. This disconnect in regions like Nunatsiavut is reported to foster negative emotions such as worry, boredom, isolation and stress, and limits mental health resiliency.[119] Disconnect to culture and land, in part resulting from the legacy of residential schools, is also a factor contributing to mental health issues. As is the case with general healthcare facilities, mental health resources in the north are limited, and when they are available, they are often not effective as they are not culturally appropriate and applicable for specific demographics such as Inuit youth.[120] Efforts and research to incorporate culturally sensitive resources for preventive intervention and treatment are ongoing.[121]

Despite an increased focus on the discrepancy in health status in Canada's Arctic, it remains challenging to comprehensively address physical and mental health issues in the north, given the dispersed and diverse nature of communities.

PART II: Local and Global Impacts of Arctic Shipping

Impacted Communities

The in-depth look at demographics, socio-economic conditions and living conditions has provided a general overview for understanding life in the Canadian Arctic and challenges the inhabitants face. The diverse characteristics of the regions result in multiple, complex factors that must be considered when making decisions that affect the Arctic. With regards to Arctic shipping, a look at specific communities directly served by Arctic shipping (**Exhibit 4,** Appendix II) is important to further understanding its impacts on livelihood in the Canadian Arctic.

Yukon

All of Yukon's communities, except Old Crow, have road access. Old Crow is the community of the Vuntut Gwitch'in, a First Nations group with self-government status. As it is located

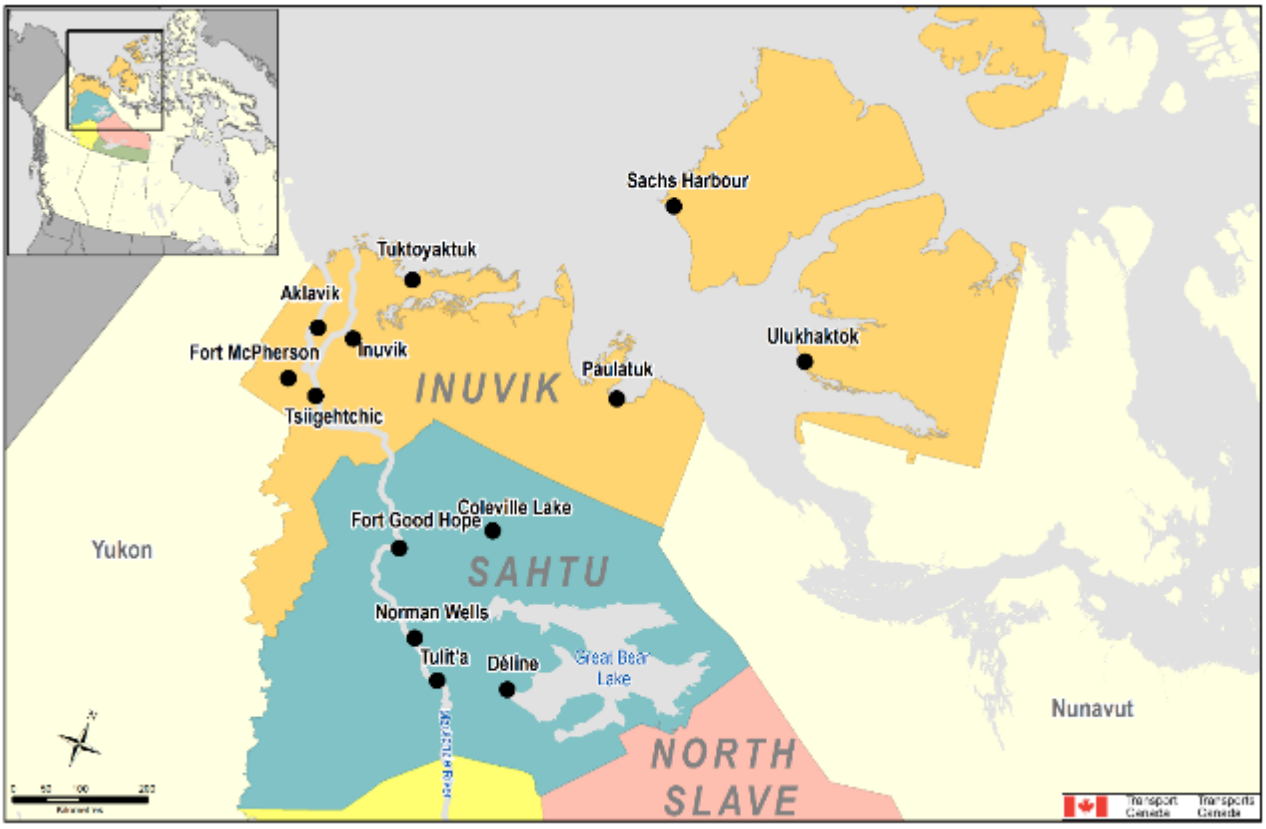
[118] Macdonald et al., Protective factors for mental health and well-being in a changing climate: Perspectives from Inuit youth in Nunatsiavut, Labrador, 138.
[119] Ibid.
[120] Government of Canada, Canadian Polar Commission, Health and Well-being in the Canadian North, 23.
[121] Ibid, 13.

inland, necessities such as other food items and diesel fuel for electricity generation must be flown in, significantly increasing the cost of living.[122] Arctic shipping therefore does not impact Yukon as no communities rely on or are directly served by it.

Northwest Territories

Approximately half of Northwest Territories' communities do not have road access. These communities are located in the two northernmost administrative regions of the territory: the Inuvik Region and the Sahtu Region (**Figure 17**).

Figure 17: Map of Communities in the Inuvik Region and Sahtu Region



Inuvik Region

The Inuvik Region is the northernmost region of Northwest Territories. It covers all of the Inuit Nunangat region of Inuvialuit as well as the Gwich'in Settlement Area, and includes

[122] Vuntut Gwitchin First Nation, Integrated Community Sustainability Plan, 6.

communities near the Arctic coast and those located on the islands of the Canadian Arctic archipelago.

Sachs Harbour and Ulukhaktok are the communities located on the islands. Sachs Harbour is on Banks Island and was established as a permanent settlement in 1929 when Inuit families moved there for trapping. The approximately 112 residents rely primarily on traditional hunting, trapping and fishing.[123] Ulukhaktok is on Victoria Island and is the traditional home of the Copper Inuit. Today, it is an Inuvialuit community home to 420 residents.[124] Hunting, trapping and fishing are relied on as a way of living and are important drivers of the local economy.[125] Further, printmaking has recently become a stable source of employment with the establishment of the Ulukhaktok Arts Centre, which sells local artists' work on-site and abroad to an international audience.[126]

Of the six communities in the Inuvik Region on the territory's mainland, Tuktoyaktuk, Inuvik, Tsiigehtchic and Fort McPherson are located along an all-season gravel road that connects to Dempster Highway in Yukon. [127] Tuktoyaktuk is the only Arctic coastal community in Canada that is connected by road access to the rest of Canada; this was established with the completion of the Inuvik-Tuktoyaktuk Highway in 2017.[128] Aklavik, to the west of Inuvik, is accessible only by winter roads when the Mackenzie Delta freezes. It is home to 600 residents with a prominent mix of both Inuit and Gwich'in peoples. Most of the community still relies on hunting and fishing, and traditional arts and crafts are a means of living and financial support for many individuals.[129] The sixth community in the Inuvik Region, which does not have access to a road, is Paulatuk, where Inuit settled in the 1920s. In the 1950s, a Distant Early Warning (DEW) line site was constructed in the community and became a source of jobs and income. Its construction and maintenance created permanent and seasonal wage labour work, starting a shift to a wage economy.[130] This site was part of a line of over 60 sites across Canada, Alaska and Greenland, with the original purpose to detect Russian bomber incursions in North American airspace. Over 40 of these sites were built in

[123] Northwest Territories Bureau of Statistics, Sachs Harbour.
[124] Northwest Territories Bureau of Statistics, Ulukhaktok.
[125] First Air, Ulukhaktok.
[126] Northwest Territories Business Development and Investment Corporation, Ulukhaktok Arts Centre.
[127] Inuvik-Tuktoyaktuk Highway, Communities Involved.
[128] Town of Inuvik, Inuvik to Tuktoyaktuk Highway.
[129] Government of Northwest Territories, Aklavik.
[130] Government of Canada, Parks Canada, Tuktut Nogait National Park.

Canada's Arctic.[131] The DEW line site has since been closed and today, many people out of the population of 312 still rely on traditional practices of hunting, gathering and fishing as their economic backbone.[132]

Sachs Harbour, Ulukhaktok, Aklavik and Paulatuk all lack year-round road access for the delivery of goods and fuel, but their coastal locations allow them to receive bulk delivery of these goods through seasonal sealift resupply services. Natural resources development, such as the oil and natural gas exploration that has started near Paulatuk, is also supported by sealift services in coastal communities through delivery of construction material, labour, and other supplies. Arctic shipping is hence important to the well-being and economic development of these communities.

Sahtu Region

The Sahtu Region is located in the middle of the territory and is part of land covered by the Sahtu Dene and Métis Comprehensive Land Claim Agreement, and consists of five communities: Colville Lake, Deline, Fort Good Hope, Norman Wells and Tulita. These Sahtu communities are currently accessible only by winter roads for around three months each year. Recently, the federal and territorial government announced funding of $140 million for the proposed Mackenzie Valley Highway, which would connect all communities in this region, except Deline and Colville Lake, to Dempster Highway and Wrigley.[133] Once complete, this would provide all-season road access from these communities to the rest of Northwest Territories. The Sahtu Region communities currently rely on winter roads and air transport. Those located along the Mackenzie River (Fort Good Hope, Norman Wells and Tulita) have access to community resupply services via river transportation from Hay River, which is connected to the highway system.[134]

Nunavut

Nunavut's 27 communities are divided into three regions: Qikiqtani, Kitikmeot and Kivalliq (**Figure 18**).

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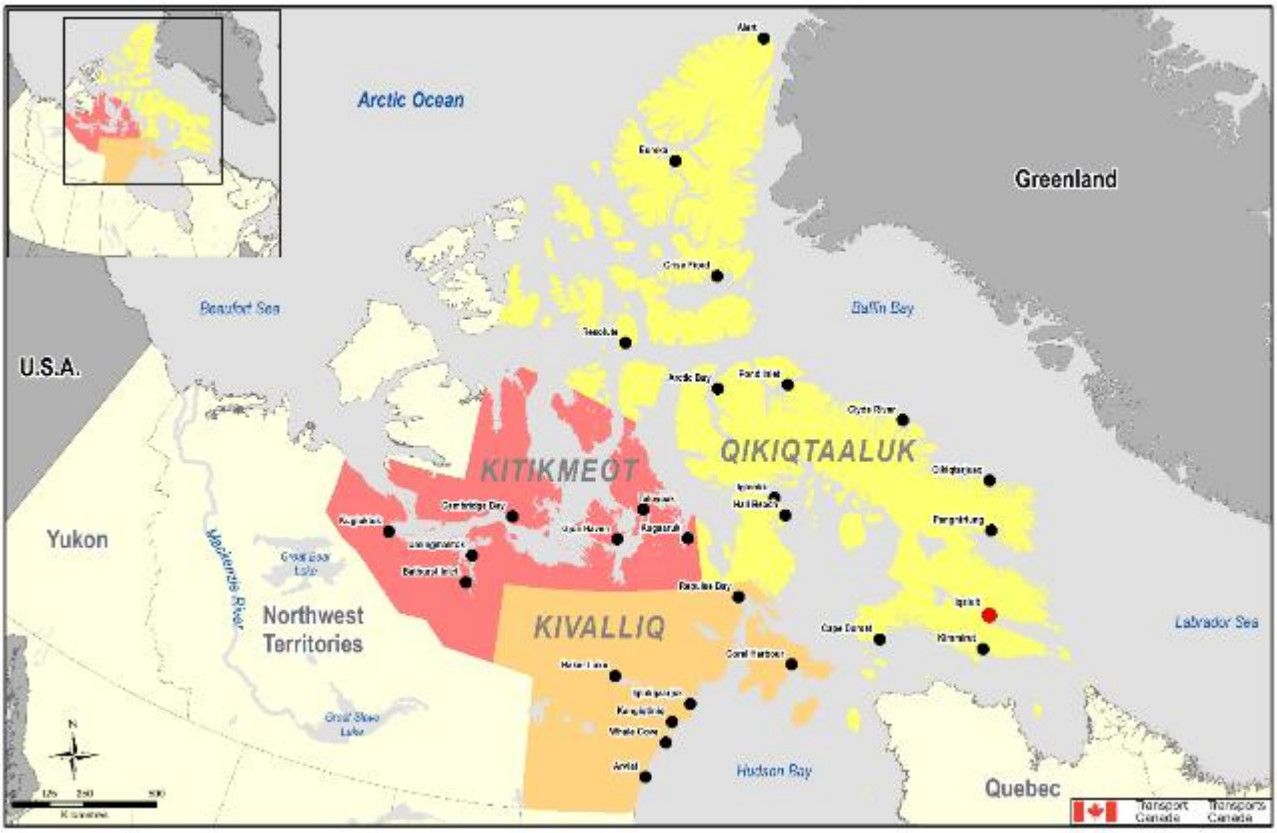
[131] Government of Canada, National Defence, The Distant Early Warning Line and the Canadian Battle for Public Perception.

[132] The Canadian Encyclopedia, Paulatuk; Northwest Territories Bureau of Statistics, Paulatuk.

[133] Government of Northwest Territories, Mackenzie Valley Highway.

[134] Government of Canada, Climate Risks and Adaptation Practices for the Canadian Transportation Sector 2016, 33.

Figure 18: Map of Communities in Nunavut's Three Regions



Qikiqtani Region

The Qikiqtani region is the largest, covering 12 communities including Iqaluit, the administrative centre of the region and the capital city of the territory. Most of these communities are located on Baffin Island, the largest island in Canada and the fifth largest in the world. Communities elsewhere are Grise Fiord located on Ellesmere Island, Resolute on Cornwallis Island, Hall Beach and Igloolik in the Melville Peninsula, and Sanikuliuaq in Hudson Bay. The Qikiqtani region covers the east part of Nunavut, and has a total population of 19,654.[135] No communities are accessible by road, and as they are all coastal, depend on seasonal sealift services in the summer for bulk shipments of goods and necessities (e.g., non-perishable foods).

On Baffin Island, high-grade iron ore deposits, including the largest one in Canada, play a role in local economic development. Baffinland Iron Mines is currently operating in this area and has contributed greatly to social and economic development of nearby communities: Arctic Bay, Clyde River, Hall Beach, Igloolik and Pond Inlet.[136] For example, $819 million

[135] Nunavut Bureau of Statistics, Population Data.
[136] Baffinland, Mary River Mine; Baffinland, The Mary River Project: Inuit Impact and Benefit Agreement.

worth of contracts have been awarded to Inuit-owned businesses since project development began in 1986.[137] Developments such as these require large amounts of bulk shipments of equipment and supplies to sustain operations, as well as day-to-day necessities for the workers, which are all delivered by ships. Mining companies also rely on Arctic shipping to export their goods to end markets around the world; for Baffinland, iron ore is shipped to destinations such as the Netherlands, France and Germany.[138] In 2017, over five million tonnes of iron ore was shipped out, with close to 50% of this product going to the Netherlands. Exploration of other resources for potential future development is ongoing, such as diamond exploration.[139]

Kitikmeot Region

The Kitikmeot region with a population of 6,900 is the westernmost in Nunavut and has seven communities located on mainland Nunavut and some islands.[140] The communities on the mainland are Kugaaruk, Bathurst Inlet, Bay Chimo, Kugluktuk and Taloyoak, and populations in these communities range from approximately 25 to over 1,000. Gjoa Haven is located on the southeast coast of King William Island and has a population of 1,483. Cambridge Bay, the administrative centre of the Kitikmeot region, is located on Victoria Island and has a population of 1,746.[141] Research centres and initiatives were historically commonly located in Cambridge Bay, for example with a Distant Early Warning line established in 1955.[142] It is also currently home to POLAR Canada's new Canadian High Arctic Research Station (CHARS) campus.[143]

In all seven communities, traditional practices such as subsistence hunting, trapping, and fishing, as well as cultural arts and crafts are the main drivers of local economies. Again with no road access, they must rely on imported goods and necessities via sealift services in the summer to receive bulk goods and necessities that cannot be found locally. All communities have potential natural resources including gold, diamonds, precious metals and nickel-copper platinum group elements. The main ongoing project is the Hope Bay Project, which

[137] Baffinland, 2017 Annual Report.
[138] Fednav, Baffinland Second Shipping Season Totals Over 2.7 Million Tonnes of Iron Ore.
[139] Peregrine Diamonds Limited, Chidliak Project.
[140] Nunavut Bureau of Statistics, Population Data.
[141] Ibid.; Kitikmeot Inuit Association, Community Profiles.
[142] Nunavut Planning Commission, Cambridge Bay.
[143] Government of Canada, CHARS Campus.

began operations in 2017.[144] The Hope Bay site has an established high-grade gold deposit amount with proven reserves of approximately 491 million ounces, with a mine life of 20 years.[145] There are other explorations currently ongoing for gold and other resources such as silver and diamond.[146] Growth of the Hope Bay Project and future potential projects will also come with more reliance on sealift services to transport supplies to and mined goods from these sites.

Kivalliq Region

The Kivalliq region is the southernmost region in Nunavut, covers mainland Nunavut, Southampton Island and Coats Island, and has a population of 10,528.[147] Of the seven communities in the region that are all coastal or located on a waterway, six are on the mainland. These are Naujaat, Baker Lake, Chesterfield Inlet, Whale Cove, Arviat and Rankin Inlet, which is the administrative centre.[148] Arviat and Rankin Inlet are the largest communities, with populations of 2,772 and 2,675, respectively. The other communities have between 1,000 and 2,000 residents, except Chesterfield Inlet, which is the smallest community with a population of 473.[149] The seventh community is Coral Harbour, which has a population of 1,080 and is located on Southampton Island at the northern edge of Hudson Bay.

An abundance of wildlife, especially sea mammals, in most of these communities allows them to maintain traditional diets and lifestyles. Arts and crafts are also an economic driver. For other goods and necessities not available locally, the Kivalliq region like the other regions in Nunavut rely on imports during seasonal sealift services for non-perishable foods and other bulk supplies. Of particular note with respect to marine transportation, Rankin Inlet, which is located at the gateway of Nunavut from Central and Western Canada, is seen as a transportation hub due to its location. The large amount of marine traffic that passes by has created a strong industry of support activities, such as freight expediters and equipment suppliers.[150]

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[144] Kitikmeot Inuit Association, Current Projects.
[145] TMAC Resources, Hope Bay. TMAC Resources, Hope Bay Project – June 2016.
[146] Kitikmeot Inuit Association, Current Projects.
[147] Nunavut Bureau of Statistics, Population Data.
[148] Kivalliq Inuit Association, About the Kivalliq Region of Nunavut, Canada.
[149] Nunavut Bureau of Statistics, Population Data.
[150] Government of Nunavut, Kivalliq Region.

The most significant natural resource development in the Kivalliq region is in Baker Lake and Rankin Inlet. Rankin Inlet has a history of mining, and in Baker Lake, the Meadowbank gold deposit exploration has already involved contributions to the local economy, by providing employment to locals.[151] With operations just started in 2018, it produced 61,447 ounces of gold and 60,000 ounces of silver just in the first quarter of the year.[152] Located 300 km from Hudson Bay, Arctic shipping is important to the development of such projects in the Kivalliq region as well.

Quebec

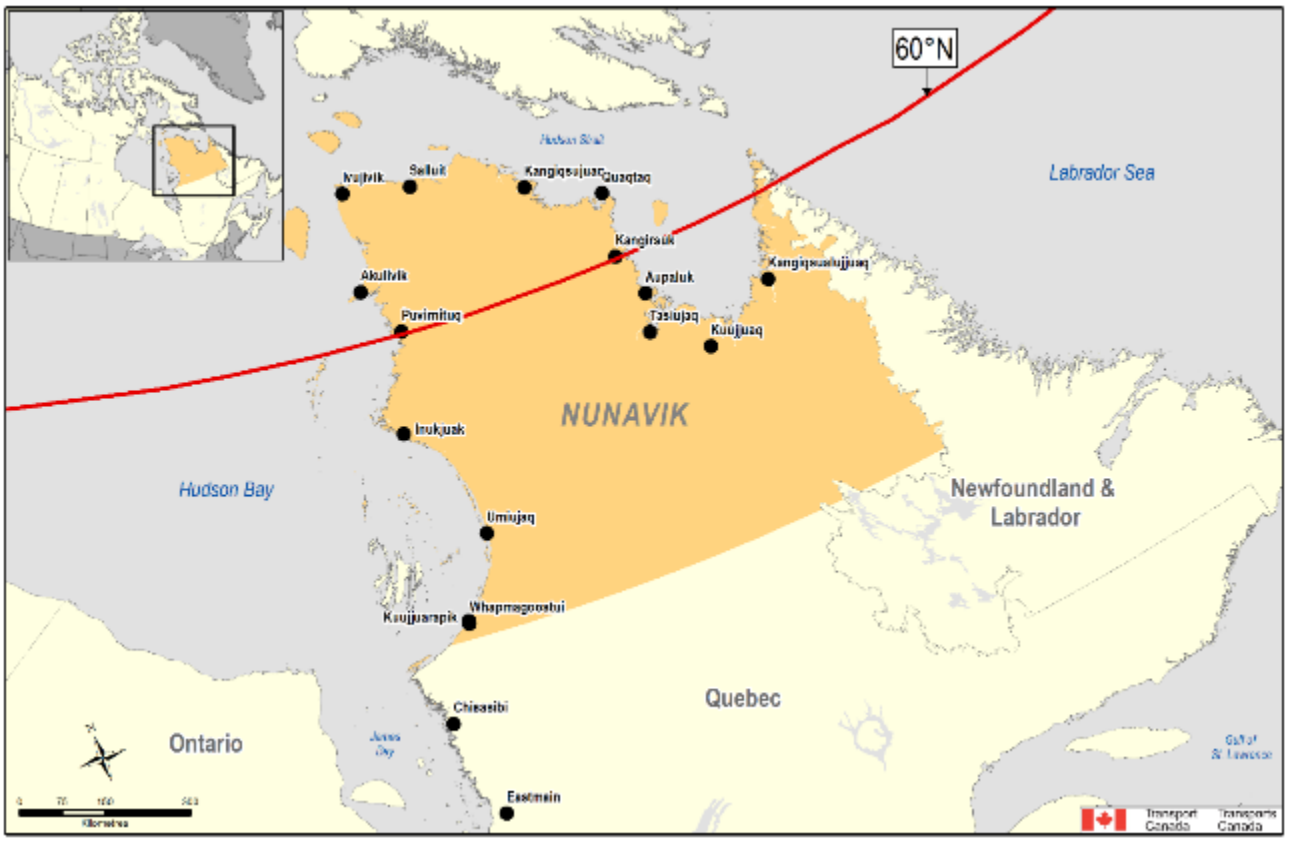
In Quebec, there are two regions that cover the northern area and coast of Hudson Bay and James Bay: Nunavik and Eeyou Istchee.

Nunavik

Nunavik (**Figure 19**) consists of 15 Inuit communities situated along the northern tip of the province next to Ungava Bay, Hudson's Straight and Hudson Bay. Kuujjuaq, located toward the east of Nunavik, is the largest of these communities and has a population of 2,400. Excluding Kuujjuaq and three other communities (Puvirnituq, Salluit and Inukjuak), the populations of all other communities in Nunavik are below 1,000. Puvirnituq and Kuujjuaq are Nunavik's administrative centres. Nunavik's total population is approximately 15,700.[153]

[151] Ibid.
[152] Agnico Eagle, Meadowbank.
[153] Makivik Corporation, Our Communities.

Figure 19: Map of Communities in Nunavik



The mostly Inuit-populated communities still rely on traditional ways of living, as the land and especially water provide them with sources of food and other necessities. However, there is a significant reliance on other goods that are not available in the region. No communities have road access, and thus must rely on seasonal sealift resupply services for bulk delivery of these necessities.[154] There are two operating mines located in Nunavik: Raglan Mine and Nunavik Nickel Mine. Raglan Mine, a nickel and copper mine and treatment facility that treats 1.3 million tonnes of ore annually, employs approximately 15% of its workers from Kangiqsujuaq.[155] This mine, one of the richest base-metal mines in the world, is also supported by Arctic shipping services via a road that connects its facilities to port facilities at Deception Bay.[156] Nunavik Nickel Mine is also located near Deception Bay and relies on Arctic shipping to export its nickel and copper concentrate products to end markets in Europe and Asia. Arctic shipping is hence important in this region, not only in terms of local benefits of operating the mine but for global players in the supply chain. For example, minerals from Raglan mine, once shipped out from the Arctic and processed at various

[154] Ibid.
[155] Ibid.; Glencore Group, Raglan Mine.
[156] Glencore Group, Raglan Mine.

stages in Quebec City and Sudbury, are sent to a refinery in Kristiansand, Norway, before they are sold worldwide.[157] This refinery is an important economic player in its community in Norway, suggesting the importance of Arctic shipping for the mining industry not only for Canadian communities but international economies as well.

Eeyou Istchee

Eeyou Istchee is the land of the Crees of eastern James Bay and southern Hudson Bay in Quebec, and has a population of 30,000, with approximately 15,000 Crees, in its nine communities.[158] The administrative centre of Eeyou Istchee is in the community of Nemaska, which is the smallest community with a population of around 700.[159] The largest community, Chisasibi, has a population of over 3,000 and is the northernmost Cree community that has road access.[160] The one community north of Chisasibi, called Whapmagoostui, is the only community in Eeyou Istchee that has no road access. Whapmagoostui is located with Kuujjuarapik, the southernmost Nunavik community (**Figure 18**).[161] This unique bicultural community next to the coast is a destination that is serviced by seasonal sealift resupply services, delivering goods to the community.

Labrador

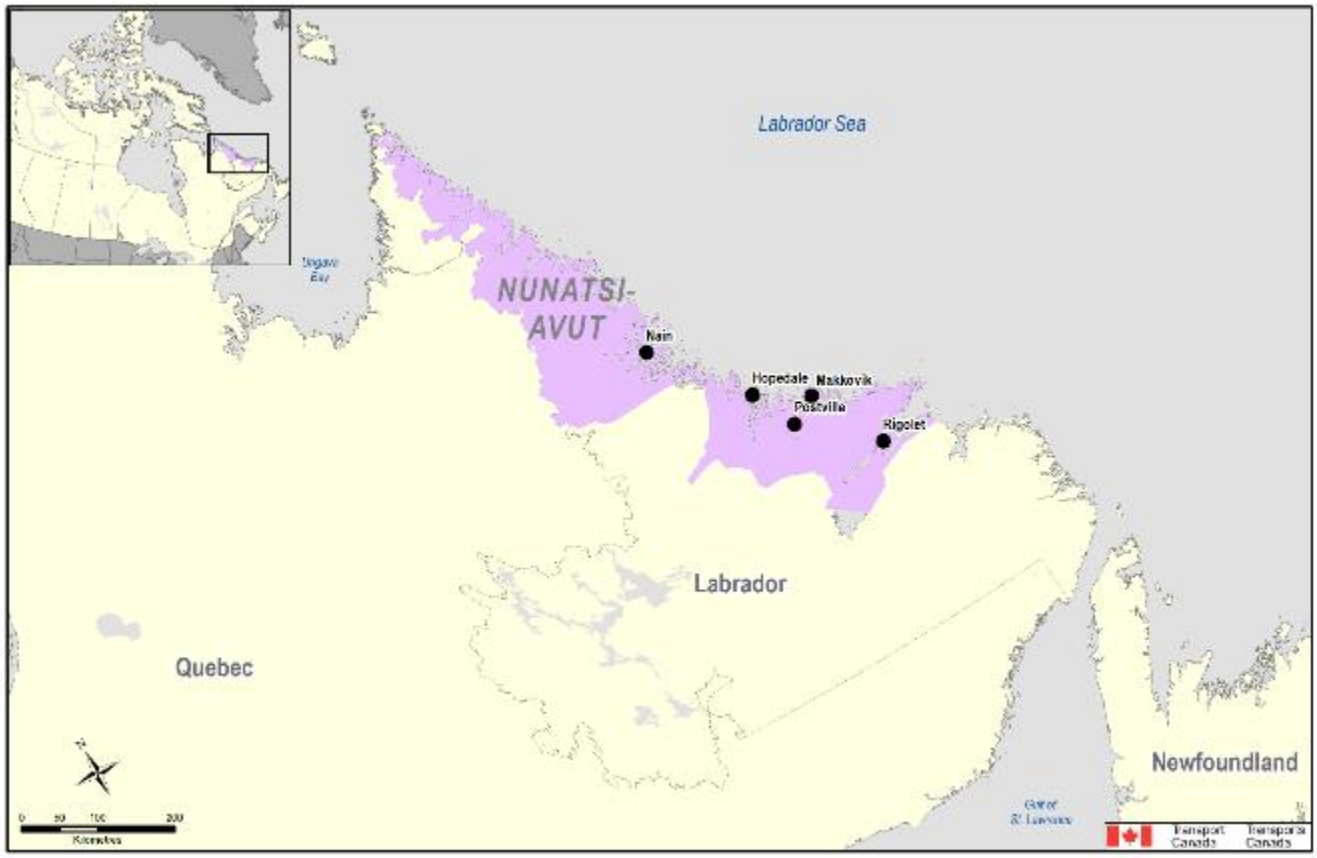
Nunatsiavut

The Inuit Nunangat region of Nunatsiavut (**Figure 20**) covers the northern tip Labrador, and consists of five communities with a total population of over 2,700.[162] Nain, the largest community with a population of 1,170, is the administrative capital of the Nunatsiavut Government. The other four communities have fewer than 1,000 people each, with Postville being the smallest community with a population of merely 195.[163] The southernmost community in Nunatsiavut, Rigolet, is also the southernmost Inuit community in the world.[164] All five communities are coastal and not road-accessible, so these communities are part of the seasonal sealift resupply services. In Nunatsiavut, a significant natural resource development is Voisey's Bay, a mine producing nickel-cobalt-copper concentrate and copper concentrate. There are 6,000 tonnes-per-day produced by this mine, which employs 51% of

[157] Glencore Group, Raglan Mine Concentrate Production.
[158] Cree Hunters and Trappers Income Security Board, Cree Communities of Northern Quebec.
[159] Statistics Canada, 2016 Census Profiles.
[160] Grand Council of the Crees, Communities.
[161] Makivik Corporation, Our Communities.
[162] Tourism Nunatsiavut, Communities.
[163] Tourism Nunatsiavut, Communities.
[164] Town of Rigolet, Rigolet.

its workforce from the local Indigenous population.[165] Although Voisey's Bay's operations is not in the boundaries of Arctic waters, an Arctic shipping company is used for the delivery of cargo and other supplies to the mine and to transport ore concentrate from the mine.[166]

Figure 20: Map of Communities in Nunatsiavut



Manitoba

Churchill, a remote northern town in Manitoba on the west side of Hudson Bay and slightly below the edge of Canada's Arctic, has a population of approximately 900. It is a small community compared to its Census division, which includes surrounding areas and has a population of over 8,000.[167] The majority of Churchill's population is Indigenous, including over 7,000 First Nations peoples, as well as some Métis and Inuit.[168] Despite the modernization of the town given multiple opportunities for economic development in the past, such as scientific research centres and military bases, traditional activities are still practiced by some residents as a means of living.[169]

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[165] VALE, Voisey's Bay.
[166] VALE, Marine Traffic Schedule.
[167] Statistics Canada, 2016 Census Profiles.
[168] Ibid.
[169] Everything Churchill, About Churchill: History.

Churchill has historically been an important area for Arctic shipping, as it is Canada's only Arctic seaport. Although it is located below the 60th parallel North, vessels must transit through Arctic waters to access it. Following the completion of the Hudson Bay Railway in the 1900s, it became an important port for grain shipments, which arrived from the south via railroad. The grain was shipped to Canada's northern communities and around the globe.[170] The Port of Churchill was also important in that sealift resupply materials to be delivered to northern communities came through the port. With the demise of the Canadian Wheat Board, however, fewer shipments of grain were made through the Port of Churchill, and its operations were closed[171] in 2016 by the holding company, Omnitrax. The railway (also owned by Omnitrax), was severely damaged in May 2017 by flooding. This has severely increased the cost of living to residents in Churchill, having to receive goods and necessities by air and sealift resupply services in the summer. Following its purchase in August 2018 by the Arctic Gateway Group, the railway was repaired and received its first freight train on November 24, 2018, followed by the first passenger train on December 4, 2018.

Sealift Operations in Canada's Arctic

Since air transportation is costly and most communities in the Arctic have no road or rail access, sealift has always been a safe and economically feasible means of transporting goods to and from Canada's Arctic.[172] Seasonal sealift resupply services occur each year during ice-free periods over the summer, and are used to transport bulky, heavy or non-perishable items. These items include necessities such as food, household items, and fuel for power generation. A sealift season typically includes three sailings and approximately five voyages per sailing, with each voyage usually making between five and 10 stops. Over 40 communities are served each season. Currently, up to 95% of food and other goods delivered to these communities are shipped via sealift resupply services.[173]

For food and other supplies, retailers are responsible for placing sealift orders ahead of time and managing their inventory once the shipment arrives, often resulting in high inventory holding costs as retailers need to order a year's supply of goods.[174] For the imported fossil

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[170] Ibid.

[171] The port facilities remain open for resupply to Nunavut.

[172] Arctic Council, AMSA 2009 Report, 112.

[173] Government of Canada, Transport Canada, Investments under the Oceans Protection Plan to Protect Canada's Arctic Coast and Water.

[174] Nutrition North Canada, Northern Food Retail Data Collection & Analysis.

fuel that all of Nunavut's and some of Northwest Territories' communities depend on, electricity providers must order a year's worth of fuel in advance to be delivered by seasonal sealift resupply services. They are taking on significant financial risks when making fuel purchase agreements (due to the volatility of fuel prices) and additional costs to store these fuels.[175] The lack of harbor facilities in the most northern communities, coupled with the challenges of operating in Arctic waters, are factors that can hinder the efficiency of sealift operations.

In addition to the aforementioned challenges that infrastructure in the north faces due to harsh weather conditions, climate change is increasingly impacting sealift operations. Warming weather has generally helped lengthen the season for sealift services. As temperatures warm and sea ice reduces, an increasing number of sealift cycles (round trips) can occur within a season. However, melting permafrost as a result of warming temperature has caused challenges to shorelines and freight lay down areas as it threatens soil stability and structural integrity of the limited, existing infrastructure.[176] Further, contrary to general rising sea levels globally, Canada's Arctic is unique in that sea levels are expected to generally decrease.[177] This will present new challenges, notably reduced water levels, potentially resulting in cancelled trips or load capacities.[178] These challenges add further risks to sealift resupply services in Canada's Arctic and could impact the timely delivery of crucial supplies to communities.

Sealift Operations for Community Resupply

In Canada's Arctic, most sealift services for community resupply of dry goods are offered by NEAS Group or Groupe Desgagnés. Both companies service remote coastal communities in the north and have acted as a 'lifeline' to these communities for years through their safe delivery of necessities.[179] The Woodward Group of Companies, which operates through its subsidiaries, offers community resupply services for liquid-bulk, delivering fuel supply for energy production to communities in northern Labrador and in Canada's Arctic. The

[175] Knowles, Power Shift: Electricity for Canada's Remote Communities, 8.
[176] Government of Canada, Polar Knowledge Canada, The State of Northern Knowledge in Canada, 13.
[177] Government of Canada, Natural Resources Canada, Climate Risks and Adaptation Practices for the Canadian Transportation Sector 2016, 56.
[178] Ibid.
[179] Makivik Corporation, NEAS Group.

subsidiaries involved in these operations are Coastal Shipping Limited and Woodward's Oil Limited.[180]

NEAS Group

NEAS Group is jointly owned by Makivik Corporation, Nunavik's Inuit Birthright Corporation, and Transport Nanuk Inc., and is mandated to charter and operate vessels in the Canadian Arctic through NEAS Inc. NEAS Inc. (NEAS) is composed of Nunavut Eastern Arctic Shipping Inc. and Nunavik Eastern Arctic Shipping Inc., which deliver marine transportation and other services such as container services to communities. These include the essential seasonal sealift resupply services, covering communities in Nunavik and Nunavut, as well as northern Labrador, Churchill and Inuvialuit in northern Northwest Territories. NEAS is the only sealift company serving these regions that has an Inuit-owned fleet, which consists of five vessels (**Exhibit 5,** Appendix II).

The 2017 sealift season for NEAS included 16 voyages that covered 100 stops in over 40 communities.[181] In addition to their five vessels, NEAS chartered the *M/V Dolfijngracht* for two of the voyages as part of its 're-fleeting strategy,' all of which operate on HFO when engaged in community resupply. This strategy involves investing in Canadian flagged vessels to improving cargo services, in response to the rising demand for sealift services in the north.[182] The 2018 sealift season began on June 16. The first sailing, originating in Valleyfield, Québec, included five voyages.[183] The second sailing began mid-August, and the third sailing took place in September. The end of the sealift season usually occurs in mid-October.

Groupe Desgagnés

Groupe Desgagnés (Desgagnés) is headquartered in Quebec City and is a conglomerate with operations in Arctic waters, the St. Lawrence Seaway System, and globally. One subsidiary is Desgagnés Transarctik Inc. (DTI), which operates a fleet of vessels specifically for voyages in the north (**Exhibit 6,** Appendix II); Arctic sealift services have been provided for over 50 years.[184] DTI is a managing partner of Nunavut Sealink and Supply Inc. (NSSI), which is Inuit majority owned and serves 26 communities in Nunavut for both food and fuel resupply.[185]

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[180] Woodwards, Coastal Shipping Limited.
[181] Ibid.
[182] Makivik Corporation, 2016-2017 Annual Report, 59; Facebook, NEAS Arctic Sealift, Press Release on August 2, 2017.
[183] NEAS, Sailing Schedule.
[184] Groupe Desgagnés, Subsidiaries.
[185] Desgagnés Transarctik Inc., DTI: About Us.

DTI also works with Taqramut Transport Inc. (TTI), which helps operate sealift services to all communities in Nunavik. Both NSSI and TTI work with local co-operatives to ensure collaboration with retail stores and other customers. Another subsidiary within Desgagnés is Petro-Nav, which specializes in commercial and charter services for transporting liquid bulk cargo, such as petroleum and chemical products, and also serves the Arctic.[186]

There are three sailings planned for the 2018 sealift schedule for DTI, originating from Bécancour, Valleyfield, and Sainte Catherine, Québec and operating on HFO. The first vessel of the first sailing departed on June 18, the second sailing began in early August, and the third sailing is scheduled for September.[187] Destinations for these voyages will include communities in Nunavut and Nunavik, as well as Churchill and parts of northern Labrador.

Sealift Operations for Natural Resource Development

Sealift services are also critical for supporting the mining industry in Canada's Arctic. Currently, there are five operating mines in the north that rely on sealift services: Raglan Mine (Nunavik), Nunavik Nickel Mine (Nunavik), Baffinland Iron Mines (Nunavut), Meadowbank Gold Mine (Nunavut) and Voisey's Bay Mine (Nunatsiavut). Four of these mines are located above 60°0'N and while Voisey's Bay Mine is located below 60°0'N, it uses the same Arctic shipping services as Raglan Mine, Nunavik Nickel Mine and Baffinland Iron Mines. Future mining activity, as well as oil and gas extraction, is expected to be developed, and will potentially also rely on sealift services for each phase of their development (i.e., from exploration to extraction). In addition to bulk carriers that support mining operations, mines require day-to-day necessities to be delivered via sealift resupply services as well, which NEAS and Desgagnés complete. Meadowbank Gold Mine currently receives sealift resupply services but exports its output via air transportation. Concentrate products are also sometimes transported through Arctic waters via the Northwest Passage from British Columbia to European countries such as Finland, including steel-making coal. This route has allowed vessels to travel less distance, by up to 1,000 natural miles, resulting in fuel savings of approximately $80,000.[188]

Fednav is Canada's largest provider of dry-bulk shipping services for base metal mining operations in Canada's Arctic. It operates both domestically and internationally. For its

[186] Association of Canadian Port Authorities, Biographical Note on Jacques Beauchamp.
[187] Desgagnés Transarctik Inc., Sealift Schedule.
[188] Natural Resources Canada.

Arctic-specific activities, it has a fleet of three icebreaking bulk carriers. These vessels support the operations and the output of mining activity, by bringing in necessary equipment and supplies, and transporting mineral concentrates to domestic and international markets.[189] Fednav's services for mining activity in Canada's Arctic occurs year-round. Two of Fednav's vessels that transit Canada's Arctic waters above 60°0'N currently burn HFO as fuel, and provide shipping services to Raglan Mine and Nunavik Nickel Mine. Their third icebreaking vessel provides shipping services to Voisey's Bay Mine. As it operates exclusively within the North American Emissions Control Area, it uses distillate fuel. For Baffinland Iron Mines, Fednav provides vessel traffic management such as port operations and supervision of vessels that are servicing the mine.

Another significant project supported by Fednav services is Red Dog Mine in Alaska, operated by Teck, a Canadian company. Like the mines in Canada, Red Dog Mine supports local economic development through an operating agreement that benefits local Indigenous peoples through hiring, skills training and financial contributions, such as taxes and royalties.[190] As one of the world's largest zinc mines, Red Dog Mine works with Fednav to transport its product to international markets, such as Europe and Asia.[191]

The proposed HFO ban would directly and indirectly affect mining activity in the north, where Arctic shipping is crucial to mining activity located around remote communities with no road access. While ship operators would be most directly impacted, it is important to consider the fact that miners pay for freight to smelters and the increased costs that they may incur. In addition, these mines are not only important for local economic development, particularly with local hiring and skills development, but also globally, for international markets that import from these mines.

Indigenous Perspectives on Arctic Shipping

All communities in Canada's north that are directly impacted by Arctic shipping are part of a Comprehensive Land Claims Agreement. According to specified boundaries, the bodies of water flowing through and surrounding these lands are also part of the land claims agreements. This includes passages that may be used domestically and internationally by

[189] Fednav, Arctic Operations and Projects.
[190] Teck, About Red Dog.
[191] Fednav, Nunavik's Log Book.

vessels, such as the Northwest Passage. Both destination and transit shipping in Canada's Arctic therefore pass through Indigenous waters and impact Indigenous communities. As such, Indigenous perspectives on Arctic shipping must be considered prior to making decisions that change how Arctic waters will be used.

The Northwest Passage and other areas of water used by Arctic shipping is part of Inuit Nunangat. According to Inuit Tapiriit Kanatami (ITK), the national organization representing Inuit in Canada, these waters are viewed by Inuit as a part of their identity and as a lifeline to practice their culture and means of subsistence. It is acknowledged that Arctic shipping is necessary for seasonal sealift resupply services, and that it provides a means of accessing necessities not available in the north.[192] However, Arctic shipping is also seen as a disruption to Inuit life, especially travel. For example, hunting activities can be impacted by icebreaking activities that prevent access to certain areas. There are also general concerns that have been expressed by local inhabitants about the impact of Arctic shipping on the environment and particularly wildlife. Observed increases in vessel traffic have heightened these concerns due to a lessened sense of security; domestic and international vessels are unexpectedly entering communities and ecologically or culturally sensitive areas, eroding the sense of control of local inhabitants over their communities.[193] Although information about these vessels is available, they are not necessarily accessible to individuals, for reasons such as limited broadband connectivity. Some Inuit groups have stated that that knowing the following details about incoming vessels would provide a stronger sense of security: who is coming, from where, and their purpose. In addition, the sense of lessened security stems from uncertainty regarding what the impacts could be on the environment, wildlife and society.[194]

To avoid such disruptions and address these concerns, Inuit groups have recommended taking the time to assess situations before making any significant decisions regarding Arctic shipping; this involves including local inhabitants in discussions relating to the Northwest Passage and other bodies of water that affect Indigenous communities.[195]

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[192] Inuit Tapiriit Kanatami, Nilliajut 2, 65.
[193] Ibid.
[194] Ibid.
[195] Ibid.

Arctic Shipping Traffic Overview

The overall increase in Arctic shipping traffic, in part due to the melting of sea ice allowing for longer ice-free periods over summer months, has been observed by Indigenous peoples. Despite the general limited availability of information about Arctic shipping traffic in Canada, studies have supported these observations with findings indicating a tripling of total kilometres travelled by all vessel types in Canada's Arctic in 25 years (from 1990 to 2015).[196] Other than climate change, factors that may have effects on the amount of traffic through Arctic waters includes natural resource development, tourism and societal trends, such as increased demand for imported food.[197] An understanding of spatial distribution of shipping traffic, as well as the level of shipping traffic by vessel type, is important for determining trends in how Arctic shipping is evolving and how this might impact communities.

In addition to the vessel types that support sealift services and mining activity, there are other vessel types that operate in the Arctic. **Figure 21** indicates examples of these vessel types and their proportionate role in total Arctic shipping traffic in Canada.

[196] Dawson et al., Temporal and Spatial Patterns of Ship Traffic in the Canadian Arctic from 1990 to 2015, 19.
[197] Ibid., 16.

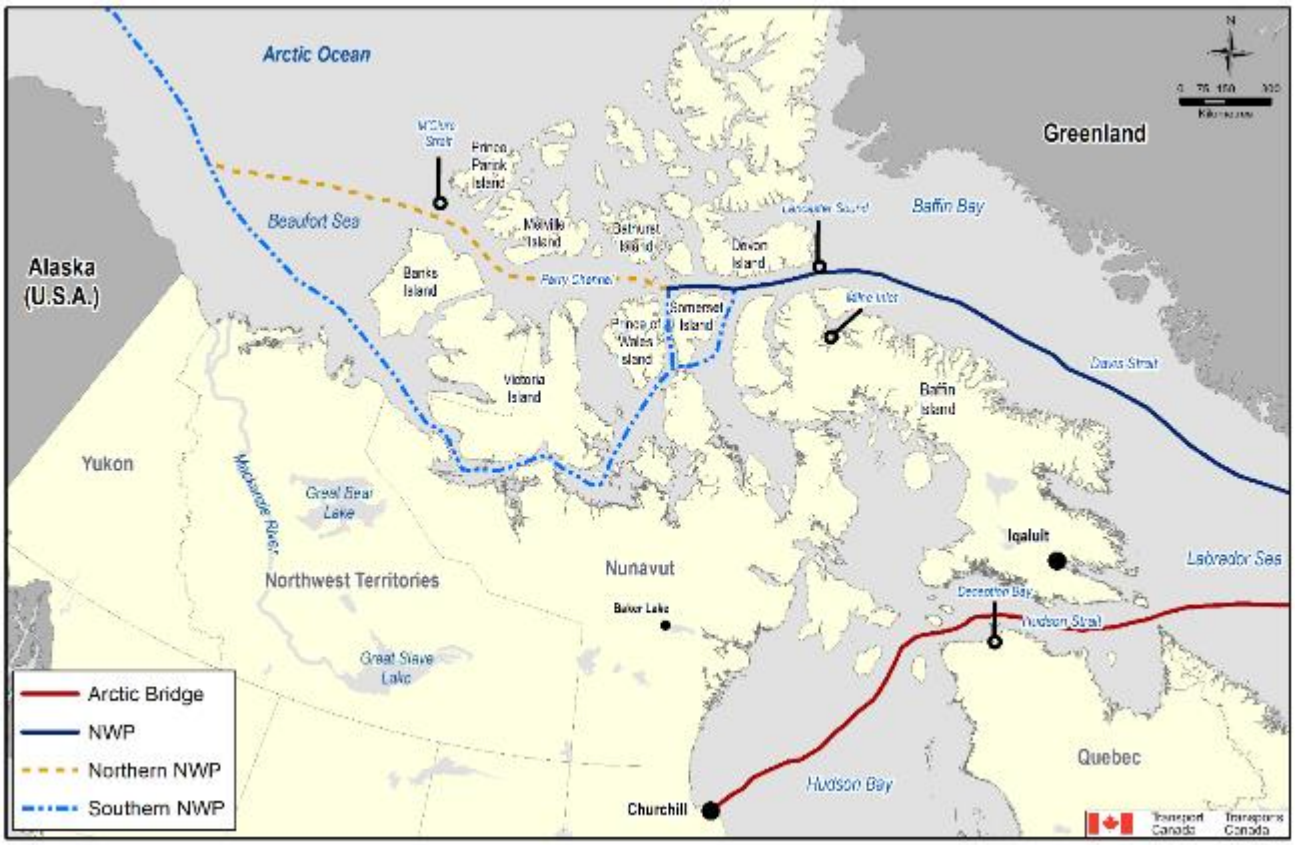
Figure 21: Main Vessel Types

Vessel Type	Examples	% of Vessel Traffic (2015)
Government Vessels and Icebreakers	Coast Guard vessels, research vessels, icebreakers for government and research purposes	18%
General Cargo Ships	Community resupply ships	21%
Tanker Ships	Bulk liquid tankers (oil, natural gas, chemicals)	15%
Pleasure Craft	Yachts, sailboats	8%
Fishing Vessels	Trawlers, small and large fishing boats (commercial and independent)	15%

Adapted From: Dawson et al.

In Canada's Arctic, the main routes available for shipping are illustrated in **Figure 22**.

Figure 22: Main Shipping Routes in Canada's Arctic



Adapted From: Dawson et al.

While there has been relatively stable vessel traffic growth historically, rapid growth in shipping traffic began in 2006 and has continued up to the present, with expectations of continued growth in the future. The most significant area of this increased traffic is the

Arctic Bridge, through the Hudson Strait and particularly toward the Baker Lake region.[198] This can be partially attributed to bulk carriers and other vessels supporting activities at Meadowbank Gold Mine (located near Baker Lake), as well as Raglan Mine and Nunavik Nickel Mine (Deception Bay). The other area that experienced significant increases in shipping traffic in recent years is the southern Northwest Passage (NWP).[199] One specific contributing factor is the Arctic shipping that supported pre-production development of Baffinland Iron Mines, which is located near the northern shore of Baffin Island at Milne Inlet. Across all regions, changes in levels of mining activity heavily influence the amount of traffic an area experiences. Tug and barge vessel traffic has increased as well in similar spatial patterns as bulk carriers, as they mostly support mining activity. Traffic from tug and barge vessels has also increased near Northwest Territories, at the mouth of Mackenzie River (to support other vessel activity there).

The general increase in Arctic shipping traffic along the Northwest Passage, with a focus on the southern route, is a result of increased tourism. This is especially true for tourism via pleasure crafts, which are the vessel type that experienced the fastest growth in recent years; between 2006-2010 and 2011-2015, overall kilometres traveled by pleasure craft in Canada's Arctic increased by 2288%.[200] This traffic also extended to the northern coast of Northwest Territories and Yukon and is another main source of increased traffic in those areas along with tug and barge activity.

The amount of fishing vessel traffic is mostly concentrated near the southeastern coast of Baffin Island, reflecting the locations of commercial fisheries. Fishing vessels, including independent smaller vessels, are mostly limited to more southern regions as they are not ice-strengthened.[201] Due to recent investments to support small-scale fishing operations infrastructure, there has been rapid increases of fishing vessel traffic in the past few years.[202]

Shipping traffic from tankers has also grown rapidly, likely due to increased demand for electricity resulting in more diesel being delivered to communities and mines. Steadily increasing traffic from general cargo vessels reflects the growing population, which is relying

[198] Dawson et al., Temporal and Spatial Patterns of Ship Traffic in the Canadian Arctic from 1990 to 2015, 21.
[199] Ibid.
[200] Dawson et al., Temporal and Spatial Patterns of Ship Traffic in the Canadian Arctic from 1990 to 2015, 20.
[201] Ibid., 21.
[202] Ibid., 16.

more on imported food and other goods, resulting in more sealift voyages for community resupply.[203] The amount of traffic individual communities experience directly mostly depends on mining activity nearby and sealift services for community resupply.

Environmental Considerations

Increased Arctic shipping traffic has led to a focus on the potential environmental impacts, particularly oil spills. Discussions of this issue have taken place at MEPC, and led to a proposal to ban the use and carriage for use as fuel of HFO in Arctic waters. Potential environmental impacts are also a key concern of Indigenous peoples in the Arctic. There is ongoing research regarding the effects of oil spills specifically in Arctic waters, as well as differences in these effects with different fuel types. Other general environmental risks associated with marine transportation include potentially harmful effects of underwater noise (produced by vessels), collisions between vessels, and the introduction of invasive species.[204] These risks impact wildlife most directly, specifically different species of whales including narwhal, beluga and bowhead.

This leads to the concerns regarding climate change in general. In the Arctic, warming is occurring at twice the global rate.[205] These rising temperatures have direct and indirect effects on wildlife. For example, wildlife whose habitat's characteristics have changed as a result of warming will have to adapt to new terrain, as well as changing food availability.[206] In addition, marine transportation itself can disrupt the movement and habitats of wildlife, which is also a concern expressed by Indigenous peoples with regards to hunting and fishing activities.

Current Operational Context in Canada – Initiatives and Regulations

An ongoing initiative in Canada that addresses environmental and socioeconomic aspects of shipping is the $1.5-billion Oceans Protection Plan (OPP), which the Government of Canada launched in 2016. The OPP includes significant investments in Arctic-specific components to enhance marine safety, environmental protection, search and rescue and emergency response services, and Indigenous and coastal community engagement.[207] **Exhibit 7** (Appendix

[203] Ibid., 20.
[204] World Wildlife Fund Canada, Arctic Shipping.
[205] World Wildlife Fund Global, Arctic Climate Change.
[206] World Wildlife Fund Canada, Arctic Shipping.
[207] Government of Canada, Transport Canada, Government of Canada Introduces New Measures to Protect the Marine Environment and Coastal Communities in Canada's Arctic.

II) outlines the Arctic-specific measures that are part of the OPP. These measures, such as improved land-based marine infrastructure, improved monitoring of vessel traffic and employment opportunities for local inhabitants could directly and indirectly help address current socioeconomic issues such as food insecurity and concerns such as unexpected vessel traffic.

Other initiatives related to environmental and socioeconomic aspects of Arctic shipping in Canada are the Northern Transportation Adaptation Initiative (NTAI) and the National Trade Corridors Fund (NTCF). The NTAI was established in 2011 to support the efficiency, safety and environmental sustainability of transportation systems in the north, in light of the impacts of climate change. Funding is provided through the NTAI for research, development and capacity-building activities including those that develop knowledge, tools and training.[208] An example of a project that NTAI has supported to date related to Arctic shipping is a University of Alberta study on the impacts of climate change on the Mackenzie River Basin, specifically how changing streamflow and water levels may affect future transportation access and community resupply. Other projects have included studies on iceberg fluxes, assessments on port infrastructure and evaluating search and rescue response times. Knowledge gained through NTAI-supported initiatives can enhance the understanding of the impacts of climate change on transportation systems in the north and guide decision-making. The NTCF is a $2 billion 11-year merit-based program launched in 2017 meant to improve trade corridors by investing in infrastructure that aids economic activity or the essential movement of goods or people. As part of this program, $400 million is allocated to fund specifically northern transportation infrastructure.[209] This fund, which includes a specific objective to address transportation needs in Canada's Arctic, will also assist the movement of people and supplies to and from communities, alleviating some barriers to economic and social development currently caused by limited transportation infrastructure. One project funded to date in the north was the recent $35 million investment in First Air operations, including expanding cargo capacity at the Iqaluit airport for both non-perishable and perishable goods. This is estimated to create over 120

[208] Government of Canada, Transport Canada, Northern Transportation Adaptation Initiative Program.
[209] Government of Canada, Trade and Transportation Corridors Initiative.

construction jobs and will have long-term impacts by improving resupply services to nearby communities.[210]

Canada's current regulatory framework also aims to mitigate environmental risks associated with Arctic shipping. The Arctic Shipping Safety and Pollution Prevention Regulations (ASSPPR), came into force in 2017. These regulations are intended to reflect technological advancements in the shipping industry and incorporate Polar Code measures that were not already reflected in the existing regulatory regime. Along with the Vessel Pollution and Dangerous Chemicals Regulations and the Arctic Waters Pollution Prevention Act, ASSPPR strengthens Canada's existing levels of safety and pollution prevention in Arctic shipping.[211]

Opportunities

The breadth of geopolitical development in the past 50 years along with social and economic changes demonstrates the pace at which Canada's Arctic is evolving.[212] Further, climate change and its implications for life in the Arctic adds another aspect of change facing communities. Looking ahead, these changes mean that new challenges will potentially emerge and add to the already complex nature of ongoing challenges in the north. Along with these challenges however will emerge more opportunities. For example, improving broadband connectivity across the north could lead to better access to education and health care, contributing to a stronger work force as the youth transition into adulthood.[213]

In the context of Arctic shipping, the expected increase in ship traffic as a result of longer shipping seasons in summer months similarly comes with both risks and benefits.[214] An increase in ship traffic, if not properly managed, could lead to increased direct and indirect environmental damage to ecologically sensitive areas.[215] Increased shipping traffic also carries social risks associated with disruption of traditional land and water use practices, such as hunting and fishing. On the other hand, growing communities in the Arctic have increasing demand for goods and necessities. A prolonged shipping season could mean that

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[210] Government of Canada, Government of Canada Invests in Transportation Infrastructure at First Air Operations in Iqaluit

[211] Government of Canada, Transport Canada, Coming Into Force: New Arctic Shipping Safety and Pollution Prevention Regulations

[212] Government of Canada, Indigenous and Northern Affairs Canada, Canada's Arctic Policy Framework: Discussion Guide.

[213] Government of Canada, Indigenous and Northern Affairs Canada, Canada's Arctic Policy Framework: Discussion Guide.

[214] Arctic Council, AMSA 2009 Report, 114.

[215] Ibid., 112.

more goods can be delivered via sealift resupply services to contribute to the well-being of these communities. Increased shipping in the Arctic also benefits local economies, particularly with regards to natural resource development. A large amount of the raw materials required for global green economy innovation in renewable energy are found in Canada's Arctic; these materials include gold, copper and lithium.[216] Development of these abundant natural resources, which will support future scientific and technological innovations, require Arctic shipping both to support operations and to export to world markets, and will also provide a source of local jobs. Increased natural resource development and a growing tourism industry, for example with cruises, are a significant opportunity for local economic development and diversification.[217]

Conclusion

The role of Arctic shipping in Canada's north is complex yet crucial for the well-being of communities as well as the advancement of Canada's natural resource industry. Supporting over 50 communities that have no road access by delivering necessities such as food and fuel, Arctic shipping helps alleviate the otherwise even costlier method of delivery by air transportation for some goods. As communities already face high costs of living and tend to have lower socioeconomic status, continued or increased levels of sealift operations are important to ensure issues such as food insecurity do not worsen. The expected increase in demand for sealift resupply services as a result of social and environmental changes also suggests an increasing importance of Arctic shipping for communities. Arctic shipping further contributes to the local and global economy by supporting natural resource development, and with current levels of operations and future opportunities, will continue to be an important service.

Concerning the proposed ban on the use and carriage for use as fuel of HFO in Arctic waters, the complexities of living conditions in the Arctic and the impacts of Arctic shipping on communities outlined in this report must be considered. In addition, Indigenous perspectives are important to take into account when assessing impacts, as they are the original inhabitants and users of the land and water in Canada's Arctic. Finally, the environmental impacts of Arctic shipping, specifically with regards to HFO use and carriage for use as fuel,

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[216] Government of Canada, Indigenous and Northern Affairs Canada, Canada's Arctic Policy Framework: Discussion Guide.

[217] Ibid.

must be reviewed comprehensively to inform the decision-making and assessment of the proposed ban.

Appendix I: Additional Fact Sheet on Demographics

Population Growth

Population growth in the territories varies by region (**Figure 3**). Between 2011 and 2016, National Census results from *Statistics Canada* indicated a 5% population growth in Canada. The population growth in Northwest Territories was lower at 0.8%, whereas Yukon's and notably Nunavut's population grew by 5.8% and 12.7% respectively.[218] Canada's population is expected to reach 39 million by 2023, using a 6% growth projection. Northwest Territories' population in 2023 is projected to be approximately 45,000, growing at a slower rate of 0.5%. Nunavut's growth reduces slightly to 10.5%, still almost twice the Canadian rate, and is expected to reach a population of 42,000 by 2023. Particularly significant is Yukon's population growth rate of 13.5% between 2018 and 2023, reaching a total population of 44,000.[219]

Age and Gender Characteristics

Similar to Canada, the majority of Yukon's population is aging, as the age categories with the highest populations are between 50 and 60 years. On the other hand, Nunavut's newborn and young population is increasing, as the age categories with the highest populations are between 0 and 10 years, demonstrating an increasing young population. Northwest Territories' age distribution shows more fluctuations but is also generally younger, as the age categories between 25 and 35 are most numerous.

Age Distribution for Canada and the Territories

[218] Conference Board of Canada, Territorial Outlook.
[219] Ibid.

Age Category	Canada	Yukon	Northwest Territories	Nunavut
0 to 4 years	1,898,790	2,140	3,120	4,155
5 to 9 years	2,018,130	2,125	3,015	4,115
10 to 14 years	1,922,645	2,020	2,735	3,420
15 to 19 years	2,026,155	1,930	2,715	3,135
20 to 24 years	2,242,695	1,965	3,065	3,045
25 to 29 years	2,285,985	2,555	3,465	3,190
30 to 34 years	2,329,400	2,890	3,390	2,815
35 to 39 years	2,288,365	2,590	3,215	2,390
40 to 44 years	2,255,135	2,540	2,825	2,030
45 to 49 years	2,359,970	2,455	2,885	2,060
50 to 54 years	2,678,075	2,885	3,195	1,845
55 to 59 years	2,620,245	2,995	2,825	1,405
60 to 64 years	2,290,515	2,535	2,110	975
65 to 69 years	1,972,480	1,850	1,415	650
70 to 74 years	1,420,875	1,090	820	345
75 to 79 years	1,021,850	645	465	210
80 to 84 years	749,645	375	300	100
85 to 89 years	482,525	195	145	45
90 to 94 years	223,510	80	60	10
95 to 99 years	56,520	25	15	10
100 years and over	8,230	-	5	-
Total	**35,151,740**	**35,885**	**41,785**	**35,950**

Adapted From: Statistics Canada, 2016 Census Profiles

= Most populated age category of region

The gender distribution is more similar between the territories, as all three have a higher male population than female population in general, contrary to Canada's higher female population.[220] The difference in gender distribution in general between Canada and the three territories can be a result of the discrepancies in health care accessibility and quality of life that affect different genders at different ages.

Gender Distribution for Canada and the Territories

[220] Statistics Canada, 2016 Census Profiles.

Age Category	Canada		Yukon		Northwest Territories		Nunavut	
	Male	Female	Male	Female	Male	Female	Male	Female
0 to 4 years	973,030	925,760	1,155	985	1,605	1,515	2,130	2,025
5 to 9 years	1,034,685	983,445	1,130	995	1,520	1,495	2,130	1,985
10 to 14 years	985,200	937,445	1,075	945	1,350	1,385	1,720	1,700
15 to 19 years	1,039,215	986,940	1,000	930	1,405	1,310	1,600	1,535
20 to 24 years	1,144,495	1,098,200	1,035	930	1,635	1,430	1,535	1,510
25 to 29 years	1,144,470	1,141,515	1,245	1,310	1,755	1,710	1,610	1,580
30 to 34 years	1,148,290	1,181,110	1,395	1,495	1,670	1,720	1,390	1,425
35 to 39 years	1,118,635	1,169,730	1,235	1,355	1,565	1,650	1,210	1,180
40 to 44 years	1,104,440	1,150,695	1,170	1,370	1,365	1,460	1,065	965
45 to 49 years	1,157,760	1,202,210	1,210	1,245	1,485	1,400	1,055	1,005
50 to 54 years	1,318,755	1,359,320	1,390	1,495	1,620	1,575	955	890
55 to 59 years	1,285,190	1,335,055	1,505	1,490	1,480	1,345	750	655
60 to 64 years	1,114,885	1,175,630	1,315	1,220	1,110	1,000	535	440
65 to 69 years	953,075	1,019,405	980	870	785	630	340	310
70 to 74 years	677,975	742,900	605	485	450	370	180	165
75 to 79 years	469,550	552,300	350	295	230	235	110	100
80 to 84 years	325,765	423,880	160	215	155	145	50	50
85 to 89 years	185,535	296,990	90	105	65	80	20	25
90 to 94 years	68,675	154,835	30	50	25	35	5	5
95 to 99 years	13,240	43,280	5	20	5	10	5	5
100 years and over	1,340	6,890	-	-	-	5	-	-
Total	**17,264,205**	**17,887,535**	**18,080**	**17,805**	**21,280**	**20,505**	**18,395**	**17,555**

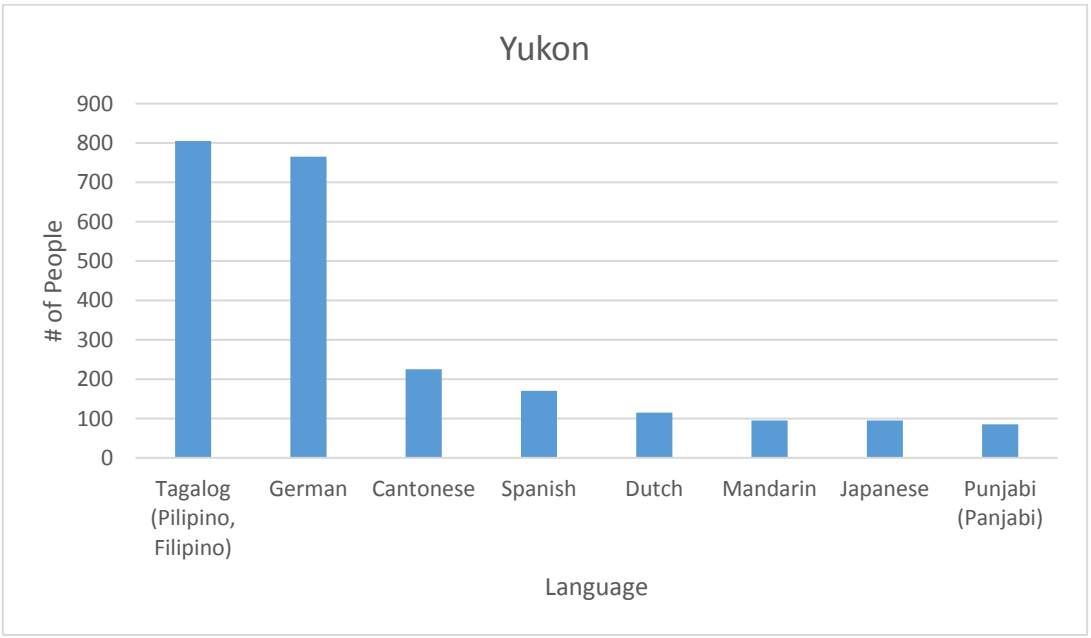
Adapted From: Statistics Canada, 2016 Census Profiles.

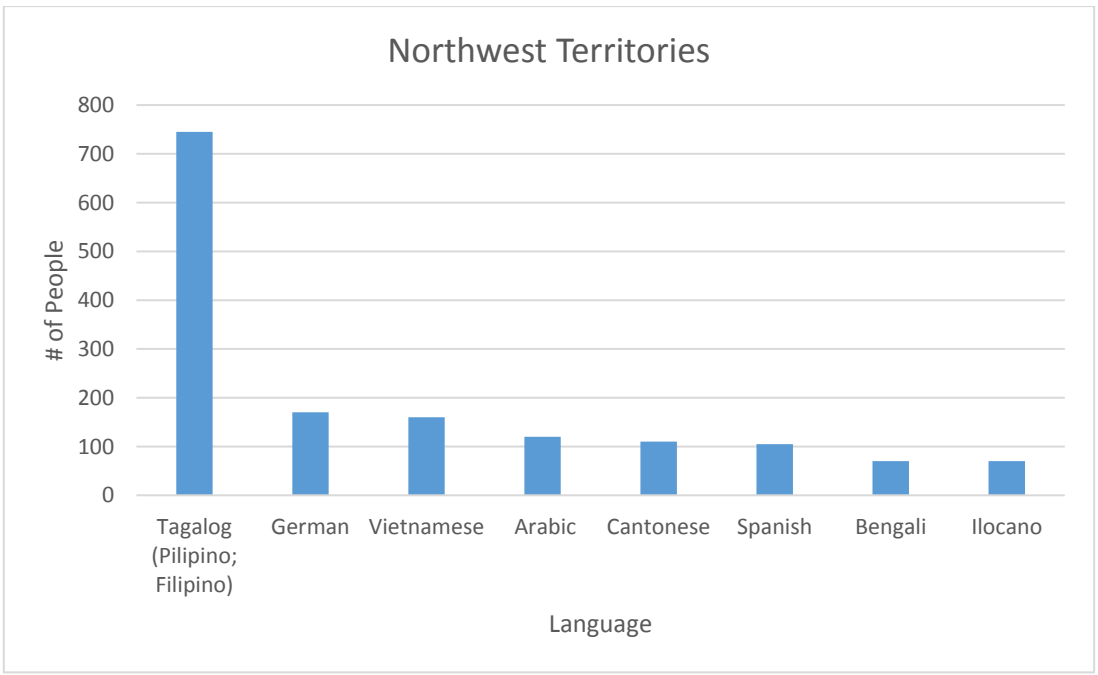
Languages Breakdown

Of Canada's two official languages, English as a mother tongue is the most prominent in all three territories. In Yukon and Northwest Territories, English makes up the largest and

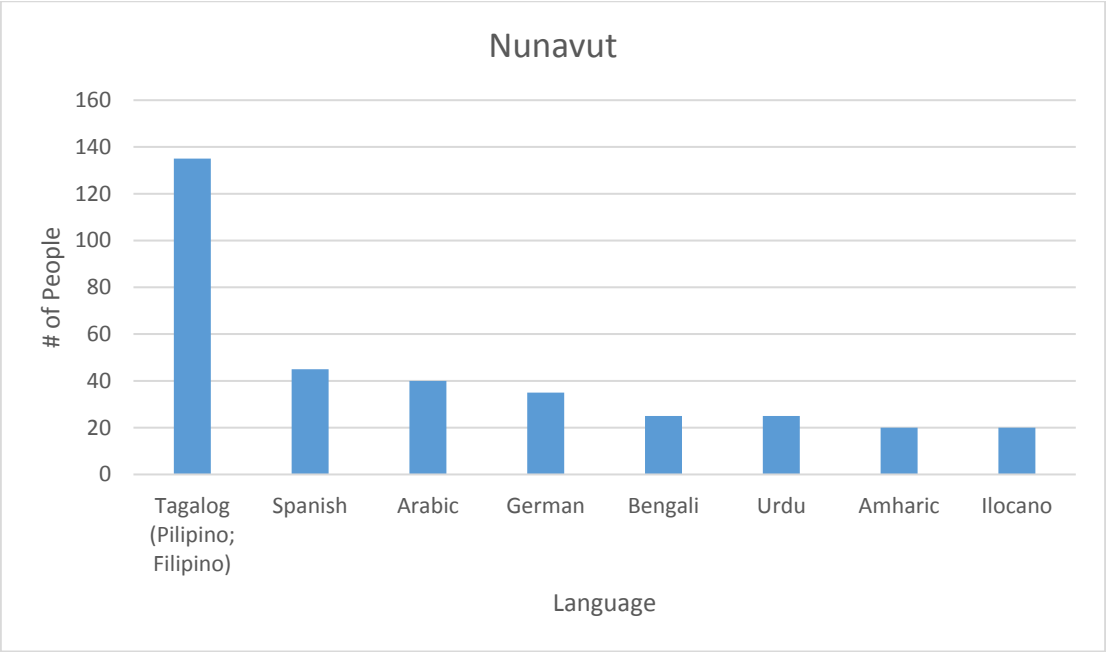
majority share of the mother tongue language profile, and in Nunavut makes up a minority share. Looking at non-official non-Aboriginal languages, the highest share is seen in Yukon, followed by Northwest Territories, and Nunavut with only 2% of the population having a non-official non-Aboriginal language as their mother tongue.[221] The graphs below show the top eight non-official non-Aboriginal mother tongue languages for the three territories.

Top Non-Official Non-Aboriginal Mother Tongue Languages in the Territories





[221] Statistics Canada, 2016 Census Profiles.



Adapted From: Statistics Canada, 2016 Census Profiles.

Governance Structure

The following are the Comprehensive Land Claims Agreements and Self-Government Agreements that have been signed in the First Nations and Métis communities in Yukon, Northwest Territories and northern Quebec:

Region	Name of Comprehensive Land Claims Agreement	Self-Government Status	Regional Organization
Yukon	Umbrella Final Agreement (1993)	11 First Nations with Self-Government status, 3 in negotiations	Council of Yukon First Nations
Northwest Territories	Gwich'in Comprehensive Land Claim Agreement (1992)	In negotiations	Gwich'in Tribal Council
	Sahtu Dene and Métis Comprehensive Land Claim Agreement (1994)	In negotiations	Sahtu Secretariat Incorporated
	Tłı̨chǫ Agreement (2005)	Self-Government status	Tłı̨chǫ Government
Northern Quebec	James Bay and Northern Quebec Agreement (1977) Northeastern Quebec Agreement (1979) Eeyou Marine Region Land Claims Agreement (2012)	In negotiations	The Grand Council of the Crees (Eeyou Istchee)

Source: Indigenous and Northern Affairs Canada (now Crown-Indigenous Relations and Northern Affairs Canada)).

All regions of Inuit Nunangat have signed, with the respective territorial/provincial governments and federal government, Comprehensive Land Claims Agreements:

Region	Comprehensive Land Claims and/or Self-Government Agreement	Year (effective)	Regional Organization
Nunavik	James Bay and Northern Quebec Agreement Nunavik Inuit Land Claims Agreement	1977 2008	Makivik Corporation
Nunatsiavut	Labrador Inuit Land Claims Agreement	2005	Nunatsiavut Government
Nunavut	Nunavut Land Claims Agreement	1993	Government of Nunavut and Nunavut Tunngavik Incorporated
Inuvialuit	Inuvialuit Final Agreement (Western Arctic Claim)	1984	Inuvialuit Regional Corporation

Source: Indigenous and Northern Affairs Canada.

The four regions are currently at different stages of negotiations surrounding Self-Government Agreements:

- Nunatsiavut: The first region in Inuit Nunangat to achieve self-government, resulting from the Labrador Inuit Land Claims Agreement in 2005. The Nunatsiavut Government, (the regional Inuit government responsible for Nunatsiavut) remains part of Newfoundland and Labrador's provincial government but has authority over governance areas such as health care and education.[222]
- Nunavut: The newest territory created in 1999 as a result of the Nunavut Land Claims Agreement (NLCA). The public territorial government (the Government of Nunavut) is a self-government uniquely created by an act of the Canadian Parliament but also with a second constitution in the form of the NLCA.[223] Prior to this, the land was part of Northwest Territories; negotiations between the Government of Canada and the Inuit of the Eastern Canadian Arctic lasted almost 20 years and agreement was eventually reached to create Nunavut as a new political territory.[224]

[222] Nunatsiavut Government, About Nunatsiavut Government.
[223] Coates et al., The Role of the Public Sector in Northern Governance, 19.
[224] Nunavut Sivuniksavut, Nunavut Land Claims Agreement I.

- Nunavik: Still in the process of achieving self-governance, having signed a Self-Government Agreement-in-Principle. This is not legally binding but is one of the last steps in finalizing a Self-Government Agreement.[225]
- Inuvik: Also still in the process of achieving self-governance, and has signed a Self-Government Agreement-in-Principle.

Appendix II: Exhibits

Exhibit 1: Official Languages of Northwest Territories

Category	Language	# of People (Mother Tongue)
Inuit Languages	Inuktitut	110
	Inuinnaqtun	470
	Inuvialuktun	405
Dene Languages	Gwich'in	140
	North Slavey	745
	South Slavey	775
	Tłı̨chǫ	1,600
	Chipewyan	440
Algonquin (Cree) Languages	Cree	120
Indo-European Languages	English	31,765
	French	1,175

Adapted From: Statistics Canada, 2016 Census Profiles; Prince of Wales Northern Heritage Centre.

[225] Government of Canada, Indigenous and Northern Affairs Canada, Self-Government.

Exhibit 2: Top Six GDP Contributors by Industry (Expenditure Based, Millions, Chained $ 2007)

Yukon ($)		Northwest Territories ($)		Nunavut ($)	
Public Administration and Defence	498.59	Mining and Oil and Gas Extraction	1,367.52	Metal Ore Mining	432.78
Finance and Insurance…*	409.74	Non-metallic Mineral Mining and Quarrying	1,143.89	Mining and Oil and Gas Extraction	400.34
Mining and Oil and Gas Extraction	366.30	Public Administration and Defence	577.85	Public Administration and Defence	384.45
Metal Ore Mining	356.70	Finance and Insurance…*	488.16	Finance and Insurance…*	283.35
Educational Services and Health Care and Social Assistance	321.88	Educational Services and Health Care and Social Assistance	419.28	Educational Services and Health Care and Social Assistance	276.86
Imputed Rent	232.22	Construction	342.77	Construction	263.62

Adapted From: Conference Board of Canada, Territorial Outlook.

* Finance and Insurance, Real Estate and Renting and Leasing and Management of Companies and Enterprises

Exhibit 3: Labour Force Breakdown by Industry

Industry - North American Industry Classification System (NAICS) 2012		Yukon	Northwest Territories	Nunavut	Churchill (Town)	Northern Quebec (Census Division)	Northern Labrador (Census Division)
11	Agriculture; forestry; fishing and hunting	245	190	155	0	645	20
21	Mining; quarrying; and oil and gas extraction	505	1,440	595	0	1250	80
22	Utilities	160	300	285	0	305	20
23	Construction	2,055	1,745	930	35	1040	115
31-33	Manufacturing	335	240	150	10	990	40
41	Wholesale trade	325	290	105	10	125	10
44-45	Retail trade	1,975	2,260	1,720	70	1880	95
48-49	Transportation and warehousing	1,060	1,460	795	105	685	40
51	Information and cultural industries	535	465	195	15	180	15
52	Finance and insurance	305	345	115	10	185	10
53	Real estate and rental and leasing	195	415	495	0	275	0
54	Professional; scientific and technical services	1,295	930	290	10	240	20
55	Management of companies and enterprises	20	15	10	0	20	0
56	Administrative and support; waste	565	710	385	15	475	25

	management and remediation services						
61	Educational services	1,630	1,805	1,840	45	2515	115
62	Health care and social assistance	2,070	2,175	1,245	120	4600	130
71	Arts; entertainment and recreation	600	350	285	20	420	20
72	Accommodation and food services	1,545	1,230	565	10	1065	55
81	Other services (except public administration)	775	870	460	15	675	40
91	Public administration	5,205	6,010	4,345	105	3280	255

Adapted From: Statistics Canada, 2016 Census Profiles

Exhibit 4: Map of Impacted

Exhibit 5: NEAS Fleet

Name	Type	Class	Cargo Capacity
M/V Umiavut **1998**	Multi-purpose/container /strengthened for heavy cargoes	LLOYD'S 100 A1 – ICE CLASS 1	○ Bale Cubic: 11,840 m^3 ○ Deadweight: 9,587 MT ○ Container Capacity: 567 TEUs ○ Heavy lift derricks: 2 X 50 MT or 40 MT SWL/24m
M/V Avataq **1989**	Multi-purpose/container /strengthened for heavy cargoes	LLOYD'S 100 A1 – ICE CLASS 1	○ Bale Cubic: 11,840 m^3 ○ Deadweight: 9,587 MT ○ Container Capacity: 567 TEUs ○ Heavy lift derricks: 2 X 50 MT SWT/18 m or 40 MT SWL/24m
M/V Qamutik **1994**	Multi-purpose/container /strengthened for heavy cargoes	LLOYD'S 100 A1 – ICE CLASS 1	○ Bale Cubic: 14,870 m^3 ○ Deadweight: 12,754 MT ○ Container Capacity: 730 TEUs ○ Heavy lift derricks: 3 X 60 MT SWL/16 m or 40 MT SWL/24m
M/V Mitiq **1995**	Multi-purpose/container /strengthened for heavy cargoes	LLOYD'S 100 A1 LMC – UMS LNC AA1A	○ Bale Cubic: 556,980 ft^3/14,870 m^3 ○ Deadweight: 12,754/12,324 MT ○ Container Capacity: 730 TEUs ○ Heavy lift derricks: 3 X 60 MT SWL/16 m or 40 MT SWL/24m
M/V Nunalik **2009**	Multi-purpose/container /heavy lift	LLOYD'S 100A1 FINNISH/SWEDISH1A	○ Bale Cubic: 15,952 m^3 ○ Deadweight: 12,744 MT ○ Container Capacity: 665 TEUs ○ Heavy lift cranes: 2 X 180 MT (360 MT in tandem)

Exhibit 6: DTI's Core Fleet

Name	Type	Class	Cargo Capacity	Speed and Consumption
M/V Rosaire A. Desgagnés **2007**	Multipurpose Lo-Lo Vessel with Tweendeck	GL+100 A5 E3 (equivalent to Lloyd's 100 A1 Ice Class 1A)	**Containers:** 665 TEU **Holds:** 15,953 m^3	Speed: 15.5 knots3 Consumption at sea: 23.0 MT/day IFO 380
M/V Acadia Desgagnés **2013**	General Cargo Ship	RINA – C: Equipped for carriage of containers – Heavy Cargo –	**Tank:** HFO | MDO: 687.5 m^3 | 155.6 m^3 Fresh Water: 119.5 m^3	M/E Cons. at sea: 12.5 MT per day Gen Cons. in port: 1.2 to 2.5 MT per day

		Unrestricted Navigation *AUT-UMS – BWM-E – Sequential Grainloading – Ice Class ID – Inwater Survey	**Holds:** Total Bale capacity: 14267.4 m^3 Total Grain capacity: 14267.4 m^3 **Container**: 164 TEU on deck (20 feet equivalent unit)	
M/V Taiga Desgagnés **2007**	Multi-Purpose Cargo Ship	DNV GL +100 A5 ICE E3 G + MC E3 AUT, SOLAS II-2 Reg.19	**Tank**: HFO: 1526 CBM MGO: 145 CBM Fresh water: 335 CMB Ballast water: 5670 CBM **Holds:** Hold 1: 22.50m x 13.21m x 12.10 m (SWL 20T/m^2) Hold 2: 42.40m x 18.60m x 13.80m Hold 3: 21.66m x 18.60m / 6.54 x 13.20 m (SWL HATCH:2.2t/m^2)	Speed: 15.00 KN on 29 MT RMG 380 per day In port without gear: 2.1 MT MGO DMA per day In port with gear: 4.7 MT MGO DMA per day Boiler fuel consumption in port : 1.5 MT MGO DMA per day Additional information : At Sea + 2.1 MT MGO DMA per day *Vessel is burning fuels according to ISO 8217-2005
M/V Claude A. Desgagnés **2011**	Heavy Lift Multi-purpose Dry Cargo Vessel with Tweendeck	DNV + 1A1 Ice 1A (equivalent to Lloyd's 100 A1 Ice Class 1A)	**Containers**: 665 TEU **Holds**: 15,953 m^3	Speed: 15.5 knots Consumption at sea: 24.0 MT/day IFO 380

M/V Sedna Desgagnés **2009**	Multipurpose Lo-Lo Vessel with Tweendeck	GL+100 A5 E3 (equivalent to Lloyd's 100 A1 Ice Class 1A)	**Containers:** 665 TEU **Holds**: 15,953 m^3	Speed: 15.5 knots Consumption at sea: 23.0 MT/day IFO 380
M/V Zélada Desgagnés **2009**	Multipurpose Lo-Lo Vessel with Tweendeck	GL+100 A5 E3 (equivalent to Lloyd's 100 A1 Ice Class 1A)	**Containers**: 665 TEU **Holds:** 15,953 m^3	Speed: 15.5 knots Consumption at sea: 23.0 MT/day IFO 380
M/V Nordika Desgagnés **2010**	Multi-Purpose Dry Cargo Ship	DNV GL 100 A5 Ice E3, BWM, DBC SOLAS-II-2, Reg.19 G IW MC E3 AUT CM-PS EP-D	**Container:** 958 TEU nominal (617 TEU at 14 MT homogeneously loaded) 60 reefer plugs on deck **Holds:** Bale Capacity: 18,788.4 m^3 Grain Capacity: 19,777.3 m^3	Speed & Consumption at sea: 13,0 kn on 22 MT HFO 380 per day Consumption at port, idle: 2.1 MT MGO per day Consumption at port, working: 4.7 MT MGO per day

Exhibit 7: OPP's Arctic-Specific Measures

Name of Measure	Purpose of Measure
Safety Equipment and Basic Marine Infrastructure in Northern Communities Initiative	Investments of $94.3 million over five years for Arctic resupply operations, with a focus on safety and efficiency. Investments will focus on on-the-ground equipment and infrastructure, as well as training to maintain the equipment and infrastructure.
Low Impact Shipping Corridors	Specific shipping routes to be developed based on safety (where there is necessary infrastructure, navigational support, and emergency response services) and environmental sensitivity.
Arctic National Aerial Surveillance Program Complex	Investments of $29.9 million to build a facility in Iqaluit including a hangar and accommodations unit, to support year-round aerial surveillance as an effective means of detecting oil spills and generally supporting safe and secure shipping.
Marine Training Contribution Fund	Investments of $21 million to support engagement with underrepresented groups in Arctic shipping, such as Indigenous peoples and women. This fund will provide long-term skills training to contribute to a stronger local labour force.

Office of Incident Management	Investments of $16.9 million to modernize and standardize the incident response process in the north, with the implementation of the Incident Command System at Transport Canada (currently used by other departments such as the Canadian Coast Guard).
Community Participation Funding Program	Investments of $13.4 million to fund and facilitate partnerships and engagement with Indigenous groups with regards to marine safety issues, and to increase the knowledge sharing capacity of such groups. This is an initiative for all of Canada, including the Arctic.
Canadian Coast Guard Auxiliary in the Arctic	Continued support from the Canadian Coast Guard to expand the Canadian Coast Guard Auxiliary, with the addition of more locations. This will improve Canada's collective ability for emergency response in the Arctic.

Source: Government of Canada, Investments under the Oceans Protection Plan to Protect Canada's Arctic Coast and Water

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