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Marine Conservation in the Canadian Arctic

Case Study: Canada

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Report

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Abstract

This report contains one of six case studies of the ArkMPA, including five on marine policies in states bordering the Arctic Ocean, and one overarching regional report.

The report provides an overview of the Canadian marine Arctic environment in terms of: 1) the state and status of its ecosystems and their biodiversity; 2) the drivers and associated pressures that impact marine ecosystem health, as well as 3) the policies in place to protect the marine environment, in particular through marine protected areas.

Indigenous Peoples are heavily affected by both, the changes of the ecosystem, as well as by the Canadian marine policies. This case study provides some elements in the respective context, and a offers a separate section with additional detail.

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Executive Summary

The ocean area in the Canadian Arctic covers an equivalent of over 40% of Canada's landmass. It comprises diverse landscapes, biodiversity, and habitats and is linked to various economic activities, such as fishing, shipping, and oil and gas exploration and exploitation. Canada's Arctic area is home to more than 130,000 people. Almost half are Indigenous populations of Inuit Nunangat, which inhabit a significant part of Canada's coastline, as well as First Nations and Métis. Many of them trace their heritage back to time immemorial. Indigenous coastal communities depend on Arctic waters for subsistence, including fisheries and transport. The Canadian Arctic is vast, and the responsible governance entities vary for different regions. This along with accelerating sea ice decline linked to global warming, has important implications for the governance of the region.

Climate change is a large-scale driver of biodiversity and ecosystem loss in the Canadian Arctic. Its detrimental effects are accelerated by economic drivers in the marine realm. Most significant are fishing, generating €2.5 billion in direct contribution to Canada's GDP and harming biodiversity by means of biomass removal, as well sea-floor dredging, and shipping for transport and tourism. Transport makes up 11% of blue economy jobs and tourism is responsible for 30% of Canadian blue economy jobs. Currently offshore drilling for oil and gas does not drive biodiversity and ecosystem loss, because in 2016 the Government of Canada along with the United States imposed a moratorium on issuing new oil and gas licenses in the Arctic Ocean. A 5-year science-based review of the moratorium was expected to be published by 2021, but has not yet been completed. Changing demands on the international oil and gas markets could impact future prospects for oil and gas in the Canadian Arctic.

In the late 1990s, Canada implemented the Oceans Act to protect its marine environment against drivers of biodiversity loss through integrated management of the sea. Since 2010, Canada has designated three Arctic MPAs and several other types of protected areas. Altogether, Canada has declared that it protected 13.81 % of its marine coastal waters by 2020. On the international level, Canada agreed to the Aichi targets under the Convention on Biological Diversity and has already exceeded the Aichi target 11 to conserve 10% of marine area by 2030. Canada has announced to conserve 25 % by 2030, working towards 30% by 2035. The policy framework in place to protect valuable Canadian biodiversity and ecosystems from stressors is comprehensive, yet not fully effective in its implementation and gaps remain. In recent decades, the federal government has collaborated increasingly with provincial governments and Indigenous communities to pass and implement laws and strategies to protect endangered marine flora and fauna. In 2019, the Canadian Government released its "Arctic and Northern Policy Framework", which was co-developed with Indigenous Peoples. Among other aspects, the framework includes a goal to ensure healthy and resilient Arctic and northern ecosystems. This provides a foundation to develop new regional and local governance elements, as well as complement existing ones. It however requires further governance structures to implement it across different sectors.

1 Introduction

Global interest and activity in the Arctic have increased greatly in recent decades. The Arctic is warming three times faster than the global average. These rapidly increasing temperatures are already profoundly changing – and will continue to change – the Arctic with yet unknown consequences for the people, environment, and economy in the region as well as worldwide (SDWG, 2021). The diminishing sea ice extent and the changing distribution of marine living resources have led to an increase in economic interest as well as concerns about the sustainability of economic activities in the Arctic (Raspotnik et al., 2021). Declines in sea-ice extent are most severe in the Canadian Northern Labrador Sea at 17% per decade (Environment and Climate Change Canada, 2016). The challenge is to identify development pathways that can ensure the sustainable use and conservation of the Arctic marine environment (SDWG, 2021).

In order to identify how to ensure both conservation and sustainable use of the Arctic marine environment, a broad understanding of the marine environment, the pressures affecting it, and the relevant regulations is needed. Ecologic Institute and the Institute for Advanced Sustainability Studies aim to provide an overview of relevant information through a series of reports on marine conservation in the Arctic. The reports focus on the five Arctic coastal states: Canada, Denmark (by virtue of Greenland), Norway, the Russian Federation, and the United States. In addition, a regional report gives a broader overview and summarises relevant international and regional regulations. The reports were published in 2022 and are available for download on the websites of the Ecologic Institute and the Institute for Advanced Sustainability Studies.

This report provides an overview of the Canadian marine Arctic environment in terms of:

1) the state and status of its ecosystems and their biodiversity (“The Canadian Marine Environment”, section 2),
2) the drivers and associated pressures that impact marine ecosystem health (“Drivers and pressures”, section 3), as well as
3) the policies in place to protect the marine environment on the national, regional and international level (“Responses”, section 4). An overview of relevant international and regional agreements and frameworks is provided in the regional report that forms part of this series of reports.

Indigeous Peoples are affected by the changes of the ecosystem as well as by the Canadian marine policies. The three sections above provide first aspects in the respective context, and an additional section 5 provides additional detail.

The content of this report is entirely based on publicly available data, articles, and reports. The data presented in this report was mainly collated during the ongoing global Covid-19 pandemic and prior to the 2022 Russian invasion of Ukraine. The political and economic impacts of these events cannot be foreseen at the time of publication and some of the developments and trends presented in this report may change substantially as a result.

2 The Canadian Marine Environment

2.1 Study area

The area of the Canadian Arctic Ocean is equivalent to 41% of the country's land mass with almost four million km^2. In 2009, the Canadian Science Advisory Secretariat identified five marine bioregions, defined by their attributes and similarities, which inform planning exercises such as MPA network development (DFO, 2009):

- the Hudson Bay Complex (includes Hudson Strait, Foxe Basin, James Bay, Hudson Bay);
- the Arctic Archipelago;
- the Arctic Basin;
- the Eastern Arctic (includes Lancaster Sound and Baffin Bay-Davis Strait); and
- the Western Arctic (includes Beaufort Sea, Queen Maud Gulf, Viscount-Melville Sound).

The Canadian Arctic – see Figure 1 below – ncludes a wide, productive Mackenzie shelf subject to large river inputs, the oligotrophic Arctic Basin, and a series of passages around islands (94 major islands and over 36,000 minor islands) with narrow straits, sills and shallow waters, a smaller deep basin, and a semi-enclosed sea (Niemi et al. 2019). The two deep basins, Canada Basin in the West and Baffin Bay in the East (see darker coloured areas in the figure below) are separated by a broad, shallow continental shelf – the Canadian Polar Shelf – which acts as a sill between the Pacific and the Arctic oceans. Further East into the Atlantic Ocean, a broad and relatively deep sill in the southeast separates Baffin Bay from a third basin, the Labrador Basin (outside the figure below). Apart from the many islands, Hudson Bay and James Bay in the southeast of the Arctic region occupy a large fraction of the Canadian Polar Shelf.

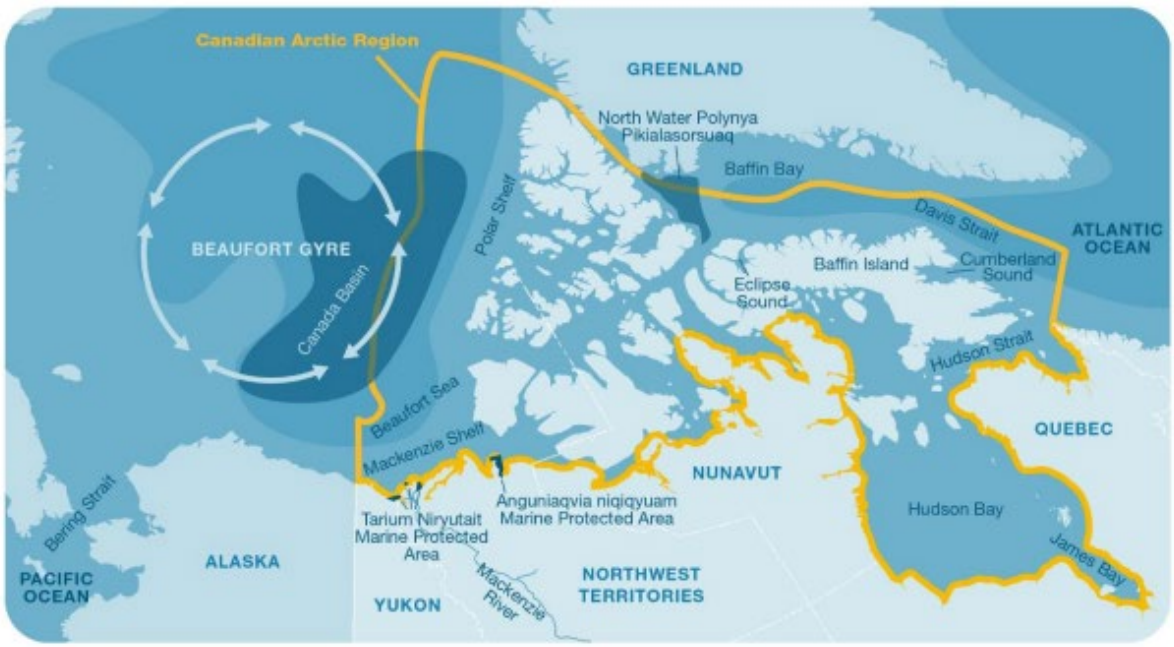

Figure 1. Canadian Arctic Ocean region (Niemi et al., 2019)

One of the key features of the Arctic Ocean, sea ice, is ubiquitous within the Canadian Arctic region, despite the region's wide latitudinal spread. Importantly, sea ice plays a key role for the biodiversity, ecology, and biochemical cycles of the Canadian Arctic region, and is fundamental to Indigenous culture. Even in summer, the average sea ice minimum from 1990-2020 covers major straits between islands (see Figure 2 below) but is receding due to global warming.

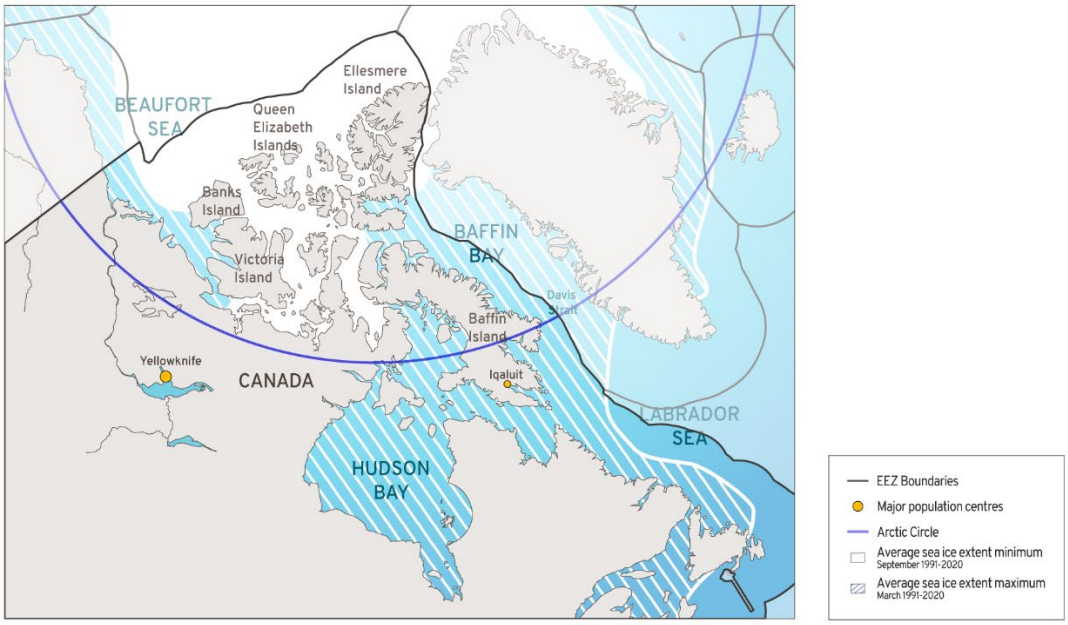

Figure 2: The exclusive economic zone of Canada. The blue line indicates the Arctic circle. IASS visualisation based on Flanders Marine Institute (2019), GRID-Arendal (2019), Copernicus Climate Change Service/ECMWF (2021a; 2021b).

2.2 State of Canada's species and habitats

The extensive area of the Canadian Arctic hosts a diverse species and habitats. Over 220 fish and 21 marine mammal species inhabit the waters, while the region supports approximately four million breeding seabirds during the summer months (Gaston, Mallory and Gilchrist, 2012). Human activities threaten this delicate system. The 2019 report on the "State of Canada's Arctic Seas" (Niemi et al., 2019) expresses the dramatic and fundamental changes occurring in the region as a consequence of the negative effects of climate change and continuous economic growth (see Section III below).

2.2.1 Fish

Of the 1,439 freshwater and marine fish species native to Canada, 222 fish species occur in Canadian Arctic marine waters. Approximately 20 of these are anadromous, meaning they move between freshwater and salt water for feeding, spawning, and overwintering. Almost all anadromous species of the northern Canadian Arctic (most of which are salmonids) support subsistence, commercial and recreational fishing. The Canadian portion of the Beaufort Sea is home to approximately 52 marine and 20 anadromous species. The Canadian Archipelago area of the Arctic Ocean (north of the mainland to the 200–nautical mile Exclusive Economic Zone boundary) is home to approximately 68 marine

and 13 anadromous species. The Baffin Bay and Davis Strait area is home to approximately 104 marine and five anadromous species of fish (ONCS, 2018).

Table 1: Comparative data and information on fish in the Canadian Arctic

Species richness	Abundance as indicated by primary productivity	Threatened species according to IUCN Red List	**Main areas**
222 species (Oceans North, 2018)	293.9 mg/Cm/day (Sea Around Us, 2016)	**0 species** (IUCN Red List, 2020)	Canadian Archipelago, Baffin Bay, Davis Strait

There are no fish species occurring in Canadian waters listed as threatened under IUCN Red List and there are no current conservation concerns for major fished species such as Arctic Cod. However, it is difficult to assess population and fish growth trends, because patterns of coastal movement and associations with sea-ice conditions are complex and not well understood (ONCS, 2018).

2.2.2 Marine mammals

Currently, there are 21 species of marine mammals resident to the Canadian Arctic (Oceans North Conservation Society, World Wildlife Fund Canada, and Ducks Unlimited Canada, 2018). These include six pinnipeds (seals and walruses) and 15 cetaceans (whales, porpoises and dolphins). The Ringed Seal (*Pusa hispida*), Bearded Seal (*Ergnathus barbatus*), Hooded Seal (*Crystophora cristata*), Harp Seal (*Pagophilus groenlandicus*), Harbour Seal (*Phoca vitulina*), Walrus (*Odobenus rosmarus*), Beluga Whale (*Delphinapterus leucas*), Narwhal (*Monodon monoceros*), and Bowhead Whale (*Balaena mysticetus*) reside in the Canadian Arctic year-round (ONCS, 2018). In addition, polar bears are included in this overview due to their cultural and economic significance to the region, even though they do not live exclusively in the marine realm (ONCS, 2018).

Table 2: Comparative data and information on marine mammals of the Canadian Arctic

Species richness	Threatened species according to IUCN Red List	**Main areas**
21 species (Oceans North, 2018)	**4 species** (1 Endangered 3 Vulnerable 13 Least Concern 1 Data Deficient) (IUCN Red List, 2020)	Coastal areas

Current population trends of marine mammal populations are for the most part unknown in the Canadian Arctic due to cost of surveys and inaccessibility of species (large scale migration, movement, remote habitats) (Niemi et al., 2019; ONCS, 2018). For some marine mammals of the Canadian Arctic, ten years have passed since the last assessment (Niemi et al., 2019). Bowhead populations are the only resident cetacean known to be increasing in abundance in the past decades, following a critical decline due to whaling (Schweder et al., 2010). The only other trends known for marine mammals is that polar bear populations are stable in the Davis Strait, Foxe Basin and northern Beaufort Sea, increasing in the Kane

Basin, and likely declining in the southern Beaufort Sea and southern and western Hudson Bay (Durner et al., 2018).

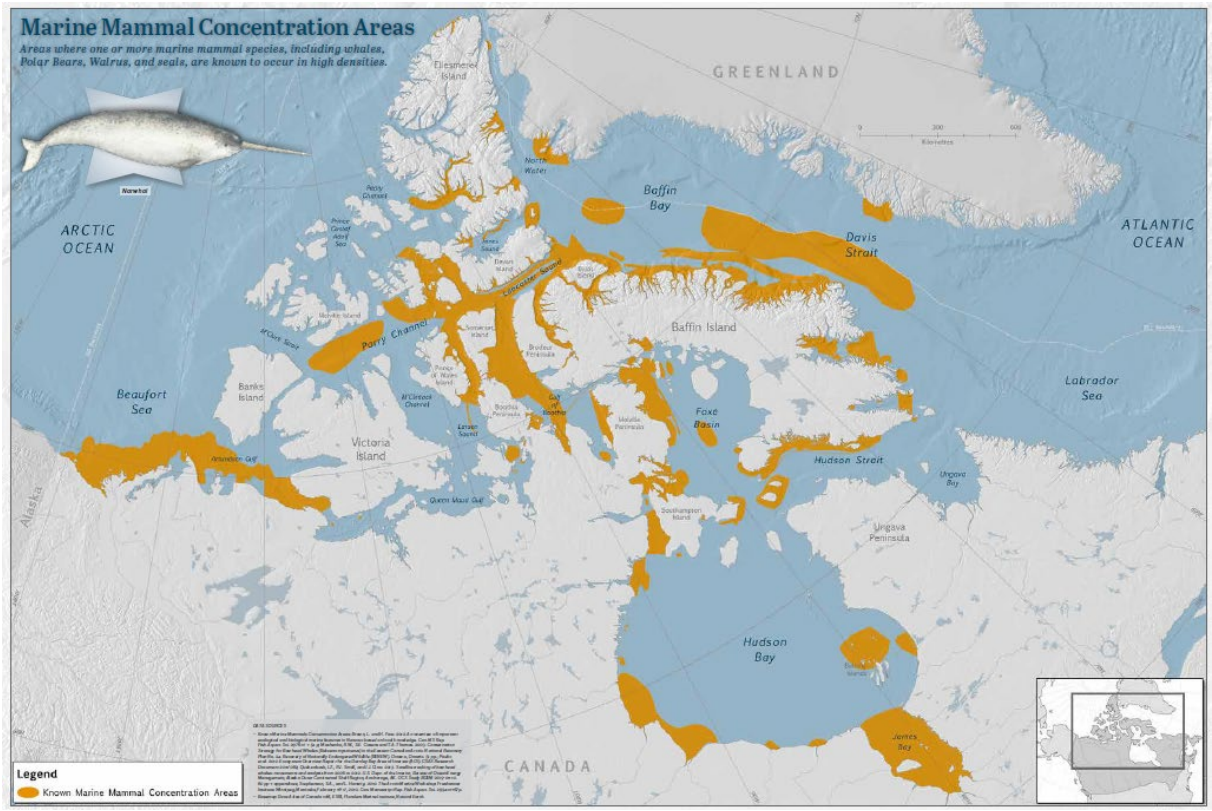

Figure 3: Marine mammal concentration areas in the Canadian Arctic (ONCS, 2018)

2.2.3 Seabirds

Table 3: Comparative data and information on seabirds of the Canadian Arctic

Species richness	Threatened seabird species according to IUCN Red List Status	Key sites (monitored colonies) for seabird (Irons et al., 2015)
254 species (incl. marine oceanic, marine intertidal, marine coastal/supratidal and marine neritic) (IUCN Red List, 2020)	**20 species** (6 Endangered 14 Vulnerable 23 Near Threatened 207 Least Concern) (IUCN Red List, 2020)	Eastern Arctic (Nunavut and Arctic Quebec – Nunanvik, N of 60°)

Evaluating the conservation status and trends of bird populations is difficult as gathering reliable data on the abundance and distribution of marine birds at sea is a challenging exercise, especially across an area as vast and remote as the Canadian Arctic (ONCS, 2018). Currently, population trends for 62% of Canadian seabird species are unknown, especially those inhabiting the remote areas of the Arctic (North American Bird Conservation Initiative Canada, 2019).

While some species have shown increasing trends, such as Arctic geese (whose abundance leads to concern over their potential ecological impacts), other species are

highly impacted by degradation of breeding habitats due to oil and gas exploration and exploitation and contamination of habitats (ONCS, 2018). In addition, polar bears that historically preyed upon seals spend more time on land due to the reduction of sea ice and have begun using seabird eggs as alternative food resource (ONCS, 2018). The effects of climate change have thus indirectly created a new threat to Canadian Arctic seabirds.

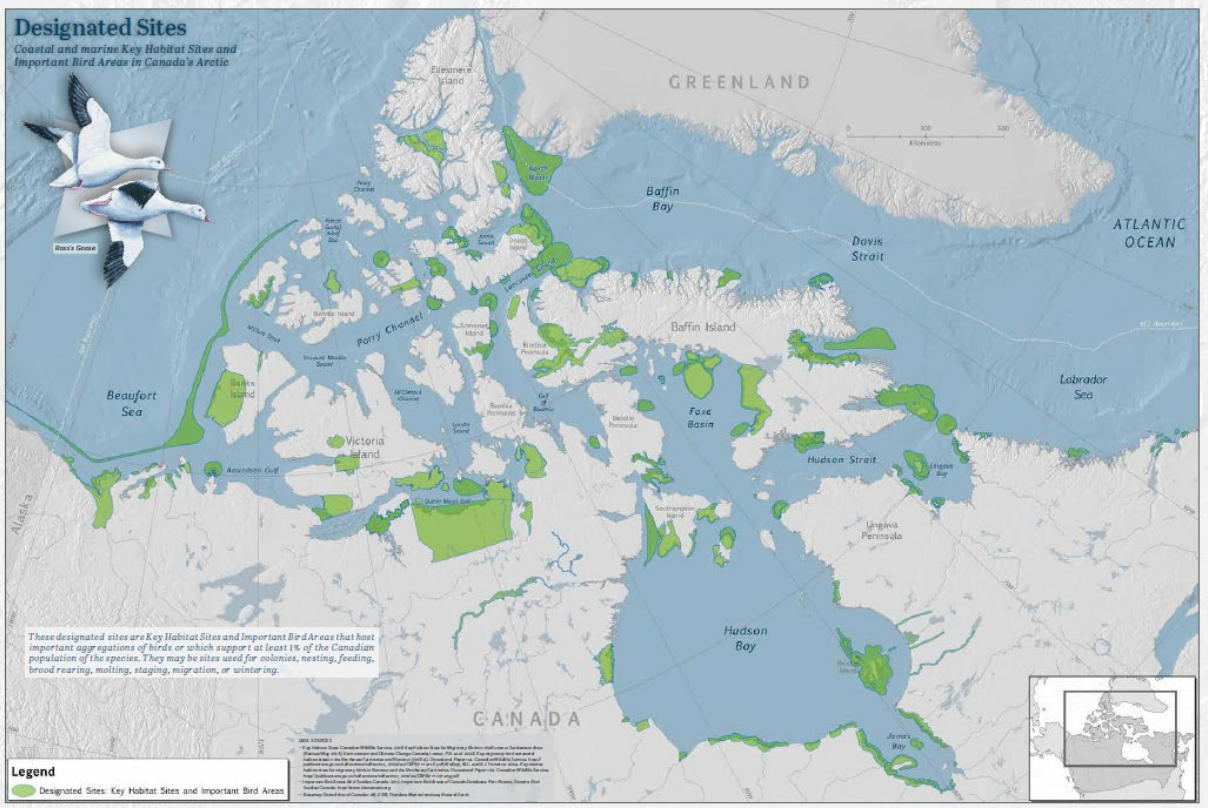

Figure 4: Designated sites of coastal and marine birds of the Canadian Arctic (ONCS, 2018)

2.3 Habitats

Benthic habitats and biodiversity have been assessed at point locations across the Canadian Arctic region, with the highest level of sampling occurring in the Beaufort Sea and Baffin Bay. A great need of information about lesser-known regions such as the high Canadian Arctic Archipelago persists (CAFF, 2017). Research in Baffin Bay shows that benthic invertebrates inhabit the entire seafloor, and that coral and sponge communities are particularly rich and abundant here compared to the rest of the Canadian Arctic. The benthic biodiversity of Baffin Bay is typical for the Arctic-Atlantic and comparable to other Arctic-Atlantic seafloors (CAFF, 2017).

The Mackenzie River delta in the Canadian Arctic is an estuarine environment that supports large communities of epibenthic mysid, amphipod species. Many polychaete species have also been shown to favour estuarine conditions around the Mackenzie River (Conlan et al., 2008). Due to the effects of climate change, freshwater input into the delta might increase and render the habitat more susceptible to ocean acidification due to the lower buffer capacity and lower calcium ion concentrations at the surface. This could affect beluga whales that migrate to coastal areas and estuaries in the summer months (CAFF, 2017).

3 Drivers and pressures

3.1 Introduction and overview

Human activities (such as shipping and fishing) are *drivers* of change in Arctic environments that impact Arctic ecosystems by placing *pressures* on flora and fauna (for example, noise pollution from boats or damage to the seafloor from dredging). This section evaluates the status and trends of key existing and emerging economic sectors driving marine biodiversity loss in Canada and identifies the pressures they place on Canadian Arctic ecosystems. Due to limited data availability, the economic importance of sectors is reported for as a whole. Wherever possible, quantitative and qualitative data for the Canadian Arctic is used complement national data.[1] We also identify sector-specific regulations that aim to limit sectoral impacts on the Arctic marine environment.

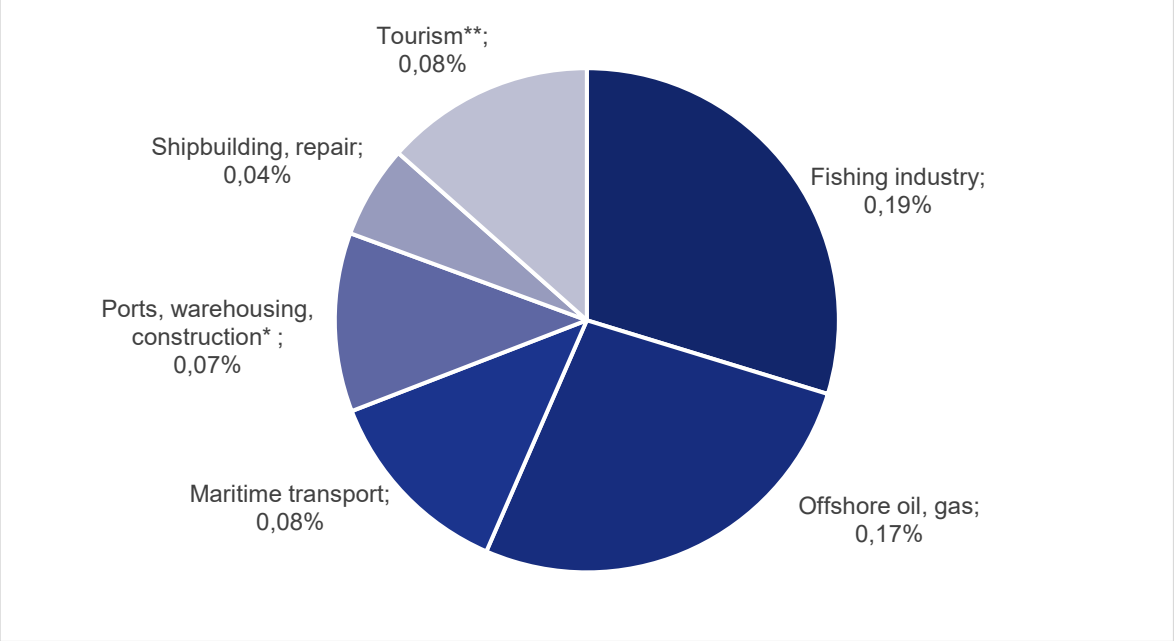

Figure 5: Contribution of blue economy sectors to whole Canadian GDP in percent, the relative share in the pie chart reflects their importance within the blue economy (source: Fisheries and Oceans Canada, 2020a; own calculations)

Canadian blue economy: Figure 5 shows the relative importance of the six main blue economy sectors to the whole of the Canadian economy, in % of GDP contributions. When considering contribution to GDP, as well as employment numbers, the fishing industry including wild fish and aquaculture, as well as processing industries, is the most significant blue economy sector in Canada. Offshore oil and gas exploration and exploitation

[1] Where possible, we follow the methodology proposed by EU Blue Economy report to make results comparable to other case studies (European Commission, 2018). Data comes primarily from Fisheries and Oceans Canada (2020). Quantitative data on the sectors is broadly comparable, with the exception of "Ports, warehousing, construction" (which excludes subsector warehousing and storage services), and Tourism (which is more accurate than the EU calculation method, giving considerably lower numbers). Also note: Canadian numbers are presented in terms of direct contributions to GDP. These are slightly different to other case studies (which present GVA, which treats taxes/subsidies differently), however the relative comparisons between sectors within Canada is broadly the same.

generates considerable contributions to Canadian GDP but employs a relatively small proportion of the population (only 0.01% of Canada's workers are employed directly in offshore oil and gas related activities). More significant employers are coastal/marine tourism, maritime transport, and ports/warehousing/construction, while these generate relatively smaller contributions to GDP (Fisheries and Oceans Canada, 2020a).

Arctic blue economy: It is important to emphasise that Figure 5 illustrates the Canadian economy as a whole; the Canadian Arctic economy is structured differently, with no oil and gas related activities. Due to a lack of consistent data sources for the region as a whole, we explore these Arctic-specific blue economy sectors on a case-by-case basis using different data sources per sector. Overall, we find that the Canadian Arctic fisheries are still at relatively low levels, but have the potential to grow under climate change. Maritime transport and tourism are both growing in the Canadian Arctic, though from low levels. While there has been oil exploration in the past, high costs, low oil prices and restrictive environmental safety regulations limit exploration within the current climate.

3.1.1 Fishing (extraction of species and associated industries)

Overview of the activity, socioeconomic importance and trends

Catch fisheries occur in all three of Canada's oceans. The most significant is catch in the Atlantic, responsible for 81% of Canadian catch, with some catches in the Pacific and a small take in Arctic waters. At the national level, the fisheries sector is the most significant blue economy sector in Canada in terms of employment and GDP contribution. In 2016, the catch, aquaculture, and fish processing industries employed more than 38,000 workers and generated €2.5 billion in direct contributions to GDP. This is equivalent to 0.19% of Canadian GDP and 0.21% of total employment. Canada-wide employment increased by 24% from 2012-2016, despite slowly declining catch since 2000.

Table 4: Quick facts on fishing and aquaculture activities in Canada

% of GVA	% of total employment	Capture in tonnes	Main areas	Summary & Trend	Estimated potential
0,2% (Fisheries and Oceans Canada, 2020, own calculations)	0,21% (Fisheries and Oceans Canada, 2020, own calculations)	**Canada** Catch: 827,727 Aquaculture: 191,323 **Arctic**: catch (2015). 189,000 (Tai et al. 2019)	**Canada**: Atlantic (80% of catch); Pacific; inland lakes. **Arctic**: Small catch - Subsistence fishing all over; Commercial fishing focused in the East Arctic	Low levels of activity in the Arctic	High

The main catch in Canadian waters differs by ocean. In the Atlantic, demersal fish such as cod and haddock and small pelagic fisheries such as herring dominate. In the Pacific, small pelagic fisheries such as herring are also prevalent, in addition flatfish, salmon and many different species of rock fish are targeted (FAO, 2020). Aquaculture is well-established in Canada, focusing on Atlantic and Chinook salmon, Arctic char, blue mussel, oyster and

clam (FAO, 2020). In 2018, total aquaculture production in Canada was 191,323 tonnes (FAO, 2020).

At the Canadian level, the fish catch has slowly declined since the early 2000s, a trend which continues. This is offset by an increase in the value of Canadian fishing between 2012-2016, largely due to higher prices for other key exports such as snow crab and lobster (Fisheries and Oceans Canada, 2021a). Aquaculture production has grown slowly but steadily since the 1980s (see Figure 6).

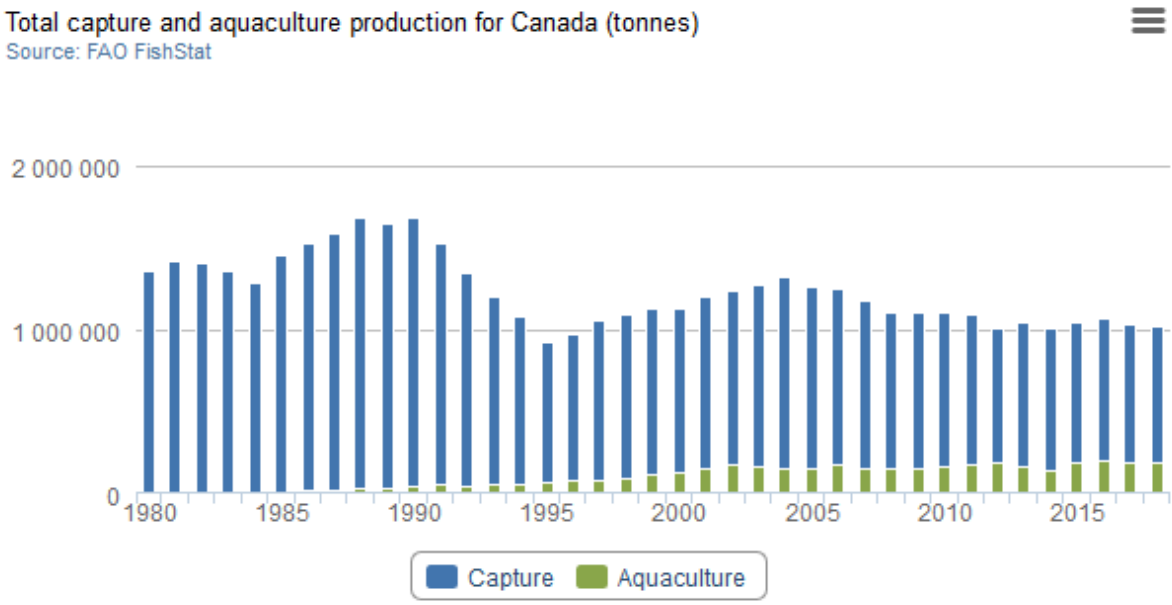

Figure 6: Trends in Canadian fish catch and aquaculture production (FAO, 2020)

Arctic fishing is less significant compared to the importance of fishing to Canada as a whole. On the local level, subsistence catch by local Indigenous communities plays an important role (see section 5.2 below), however, and also commercial fishing takes place. Regarding the regional distribution of catches, the vast majority of fish catch occurs in the Canadian Eastern Arctic and West Greenland areas (approx. 99% of Arctic catch). Here, the focus is on trawling for Northern prawn (two-thirds of catch), with longline and trawling for ground fish species. Fisheries in the remainder of the Arctic is primarily low-level subsistence fishing. This makes up on average less than 1% of total Arctic fish catch and is not thought to be a significant stressor (Niemi et al., 2019).

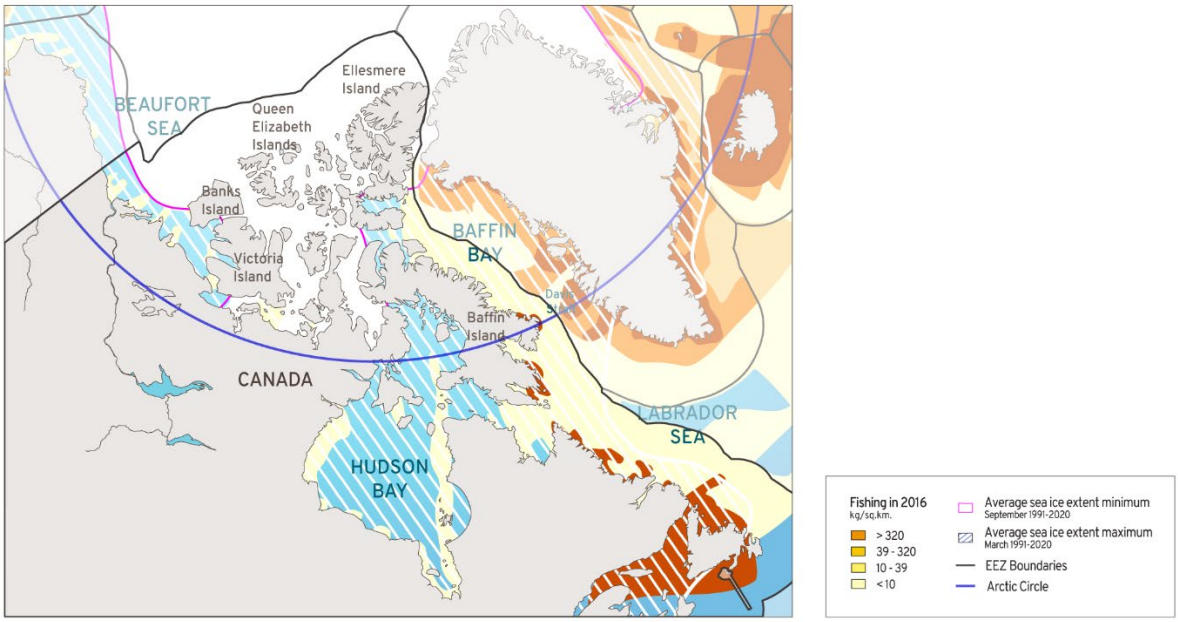

Figure 7: Fishing effort in Canadian Arctic waters. IASS visualisation based on Copernicus Climate Change Service/ ECMWF (2021a; 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), Pauly et al. (2020).

Aquaculture appears very limited in the Canadian Arctic. Fisheries and Oceans Canada do not report any aquaculture production or income data related to the Arctic Canadian territories (Fisheries and Oceans Canada, 2019). A 2018 review paper of Canadian Aquaculture reported on Arctic Char aquaculture in Yukon territory, but otherwise the Arctic regions are not discussed (Noakes, 2018).

The value of some Arctic fisheries appears to be growing at a faster rate than the value of fisheries in the rest of Canada. From 2006-2014, commercial fisheries in the territory of Nunavut increased in total value from 38 to 86 million CAD (Niemi et al., 2019). This does not appear to be due to higher catch levels, which as shown in Figure 8 seem unchanged since the mid-1970s, but due to higher prices. However, research indicates that there is potential for growth in catches as the climate warms. Tai et al. (2019) find that climate change will likely increase fish stocks in Arctic waters as the warming water allows northward migration of fish, increasing the maximum sustainable yield. They predict this could as much as double fish stocks in the Arctic.

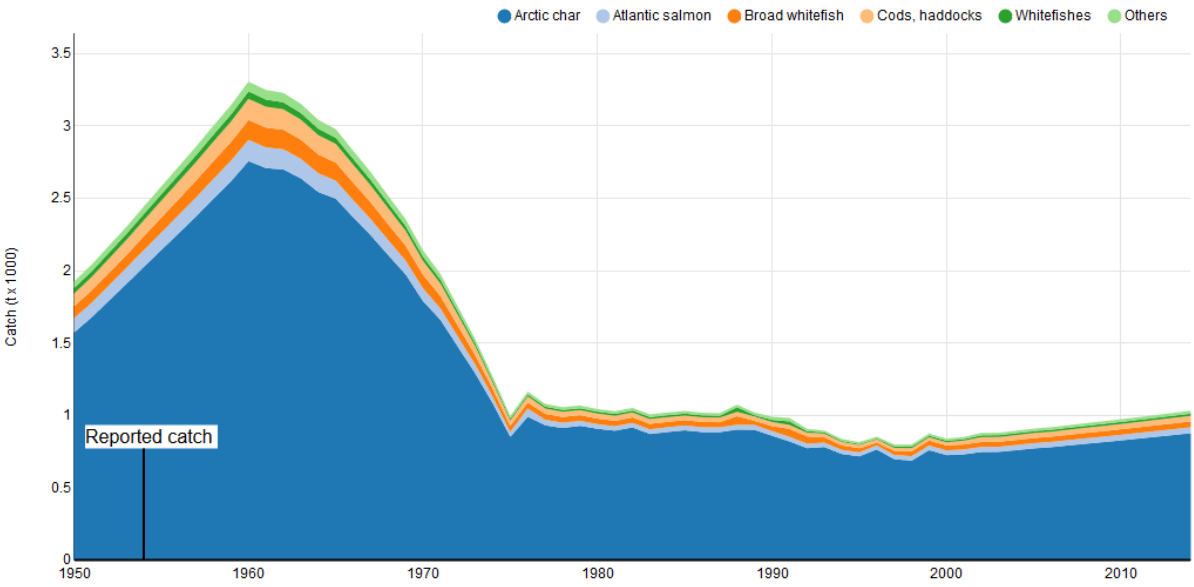

Figure 8: Canadian Arctic fishing catch by taxonomic group (in thousands of tonnes) (note: excluding shrimp) (www.seaaroundus, 2020)

Related pressures

Current level of fishing pressure in the Canadian Arctic is low. Tai et al. (2020) find that current levels of Arctic fishing catch are 189,000 tonnes, 5% of what they calculate to be the maximum sustainable yield (Tai et al., 2020).

Due to the low level of fishing in the Arctic, fishing-related pressures are considered relatively low compared to what they would be at higher levels of fishing activity. The fishing sector nonetheless affects Arctic ecosystems through its extraction of fish, as well as secondary impacts such as bycatch, noise pollution, or habitat damage from to ocean floors from trawling to catch ground fish and shrimp (Niemi et al., 2019).

Regulations

In Canada, fishery policies are based on a precautionary approach “which discourages the issuance of permits for large-scale commercial fishing in areas where the available science is insufficient to ensure a sustainable catch” (Oceans North, 2020) and ecosystem-based management (Fisheries and Oceans 2019a). Fisheries and Oceans Canada holds the authority to develop and implement policies related to fisheries, including conservation and sustainable use of resources (FAO, 2013).

The Fisheries Act is the primary federal statute governing the management and control of fisheries and the conservation of fish and their habitat, originally passed in 1868. Amendments were made in the 1970s, 2012 and 2018, most recently by the Bill C-68 (Castañeda et al., 2020). The protection of fish and fish habitats was seriously weakened by the 2012 amendments under the conservative federal administration (Hewson 2019). The 2018 amendments strengthened conservation efforts once again as they restored the protection of all fish and their habitats “including the prohibitions on habitat alteration, damage and destruction and on causing the death of fish other than fishing” (Hewson 2019). Prior to that, only fish which were part of commercial, recreational, or aboriginal fisheries were under protection (Hutchings and Post, 2013). The amended Fisheries Act foresees the inclusion of Indigenous knowledge in decision-making on habitat protections. Furthermore, the amended Fisheries Act simplifies the designation of Ecologically

Sensitive Areas and other protected areas, introduced new ministerial powers to use short-term measures to quickly respond to unpredicted threats to the management of fisheries and conservation of fish (Fisheries and Oceans Canada, 2019b), and to develop long term marine refuges (Hutchings et al., 2020).

With respect to the growing aquaculture industry, the renewal of legislation, including the creation of a federal Aquaculture Act, is in the planning process (Fisheries and Oceans Canada, 2020b).

Under the Species at Risk Act, several orders were passed to protect critical habitats of orcas, Right whales, Bottlenose whales, belugas, abalones and seals, and important fish species. Moreover, a new timeframe for listing marine species as at risk was created under the Species at Risk Act. To create enhanced accountability and speed up the protection of endangered species, the Canadian government must now list a species within 36 months after having received a species status assessment from the Committee for the Endangered Wildlife Status in Canada (Hewson, 2019).

Canada is member to several international agreements on fisheries and takes an active role in Regional Fisheries Management Organizations. The Northwest Atlantic Fisheries Organization (NAFO) is based in Nova Scotia, Canada and is responsible for the management and conservation of several fishery resources in the Northwest Atlantic, outside the Exclusive Economic Zone (EEZ) of coastal states (FAO, 2013). In addition, Canada is involved in the Inter-American Tropical Tuna Commission (IATTC), the International Commission for the Conservation of Atlantic Tuna (ICCAT), the North Atlantic Salmon Conservation Organisation (NASCO), North Pacific Anadromous Fish Commission (NPAFC), the North Pacific Fisheries Commission (NPFC), and the Western and Central Pacific Fisheries Commission (WCPFC). Other examples of Canada's engagement are that they build on G20 commitments by initiating the G7 Ocean Plastics Charter, signed an Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean and an Agreement on Port State Measures to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing in 2019 (Hewson, 2019). Canada also signed an ocean partnership agreement with the European Union towards the prevention of unregulated commercial fishing, which partly addresses the prevention of unregulated commercial fishing in the central Arctic (European Commission, 2019).

In accordance with the Fisheries Act, Fisheries and Oceans Canada manages fisheries with the key priorities of "economic viability, environmental sustainability and inclusion of stakeholders in decision-making processes" (Fisheries and Oceans Canada, 2020c). Management measures for a particular fishing season apply to (groups of) species and fishing areas, and may include management plans, total allowable catches (TACs), or seasonal openings or closures (Fisheries and Oceans Canada, 2020c). In some cases, fisheries are managed through multi-year management plans to ensure conservation and sustainable use of the marine resources, support sustainable fisheries and "combine science and Indigenous traditional knowledge on fish species with industry data to determine best practices for harvest" (Fisheries and Oceans Canada, 2021b). These multi-year plans are developed through consultation by Fisheries and Oceans Canada with the fishing industry, the provinces, other stakeholders and Indigenous organizations (Archibald and Rangeley, 2020).

In Canada, it is an obligation to hold a licence for commercial fishing, as well as for recreational fishing of commercial species (FAO, 2016). Licences are managed though an

online system administered by Fisheries and Oceans Canada (Fisheries and Oceans Canada, 2018). Fisheries and Oceans Canada is also responsible for monitoring, control and surveillance of Canadian waters. The Canadian Coast Guard is part of Fisheries and Oceans Canada (FAO, 2013).

Co-management in the Arctic

Fisheries management in the Arctic takes place under a co-management regime between the Canadian Department of Fisheries and Oceans and Indigenous Peoples. Co-management bodies aim to provide protection of Indigenous rights under the land claim agreements through representation of Indigenous Peoples' interests and their involvement in decision-making. An important example of fishing and hunting co-management exists in the Inuit Settlement Region (ISR), designated under the Inuvialuit Final Agreement (IFA) which was signed in 1984. The IFA affirms hunting and fishing rights as well as access and decision-making authority regarding fish, terrestrial animals, and marine mammals (Inuit Circumpolar Council Alaska, 2020). The IFA led to the establishment of Inuit Regional Cooperation (IRC), as well the Inuvialuit Game Council (IGC), which aim to represent the collective Inuvialuit interest in wildlife (Ayles et al., 2016). Also, the Fisheries Joint Management Committee (FJMC) holds the authority to make recommendations on fishery-related issues, such as harvesting (Inuit Circumpolar Council Alaska, 2020). Quotas are set by the Inuvialuit and the federal government. They are allocated by the FJMC, the IGC, and, on a local level, by several community-based Hunters and Trappers Councils (HTCs) (Inuit Circumpolar Council Alaska, 2020).

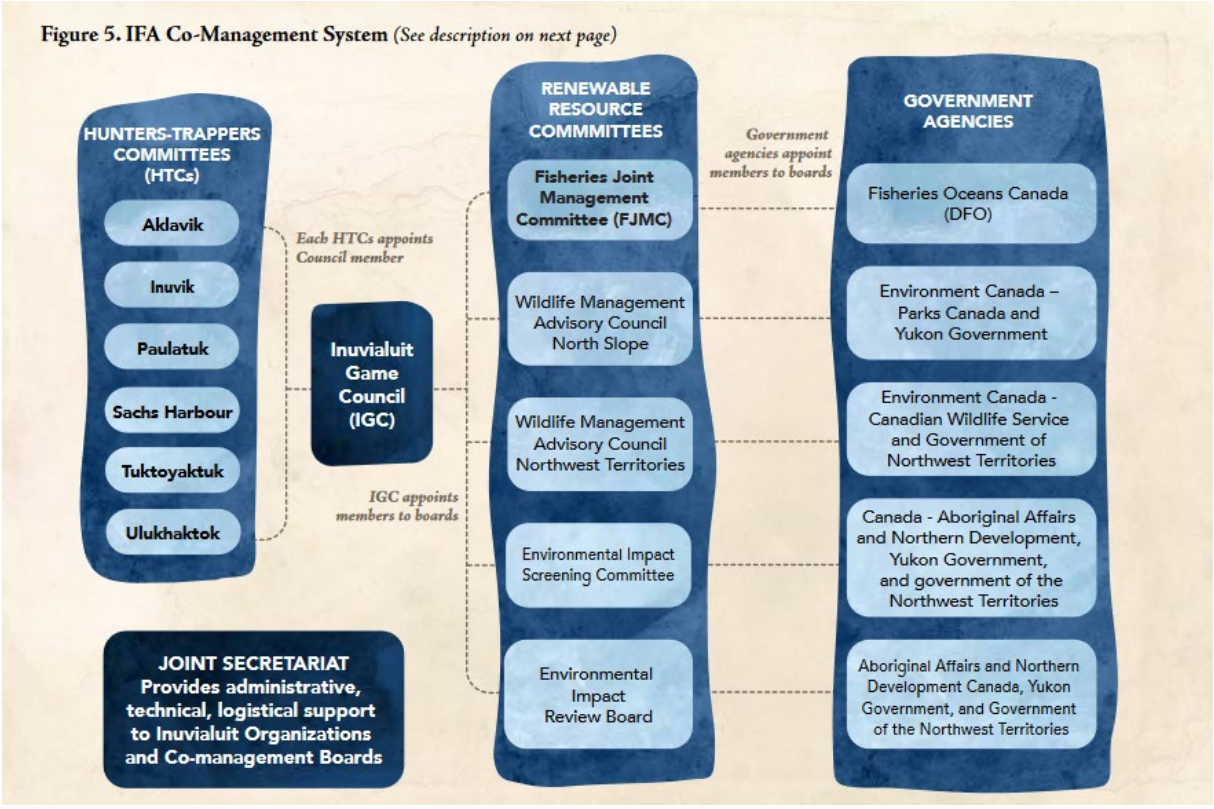

Figure 9: The Co-Management System under the IFA (Inuit Circumpolar Council Alaska, 2020)

Examples of fisheries management within the Arctic

In the western Canadian Arctic, the Inuvialuit raised concern about the effects of potential large-scale commercial fisheries. Commercial interest on a large scale was observed between 2002 and 2009 by actors outside the ISR (Ayles et al., 2016). The Inuvialuit feared the effects of this economic activity on fish and marine mammals in the ecosystem (Ayles et al., 2016). To protect the rights of the Inuvialuit, the FJMC, IRC and IGC the parties negotiated an agreement to protect the Beaufort Sea from commercial fisheries. It began with a decision taken in 2009 by the FJMC, IRC and IGC encourage small-scale, community-based management and prevent large-scale commercial fisheries (Oceans North, 2020). In 2011, the parties signed a Memorandum of Understanding (MOU) in order to develop a Beaufort Sea Integrated Fisheries Management Framework (Ayles et al., 2016). In 2014, the parties signed an agreement to protect more than 831,000 square kilometres of Canada's Beaufort Sea from commercial fishing until scientists and local communities can provide proof that it is sustainable (Oceans North, 2020).

Another example is the Nunavut Wildlife Management Board (NWMB), which is the main body for the management of and access to wildlife throughout the Nunavut Territory. The body also holds the mandate to the marine areas extending 12 nautical miles into the sea adjacent to Nunavut (Boudreau, 2016). Therefore, and in cooperation with Fisheries and Oceans Canada, Nunavut Tunngavik Incorporated (NTI) and the Government of Nunavut take decisions on fisheries in Nunavut. Decision-making incorporates both science and Inuit traditional knowledge (Boudreau, 2016). In 2015, a fisheries management plan was approved by the federal government, covering 971,000 square kilometres and protecting the continental shelf along Baffin Island from bottom trawling (Oceans North, 2020).

3.1.2 Offshore oil and gas

Overview of the activity, socioeconomic importance and past and future trends

Oil and gas exploration and exploitation affect marine environments by noise and hydrocarbon pollution from drilling and seismic surveys, habitat disturbance, as well as the risk of oil leaks. There is currently no offshore drilling for oil or gas in the Canadian Arctic due to a five-year moratorium established in 2016. However, there has been exploration in the Arctic region, and offshore oil and gas exploitation is well-established in other areas of Canada. Canada is the sixth largest producer and exporter of oil in the world. Income from the industry accounts for 7% of Canada’s GDP (CAPP, 2019). Offshore oil and gas make up only a small proportion of this, but still provides a contribution of €2.3 billion to the Canadian GDP, equivalent to 0.2% of Canadian GDP. The offshore oil and gas industry is not a large employer, with direct employment across Canada accounting for just 0.01% of jobs.

Table 5: Quick facts about oil and gas activities in Canada

% of GDP	% of total employment	Oil production volume	Exploration wells	Main areas for production (P) and exploration (E)	Summary & Trend	Estimated potential
Canada Offshore: 0,2 % (Fisheries and Oceans Canada, 2020, own calculations) **Arctic: 0%**	**Canada offshore:** 0.01% (Fisheries and Oceans Canada, 2020, own calculations) **Arctic:** 0%	**Canada crude oil (total):** 4,589,000 barrels per day **Offshore (East Canada):** 230,000 barrels per day **Arctic:** none	**Arctic:** 125 up to 2014, none since	**Canada offshore**: Labrador, Nova Scotia (5% of Canadas production) **Arctic:** none	**Canada:** Strong activity **Arctic:** Currently zero oil/gas	**Arctic:** Medium potential

Overall Canadian oil production: The vast majority (95 %) of Canadian oil production is terrestrial and takes place in the west of Canada, though there are reserves across the country and also offshore (see Figure 10).

Offshore oil production is located off the coast of Canada's eastern provinces, in particular Newfoundland and Labrador. Major projects include Hibernia, Terra Nova, White Rose and Hebron (CAPP, 2019). They accounts for approximately 5% of Canadian oil production (see Figure 11). Of these major projects, especially Hebron's production is expected to grow, as in 2018 only 3% of the 707-million-barrel field had been recovered. The other projects are in decline, with 62-82% of estimated recoverable barrels already pumped (CAPP, 2019). The offshore production in East Canada is forecasted to peak at over 350,000 barrels per day in 2026 before falling to roughly 91,000 barrels per day in 2035 (CAPP, 2019).

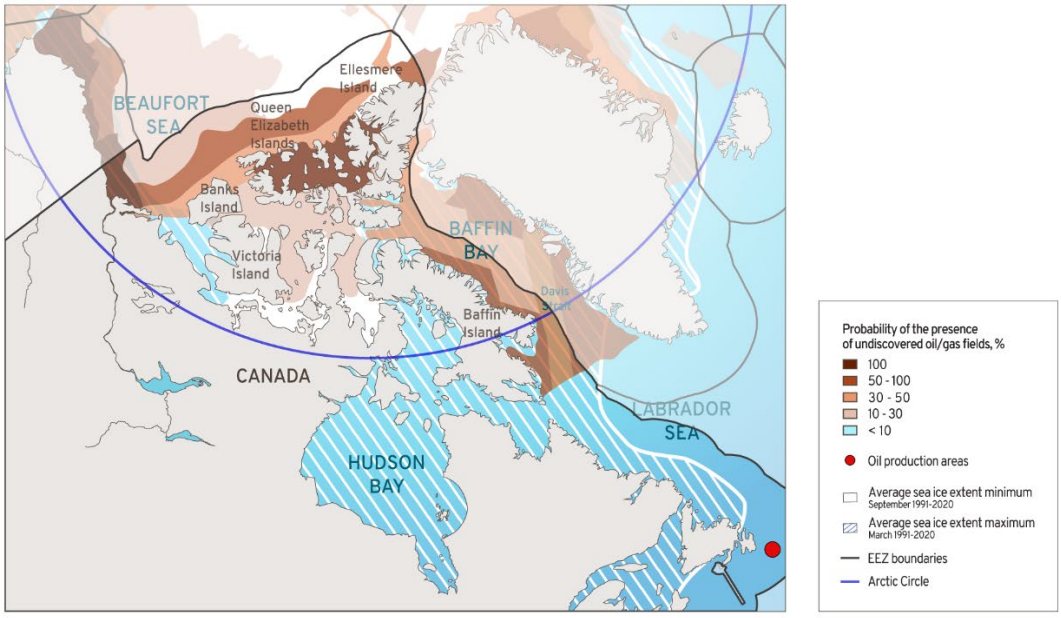

Figure 10: Probability of the presence of at least one undiscovered Arctic oil and/or gas field with recoverable resources greater than 50 million barrels of oil equivalent in East Canada according to USGS 2009 survey results. IASS visualisation based on Copernicus Climate Change Service/ECMWF (2021a; 2021b), Flanders Marine Institute (2019), Government of Newfoundland and Labrador (2021), GRID-Arendal (2019).

Figure 2.1 Canadian Oil Sands and Conventional Production

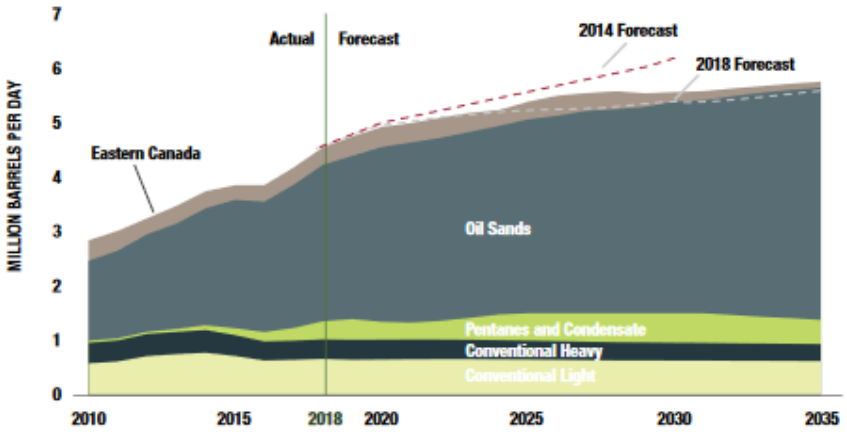

Table 2.1 Canadian Crude Oil Production

Million b/d	2018	2020	2025	2030	2035	Change
Eastern Canada	0.23	0.30	0.32	0.18	0.09	-0.14
Western Canada	4.36	4.64	5.17	5.48	5.76	1.41
Total Canada*	4.59	4.94	5.49	5.66	5.86	1.27

*Totals may not add up due to rounding

Figure 11: Canadian crude oil production (CAPP, 2019)

While oil and gas exploration activities have been carried out in the Arctic in the past, there has been no large-scale exploitation. Exploration was at its highest in the 1970s and then again in the late 2000s, however, lower oil prices and the technical challenges posed by

extreme Arctic conditions have suppressed interest in exploration and exploitation (Gulas et al., 2016). In total, there have been 125 exploration wells drilled in Canada's Arctic offshore waters as of 2014. 92 wells are in the Beaufort Sea, 30 wells in the Arctic Islands, and 3 wells in the Eastern Arctic. The vast majority of this occurred in the 1970s and 80s, although in 2005 there was another drilling of an exploratory well in the Beaufort Sea, which was deemed not commercially viable. Technical challenges, strict environmental protections, low oil prices, opportunities in other areas, as well as regulations limiting the development of the offshore oil and gas industry render it unlikely that Canada will expand Arctic offshore oil and gas activities in the short or medium term (Henderson and Loe, 2014).

Pressures

Given the absence of current exploration or exploitation of oil and gas in the Arctic, there are limited pressures from this sector on the Arctic environment. The most significant risks from drilling would be an uncontrolled oil leak, which would have significant impacts on marine birds, marine mammals and other marine life. Drilling also generates noise pollution and causes physical disturbances to the seabed. The associated transport also impacts the marine environment (Cordes et al., 2016).

Oil and gas regulations

The offshore oil and gas industry is subject to a permissive-based regime (Offshore Petroleum Management Division, 2020). Following the BP Deepwater Horizon oil disaster in the Gulf of Mexico in 2010, Canada strengthened its regulations on offshore oil and gas exploitation (Pelaudeix, 2017). The "Frontier and Offshore Regulatory Renewal Initiative" aims to update the main framework for federal-provincial co-management in the offshore oil and gas sector.

In cooperation with the federal government, the province of Newfoundland and Labrador in East Canada governs oil and gas activities in its Arctic region under the legislative framework set out by the "Accords Acts". This includes the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act and the Canada-Newfoundland Atlantic Accord Implementation Act and provincial legislations that mirror the obligations of the federal acts on the provincial level. The legislation is applied by the respective boards, including joint agencies of the federal and respective provincial governments (Offshore Petroleum Management Division, 2020).

Outside of the Accord Areas, oil and gas activities in the Arctic regions regulated by federal law (Offshore Petroleum Management Division, 2020) under the Canada Oil and Gas Operations Act (Canada Energy Regulator, 2020a). Since 2019, the licences are granted by the Canadian Energy Regulator (Offshore Petroleum Management Division, 2020).

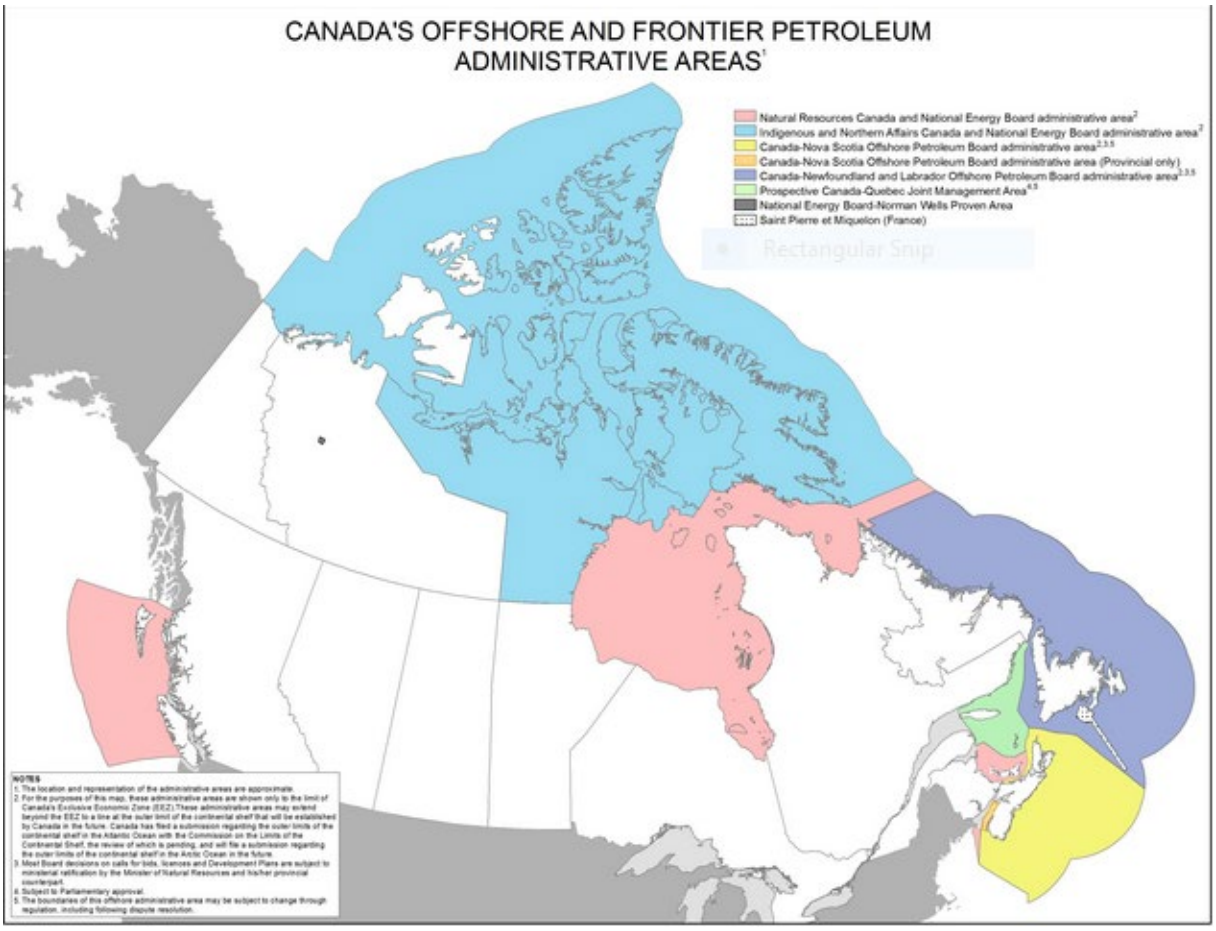

Figure 12: Canadas Offshore and Petroleum Administrative Areas (Offshore Petroleum Management Division 2020)

In 2016, the United States and Canada announced a partnership regarding their respective country's intentions for Arctic management. The statement included, amongst other aspects, a five-year moratorium on future offshore Arctic oil and gas exploration, with the intention to freeze licenses for exploration in the area. This moratorium was designed without a specific end date but is meant to be reviewed every five years. A science-based review of the moratorium was expected to be published by 2021 (Canada Energy Regulator 2020a), but has not yet been completed.

This US-Canadian statement also required national implementation into binding regulations and executive action, originally including a process with Northern and Indigenous groups to explore options to protect "the last ice area" – the only Arctic region expected to retain summer sea ice until 2050 (Prime Minister of Canada, 2016b). The moratorium was introduced with Bill C-88 in 2019, as an amendment to the Canada Petroleum Resources Act, which prohibits certain works in the North and Arctic offshore regions when in national interest (Banks et al., 2019). Expanding the moratorium over time, the Canadian government issued orders in 2019 (Vigliotti, 2019) and in late 2021 by amending Order SOR/2021-272, now also freezing the conditions of all existing licences permitting oil and gas work in the area, remaining in place until 31 December 2022. The last Arctic offshore exploration licences were issued in 2014 by Crown Indigenous Relations and Northern Affairs Canada (Canadian Energy Regulator, 2020).

Another significant change to the governance of Canada's energy sector concerns the reallocation of competencies for the evaluation processes of infrastructure projects in 2019.

The final decision has been transferred to the Minister of Environment and Climate Change (Bill C-69). The creation of two new agencies, the Canadian Energy Regulator (CER) and the Impact Assessment Agency (IAA, a continuation of the previous Environmental Assessment Agency) aims to enhance transparency and efficiency in the assessment process, while ensuring greater environmental protection. Both agencies evaluate infrastructure projects by form of integrated impact assessments and make recommendations to the Minister for Environment and Climate Change (Canadian Energy Regulator, 2020). The legal amendments of 2019 also enhanced participation of the public and Indigenous Peoples in the assessment process through hearings and review panels (Government of Canada, 2018). Within the CER, at least one board member is required to be an Indigenous person. Also, an Indigenous Advisory Committee with 9 members was established in August 2020 which aims to enhance Indigenous involvement in CER-regulated facilities and liaises directly with the CER's board (Canadian Energy Regulator, 2020).

3.1.3 Maritime transport

Maritime transport is a growing part of the Canadian blue economy, making up 11% of blue economy jobs and directly contributing 0.1% of Canada's GDP. Maritime transport plays a facilitating role for the economy across Canada. It is particularly important in the Arctic region, due to limited road and very limited rail infrastructure (Council of Canadian Academies, 2017). Fuelled by a growing economy and trade, maritime transport in Canada is increasing. This growth is especially pronounced in the Arctic, in part because news shipping routes are opening due to the climate change-related reduction in ice cover (Pew Charitable Trusts, 2016).

Table 6: Quick facts on maritime transport activities in Canada.

% of GVA	% of total employment	Main areas	Summary & Trend	Estimated potential
0,1 % (Fisheries and Oceans Canada, 2020, own calculations)	**0,07%** (Fisheries and Oceans Canada, 2020, own calculations)	Hudson Bay and Hudson Strait; North-western passages	**Medium activity** likely to increase further	**Strong potential** related to diminishing sea ice coverage along the Canadian Northwest Passage routes

Overview of the activity, socioeconomic importance and trend

Maritime transport takes place across Canadian marine areas. The majority is bulk shipping of basic commodities such as wood, minerals, and oil. However, there is also significant shipping of other cargo, including fuel and food. It also enables trade with other countries, as approximately 20% of Canada's exports by value are transported via ship. Assuming continued economic growth and trade, maritime transport in the Arctic region is expected to increase in the future (Pew Charitable Trusts, 2016).

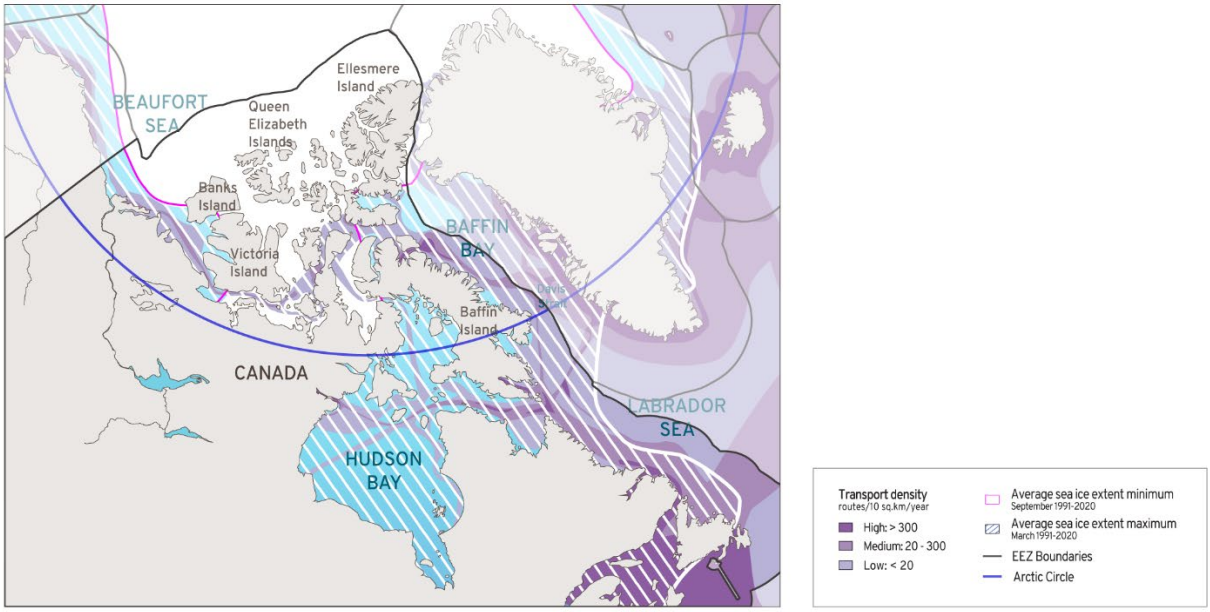

Figure 13: Transport density in Canada's exclusive economic zone. IASS visualisation based on Copernicus Climate Change Service/ECMWF (2021a, 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), Marine Traffic (2021).

Maritime transport plays a crucial role in the Arctic, where in remote communities it is relied upon (alongside air travel) to transport essential food, fuel, and other supplies. The majority of shipping traffic in the Canadian Arctic is across Hudson Bay and through Hudson Strait, primarily by oil tankers. Due to decreases in sea ice, maritime transport through the Northwest Passage of the Arctic is increasing. The number of voyages through the Northwest Passage has grown by 166% between 2004 and 2015 to over 300 per year and is expected to continue increasing as sea ice declines further (Pew Charitable Trusts, 2016). Shipping traffic has also increased elsewhere, as total vessel distance travelled by all types of ships in the Canadian Arctic tripled between 1990 and 2015 (Dawson et al., 2018). The biggest growth has been seen in fishing vessels, tanker ships, and pleasure

craft. Cargo ships, government vessels and icebreakers remained consistent (see Figure 14, Dawson et al., 2018).

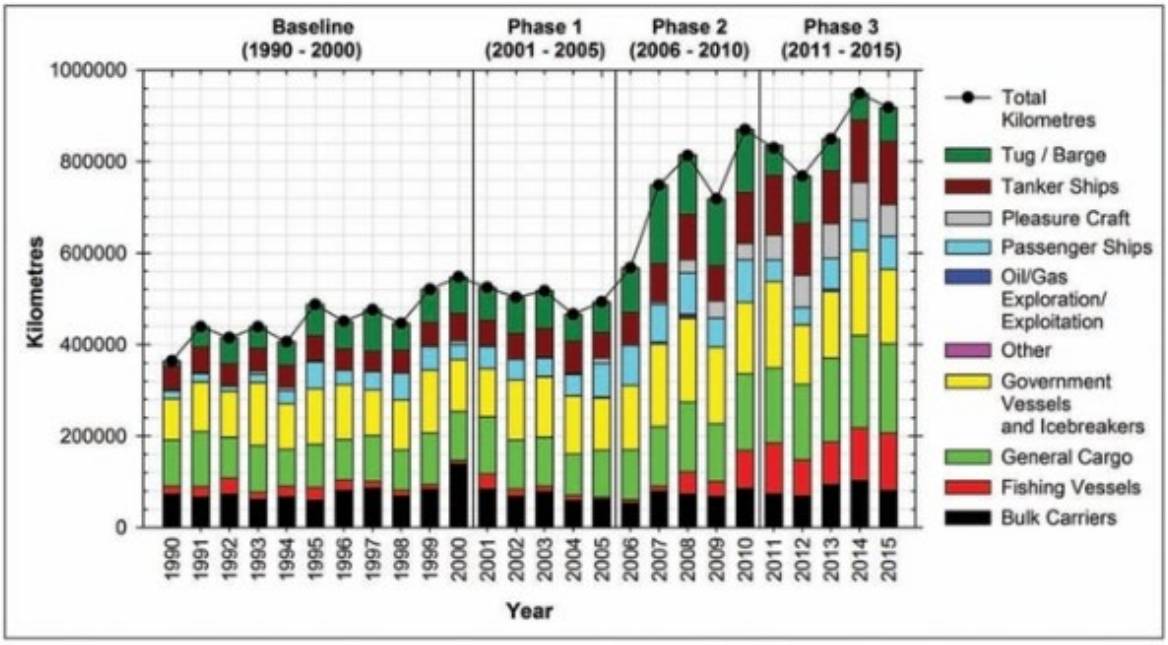

Figure 14: Total kilometres travelled annually by all vessel types in the Canadian Arctic (Dawson et al., 2018)

Pressures

Maritime transport produces multiple environmental pressures that include local air and water pollution (e.g., sulphur from heavy oil), underwater noise, and introduction of invasive species. Port infrastructure development and maintenance creates noise and seabed disturbances, as well as litter and other pollution and contaminants (Council of Canadian Academies, 2017). Of particular note are:

- **Noise:** Maritime transport and especially icebreakers can affect Arctic marine ecosystems. Marine mammals can be affected by the noise of a tanker at about 50 km away (Roth et al., 2013; PAME, 2019). As the Arctic shipping season is lengthening and vessel traffic is increasing, marine mammals are impacted by noise during different life events including migrations (Niemi et al., 2019).
- **Maritime accidents**: Shipping poses the risk of accidents, which could have significant impacts on the environment through the release of oil or other contaminants (Pew Charitable Trusts, 2016).
- **Greenhouse gases**: Shipping creates greenhouse gases. In 2013, maritime transport in Canada created 6.7 Mt of greenhouse gas emissions, equivalent to 1% of total Canadian emissions (Council of Canadian Academies, 2017).
- **Invasive alien species:** Ballast water and biofouling on ship hulls are potentially important pathways for introducing invasive alien species to Canadian Arctic waters (CAFF and PAME, 2017).

Regulations – Maritime Transport

The Canadian Shipping Act (2001) is the principal legislation governing maritime transportation, including the Arctic waters. The Marine Liability Act (MLA) stipulates the

responsibility and liability of the owner and/ or operator of his vessel and its navigations (Transport Canada, 2018).

The Arctic Waters Pollution Prevention Act (AWPPA), enacted in 1985, constitutes Canada's first approach to restrict international navigations in the Arctic waters (Bartenstein, 2019). Following a "no disposal" approach it states that "no person or ship shall deposit or permit the deposit of waste of any type in the arctic waters or in any place on the mainland or islands of the Canadian arctic under any conditions where the waste or any other waste that results from the deposit of the waste may enter the arctic waters." The AWPPA enables environmental protection officers to request documents for inspection and impose fines. This includes fines for the failure to provide plans and specifications for work in the Arctic that might lead to the deposit of waste in Arctic waters. The same is true for constructing, altering or extending any work in the Arctic without a plan, or not in accordance with an existing plan.

The Arctic Shipping Safety and Pollution Prevention Regulations (ASSPR) went into force in 2018, replacing the Arctic Shipping Pollution Prevention Regulations (ASPPR) from 2006 (Bartenstein, 2019). The regulations provide safety and pollution obligations for Canadian vessels that navigate in polar waters and for foreign vessels, navigating in the Canadian shipping control zones (Transport Canada, 2018). The ASSPR introduced the International Code for Ships Operating in Polar Waters (Polar Code) into the Canadian legal framework, including some modifications of the international obligations (Bartenstein, 2019). For example, the ASSPR introduces selected operational and structural pollution prevention measures stated by Part II-A of the Polar Code and determines additional Canadian measures regarding the prevention of the pollution through oil, sewage from vessels, garbage and pollution by noxious liquid substances in bulk.

3.1.4 Tourism

Coastal and marine tourism plays a significant role in the Canadian economy. It directly generates 0.1% of Canadian GDP and employs 0.18% of Canadian workers (Fisheries and Oceans Canada, 2020, own calculations). It is therefore one of the largest blue economy employers, responsible for 30% of Canadian blue economy jobs.

Table 7: Quick facts on maritime tourism activities in Canada.

% of GVA	% of total employment	Number of cruise passengers (2015)	Main areas	Summary & Trend	Estimated potential
0,1 % (Fisheries and Oceans Canada, 2020, own calculations)	**0,18%** (Fisheries and Oceans Canada, 2020, own calculations)	**Canada:** 2.23million (2016) (Business Research and Economic Advisors, 2017) **Arctic:** 3,500 (Dawson, Johnston, and Stewart, 2017)	**Canada:** British Colombia (63%); Atlantic (25%) (Business Research and Economic Advisors, 2017) **Arctic**: East coast of Baffin Island; Southern and northern routes of Northwest Passage	**Arctic:** Low activity Growing quickly pre-Corona	**Moderate potential**

Arctic tourism and trends: In the Canadian Arctic, cruise tourism and the number of pleasure boats is increasing. Activity focuses on the southern route of the Northwest Passage and on the eastern side of Baffin Island. Pleasure craft traffic, such as sailing or motorboats, is growing very quickly, from less than 3,000 km travelled on average from 2001-2005, to an average of more than 50,000 km travelled annually from 2011-2015 (Dawson et al., 2018).

Arctic cruise ship tourism is also growing, with 22 voyages and 3,500 cruise ship passengers in 2015 (Dawson et al., 2017) compared to 2,633 cruise ship passengers and 11 voyages in 2008 (Lasserre and Tetu, 2013). This growth is still relatively slow when compared with sectoral growth in Greenland and Norway, suggesting it might increase in the future (Dawson et al., 2017).

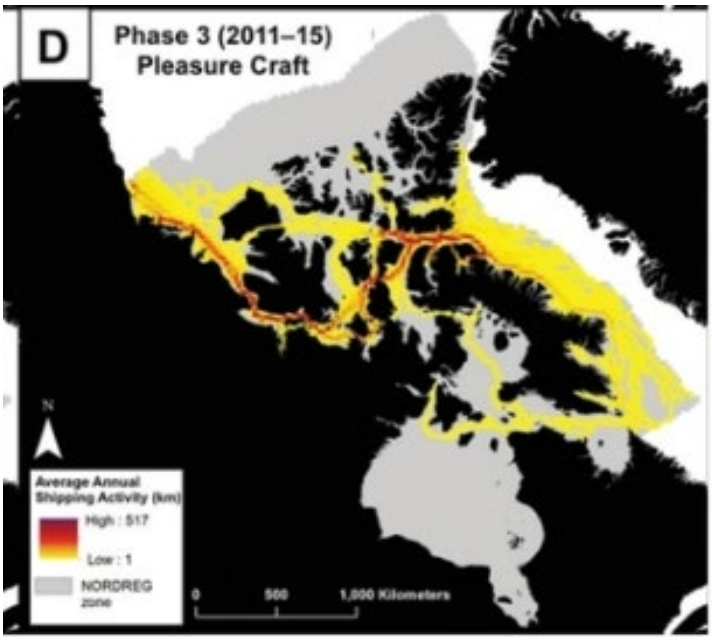

Figure 15: Map of pleasure craft shipping in the Canadian Arctic (Dawson et al., 2017)

Pressures

Tourism affects ecosystems through an increase in shipping and construction of infrastructure, as well as direct impacts from tourists entering Arctic habitats.

- **Shipping-related pressures:** Cruise vessels cause many of the same environmental pressures as maritime transport, including local pollution, greenhouse gas emissions and noise pollution (Olsen et al., 2019).
- **Infrastructure-related pressures:** Increasing number of pleasure and cruise ships may require more and enhanced tourism infrastructure, such as ports and moorings, which can disturb habitats and have operational challenges incl. logistics around waste collection, storage and treatment (PAME 2017).

Regulations

Arctic vessel operations are governed through a 'joint-management model', which means that a wide variety of federal, provincial and territorial departments and agencies as well as local and Indigenous communities are responsible through regulatory boards (Transport Canada, 2017).

In Nunavut, the marine tourism sector is managed through the Nunavut Marine Tourism Management Plan, aiming to "ensure high quality tourism experiences that do not conflict with the values and aspirations of Inuit" (Department of Development and Transportation, n.d.). By engaging with stakeholders through four strategic management goals, the territorial government intends to:

- Help communities access the potential benefits of marine tourism;
- Prepare products and services for marine tourism;
- Develop legislation and preferred policy approaches that address the needs of marine tourism in Nunavut; and
- Address communication with the marine tourism sector.

The Maritime Tourism Regulations from 2018 strengthens the legal framework for maritime tourism. The regulations impose codes of conducts for operators of commercial passenger vessels and pleasure crafts, as well as passengers. However, the regulations refer mostly to the respectful treatment of the local communities rather than imposing regulations for environmental protection.

3.2 External/global drivers

3.2.1 Greenhouse gas emissions

Climate change is considered the largest external driver of change to the Canadian Arctic environment. Every year since 2014, mean annual air temperatures across the Canadian Arctic have been higher than mean temperatures recorded since 1900. In some areas of the Arctic, summer temperatures have increased by 1 °C per decade since the 1980s. Arctic sea ice is becoming thinner, and coverage has decreased by 12.8% per decade since 1978. In the winter of 2016/17, freeze-up was 17 days later than average (Niemi et al., 2019).

The Canadian climate policy covers mitigation, adaptation and financing, involving a large number of ministries and agencies. In March 2022, Canada has announced its 2030 Emissions Reduction Plan, which outlines a sector-by-sector path to reach 40 percent

emission reductions below 2005 levels by 2030 and net-zero emissions by 2050 (Government of Canada, 2022e). In addition, a Canadian Net-Zero Emissions Accountability Act was introduced to the House of Commons by the Minister of the Environment and Climate Change in 2020 (Government of Canada, 2021b). In 2021, an independent net-zero advisory body, which is one of the cornerstones of the Canadian Net-Zero Emissions Accountability Act was established. It will make recommendations to the Canadian government regarding the best pathways to achieve climate neutrality by 2050 (Government of Canada, 2021c).

Regardless of these efforts, Canada's current climate policy is rated by the Climate Action Tracker (an independent scientific analysis of countries' progress towards the targets of the 2015 Paris Agreement) as inadequate, with an overall rating of "highly insufficient", in particular with regards to policies and action, as well as climate finance (Climate Action Tracker, 2022).

3.2.2 Long-range and transboundary pollution and persistent organic pollutants

In the Canadian marine Arctic, micro plastic is found at relatively low concentrations compared to other Arctic regions (at levels of 0-5 g/km² in the Canadian marine Arctic). The problem of persistent organic pollutants is more significant. Contaminants are being found in animals at the top of the food chain, such as polar bears or Beluga whales. Also birds are affected, for example have 80% of Arctic-nesting Northern Fulmars been found with plastic in their stomachs (Niemi et al., 2019).

With regard to long-range air pollution and its potential impacts on marine habitats, Canada ratified the United Nations Economic Commission for Europe's (UNECE) Convention on Long-Range Transboundary Air Pollution (CLRTAP) and implements its provisions via bilateral agreements with the United States and Mexico.

At the national level, the "Northern Contaminants Program" (NCP) coordinates the implementation of actions on contaminants of concern including heavy metals (mercury, cadmium and lead), and a list of persistent organic pollutants (POPs) with twelve legacy pollutants and 18 new and emerging pollutants (Government of Canada, 2022a). The program provides funding for research, monitoring and related activities in Yukon, the Northwest Territories, Nunavut, Nunavik and Nunatsiavut (Government of Canada, 2022b). Funding levels have remained relatively stable between 2016 and 2019 and increased by over 15% from around CAN$ 4,194 million in 2019-2020 to CAN$ 4,762 million in 2021-2022 (Government of Canada, 2022c).

3.3 Emerging drivers

3.3.1 Renewable energy

Regarding potential interferences of renewable energies with marine habitats, the relative importance of tidal power in Canada should be noted: Canada has 40MW of installed tidal power plants. All are located in Nova Scotia, however, and none have been proposed for the Arctic (Canadian Energy Regulator, 2020b). There is also no installed offshore wind farm in Canada (Canadian Energy Regulator, 2020b), but there is significant potential both near shore (<60 km) and further offshore, including in Arctic waters. The biggest potential is expected in the Hudson Bay, the Labrador Sea and within the Great Lakes (Blue and Jeyakumar, 2022).

3.3.2 Seabed mining

There is currently no seabed mining in Canada. Two sites in the Pacific Ocean have been identified as potentially hosting significant valuable mineral deposits (Allspop et al., 2013). There is no regulatory regime for deep-sea mining in Canadian waters (MiningWatch Canada, 2019).

4 Responses to pressures on Arctic biodiversity

As shown in the previous chapter, the Canadian government has laws and regulations in place which aim to manage the main impacts of human activities in the different marine sectors from negatively affecting the Arctic environment. In addition to these sectoral responses, the Canadian federal and sub-national governments, as well as local actors including Indigenous actors, are implementing additional responses to protect Arctic flora and fauna. In this section, we introduce legislation and processes for establishing Marine Protected Areas, as well as other conservation tools.

4.1 Marine Protected Areas

Canada has made significant progress in expanding the spatial coverage of protected areas in the marine realm, rising from 1% in 2015 to almost 14% in 2019 (Hewson, 2019).

4.1.1 Legislation

Progress was aided by the renewal of the legal framework of marine conservation. The Oceans Act was amended by Bill C-55 in 2019, which newly introduced the possibility of five-year interim protection for Marine Protected Areas (MPAs), after which a MPA can either be repealed or made permanent. It also incorporated the principle of ecological integrity and the precautionary principle into the Oceans Act (Hewson, 2019; Fisheries and Oceans Canada, 2019c). Moreover, the amendment created the opportunity to establish networks of protected areas (Hutchings et al., 2020). Bill C-55 also amended the Canada Petroleum Resources Act, authorizing the government to restrict oil and gas leases within MPAs designated under the Oceans Act. In addition, the Minister of Fisheries and Oceans established new protection standards that also prohibit dumping, mining, and bottom trawl fishing in all new federal MPAs, and committed to review all existing MPAs to ensure that they align with the new protection standards (Hewson, 2019).

4.1.2 Management

Canada has designated different types of protection for marine and coastal waters. Across all its waters, it has designated fourteen Marine Protected Areas (MPAs) under the Oceans Act, as described above. These are managed by Fisheries and Oceans Canada and currently cover 350,000 km^2 or roughly 6% of Canada's marine and coastal areas. 5,5% of this come from the Arctic Tuvaijuittuq MPA, which was placed under interim protection in 2019, but has not yet received long-term protection status (see below).

In addition to MPAs, Canada also has designated three National Marine Conservation Areas and twelve National Wildlife Areas managed by different authorities, which are

described in more detail in the next section. In addition, there are also several Marine Refuges, Migratory Bird Sanctuaries, national parks and a National Historic Site. All types of protected areas considered, Canada has conserved approximately 14,5% of its marine and coastal areas (Fisheries and Oceans Canada, 2020f). All considered, the Canadian government has declared that it has exceeded the Aichi target 11 to protect at least 10% of coastal and marine areas by 2020 under the Convention for Biological Diversity (CBD 2011). As a response, it announced a new conservation target of 25 % by 2030, working towards 30% by 2030 (Fisheries and Oceans Canada, 2020e).Of the fourteen Canadian MPAs, three have been established in the Arctic Ocean (see Figure 16 and Figure 17.). In 2010, the Tarium Niryutait Marine Protected Area (MPA) was established in the Mackenzie River Delta and estuary in the Beaufort Sea. It covers 1,750 km^2. The Tarium Niryutait Marine Protected Area Regulations prohibit activities that disturb, damage, destroy, or remove marine organisms or their habitats. The main conservation objective is the protection of beluga whales and other marine species, such as anadromous fish, waterfowl and seabirds and their habitats (Fisheries and Oceans Canada, 2019d).

In 2016, the Anguniaqvia niqiqyuam MPA in the Northwest Territories was established as the second Arctic MPA. It covers 2,358 km^2. The Anguniaqvia niqiqyuam MPA regulations restrict any activities that disturb, damage, destroy or remove living marine organism, and place some restrictions on fishing, navigation, and dredging. The main conservation objectives are to sustain the integrity of the marine environment off the coast of the Cape Parry migratory bird sanctuary, and to protect the habitats of species such as beluga whales, char, and ringed and bearded seals (Fisheries and Oceans Canada, 2019e).

In 2019, Tuvaijuittuq, an area located off the northern island of Ellesmere in Nunavut and covering an area of nearly 320,000 km^2, has been designated for interim protection under the Oceans Act. This makes Tuvaijuittuq the largest MPA in Canada, and responsible for Canada reaching the Aichi target 11. Tuvaijuittuq means “the place where the ice never melts” in the Inuktut language and is a unique area due to its multi-year pack-ice (Fisheries and Oceans Canada, 2020b). In the Tuvaijuittuq Marine Protected Area, human activities are banned for up to five years with the exceptions of exercise of Inuit harvesting rights under the Nunavut Agreement, marine scientific research, safety, security and emergency activities and certain activities carried out by a foreign national, entity, ship or state (Fisheries and Oceans Canada, 2020b). The interim protection of the area is considered as a first step in a long-term conservation process. In 2019, the Qikiqtani Inuit Association, the Government of Nunavut and the Government of Canada signed a Moratorium of Understanding, in which they pledged to work together to explore ways to protect areas within Tuvaijuittuq which create social and economic benefits for Inuit communities (Prime Minister of Canada, 2019b).

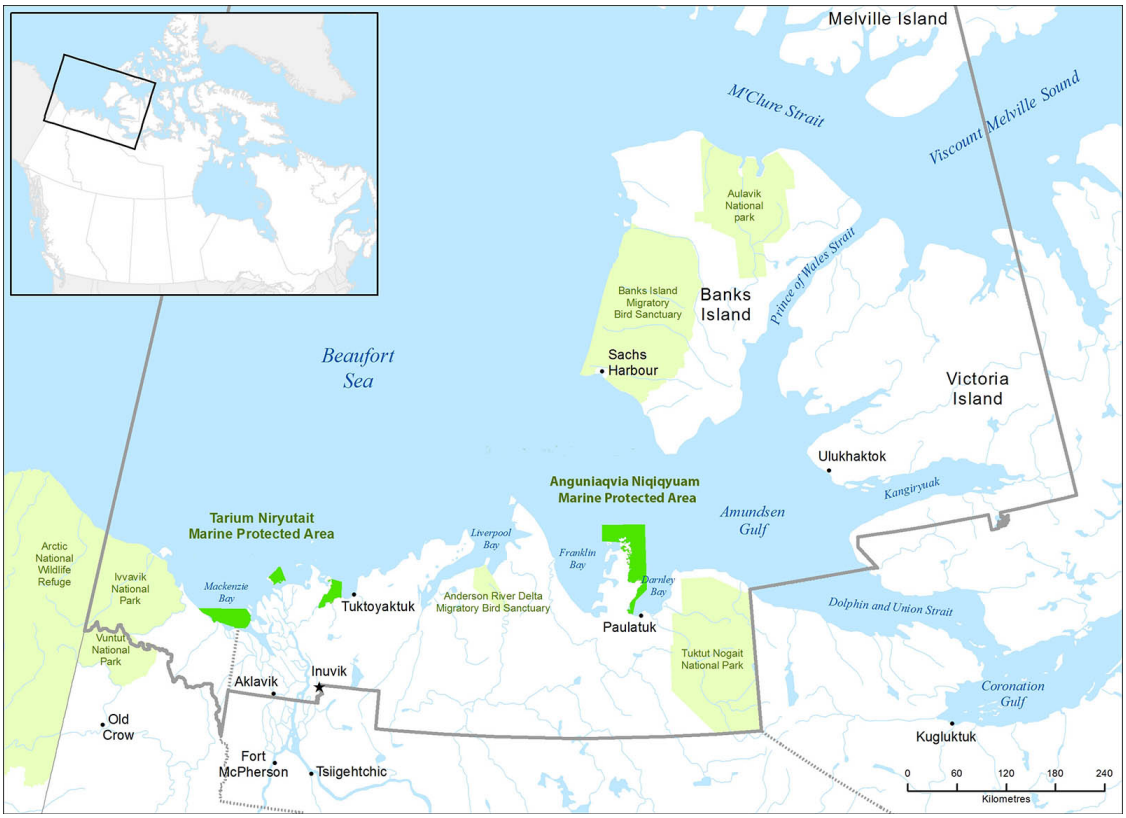

Figure 16: Anguniaqvia niqiqyuam and Tarium Niryutait MPAs (Fisheries and Oceans Canada, 2019b)

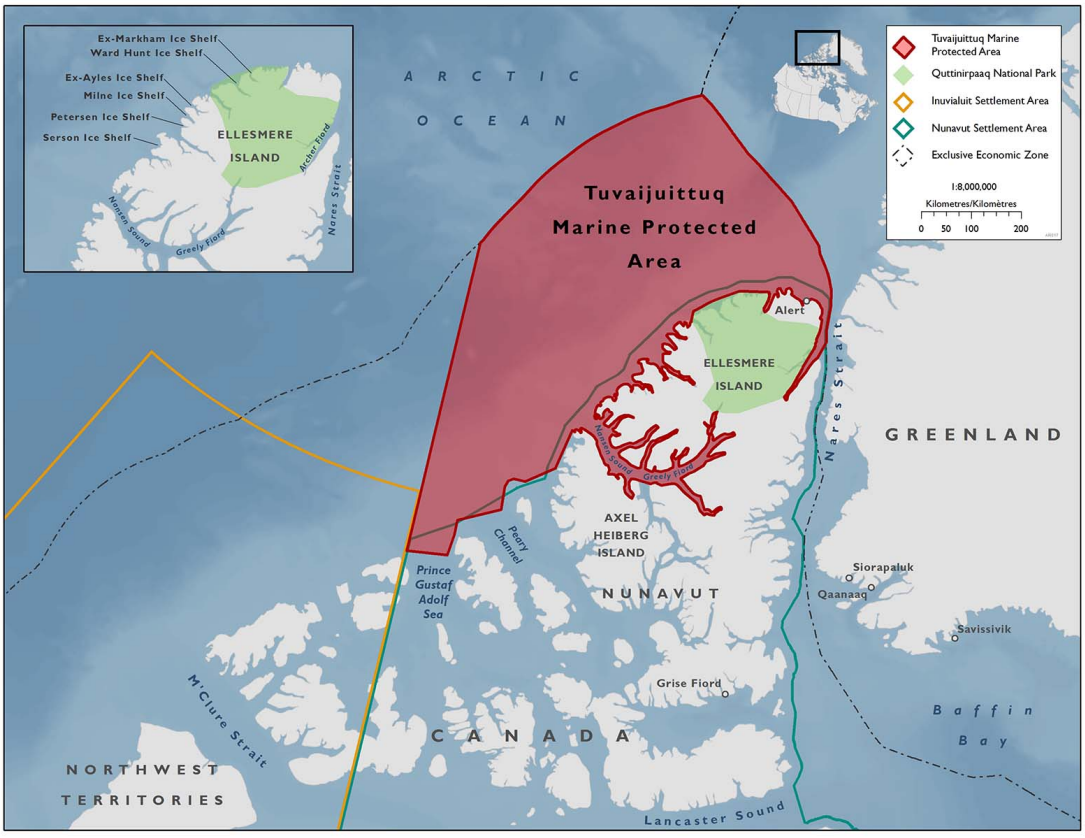

Figure 17: Tuvaijuittuq MPA (Fisheries and Oceans Canada, 2020)

4.1.3 The designation process of MPAs

The designation of an MPA under the Oceans Act includes five steps (Fisheries and Oceans Canada, 2020d):

1. **Designation as an area of interest:** Establishment of an MPA Advisory Committee
2. **Interest overview & assessment of the Area of Interest:** Preparation of assessment reports considering ecological/biophysical, social, cultural and economic aspects and local/ traditional knowledge
3. **Development of the regulatory approach and consultation with interested/affected parties:** Determination of the MPA design and regulation and conservation objectives
4. **Regulatory process & designation of the MPA:** Finalisation of the Strategic Environmental Assessment (SEA), preparation of the MPA regulations by the Ministry of Justice, and designation of MPA
5. **MPA Management:** Establishment of the MPA management framework, conservation objectives, management plan and the MPA monitoring plan

4.2 Other conservation tools

National Marine Conservation Areas (NMCAs): Parks Canada, a government agency with the mandate to manage various types of protected areas, is authorized to designate NMCAs under the legal framework of the National Marine Conservation Areas Policy (enacted in 1986, revised in 1994) and the corresponding Canadian National Marine Conservation Areas Act (enacted in 2002) (Oceans North, 2021a). Currently there are three National Marine Conservations Areas, including one in the Arctic Ocea, Tallurutiup Imanga in northeast Nunavut. Negotiations between the Qikiqtani Inuit Association, Fisheries and Oceans Canada and the Government of Nunavut started in 2007 and led to a Moratorium of Understanding in 2009 (Parks Canada, 2019). In 2019, the Canadian government and the Qikiqtani Inuit Association signed an Inuit Impact and Benefit Agreement (IIBA) as the legal framework for the establishment of the NMCA Tallurutiup Imanga. Operationalisation of the site has begun, but it is still awaiting formal protection (Oceans North, 2021a). At 108,000 km² it will be cover an area the size of Labrador and New Brunswick combined (Qikiqtani Inuit Association, 2021).

National Wildlife Areas (NWAs): Canada created five marine areas as part of National Wildlife Areas in the Arctic Ocean: The Canadian Wildlife Service has established some NWAs with marine components in the Arctic, e.g. Nirjutiqavvik National Wildlife Area, Qaqulluit National Wildlife Area, Polar Bear Pass National Wildlife Area, Akpait National Wildlife Area, and Ninginganiq National Wildlife Area. They are managed by the Environment and Climate Change department of the Canadian government (Oceans North, 2021a; ONCS, 2018; Fisheries and Oceans Canada, 2020f).

5 The role of Indigenous Peoples in Canadian marine policies

5.1 General involvement and territorial responsibilities

In Canada, Indigenous Peoples (also referred to as Aboriginal Peoples) consist of three different groups - Inuit, First Nations, and Métis. They live in the northern regions, which form Inuit Nunangat, the homeland to the Indigenous Peoples. It is divided into the four claim regions Inuit Settlement Region (ISR), Nunavut, Nunavik and Nunatsiavut (ONCS, 2018).

Indigenous Peoples play an important role in Canadian policy-making, on the federal as well as on the regional level, including particularly with regards to the coastal and marine areas in the North. On the federal level the department for “Crown-Indigenous Relations and Northern Affairs” is under the guidance of two cabinet ministers, including the Minister of Crown-Indigenous Relations and the Minister of Northern Affairs. Together, they are responsible for the implementation of the “Arctic and Northern Policy Framework” which was released in 2019, as well as for the land claim agreements (see below).

The Arctic and Northern Policy Framework was co-developed with Indigenous Peoples and includes eight major goals, each supported by several objectives, which are simplified here (Canadian Government, 2022d):

1. Indigenous resilience and health
2. infrastructure,
3. local and regional economies,
4. knowledge and understanding guiding decision-making,
5. healthy and resilient ecosystems,
6. a rules-based international order,
7. security, and
8. reconciliation.

The fifth goal includes several specific objectives with relevance for marine management, such as conservation, restoration and sustainable use of ecosystems; holistic and integrated environmental planning and management; partnerships with the local level to recognize, manage and conserve culturally and environmentally significant areas; and safe and environmentally responsible shipping. The framework aims to provide a roadmap, and its co-development was generally well received, but it has also been criticized for the “absence of a coherent strategy” on its implementation (Kikkert and Lackenbauer 2019).

With additional relevance for Indigenous communities, but with less of a focus on the Arctic marine environment, a Minister of Indigenous Services is responsible for many health, social and housing aspects for Indigenous Peoples in the country. The two legal mechanisms which aim to ensure the protection of Indigenous Peoples on traditional lands are modern land claim agreements and the constitutional duty to consult (O'Donnell et al., 2018). The duty to consult is a constitutional duty owed by the Crown to Indigenous groups, which comes into effect whenever the Crown contemplates any action that will or could adversely affect a claimed or recognized Aboriginal right or title (Newan et al., 2014).

The three Arctic provinces Nunavut, the Northwest Territories, and Yukon are subject to a number of different land claim agreements, which were negotiated between the Government of Canada and Indigenous communities (Newan et al., 2014). Nunavut has one Land Claim Agreement, four agreements in the Northwest Territories and eleven agreements in the Yukon, which are all subject to an overarching Umbrella Final Agreement (Newan et al., 2014). All agreements contain provisions on the participation of Indigenous Peoples on decisions which affect their land (O'Donnell et al., 2018). Moreover, the claim agreements provide financial compensation and provisions to build future co-management relationships with the Canadian government (Inuit Circumpolar Council Alaska, 2020).

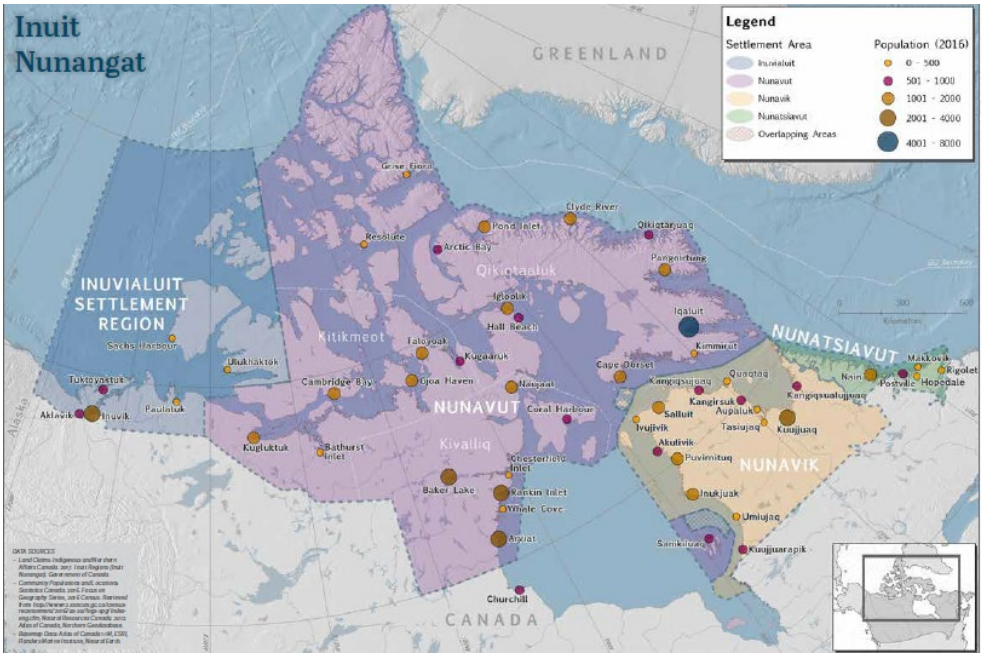

Figure 18: Inuit Nunangat and the claim regions ISR, Nunavut, Nunavik and Nunatsiavut (ONCS, 2018)

5.2 Indigenous involvement in marine conservation

Subsistence fisheries are an important pillar of food security in the coastal regions of the Arctic and represent social and cultural heritage to Inuit communities across the Arctic (Schott et al., 2019). Federal laws such as the Fisheries Act consider Indigenous traditional knowledge in habitat protection decisions and require consideration of adverse effects on Indigenous rights when making decisions under this Act (Hewson, 2019).”

Indigenous perspectives and knowledge are represented though different co-management councils in the ISR; fishing and hunting rights are affirmed under the land claim agreements and through legislation. Canada’s Marine Mammal Regulations include explicit protection for Inuvialuit fishing within the ISR. In Nunavut, conservation measures are taken on the territorial, regional and local level by a network of institutions. Under the Nunavut Land Claim Agreement (NLCA) five co-management bodies called of Public Governments were established (Boudreau, 2016); as well as one non-governmental organization, consisting of representatives from each of the Public Governments (Oceans North, 2021b). On the regional level, Indigenous perspectives are represented through three Inuit Associations.

Locally, Hunters and Trappers Organizations and Associations exist in all communities (Oceans North, 2021b). Through wildlife co-management boards such as the Fisheries Joint Management Committee (FJMC) there are participation opportunities in the assessment process of species status and in the implementation of conservation measures under the Species at Risk Act (Inuit Circumpolar Council Alaska, 2020).

Indigenous peoples must be involved in the designation process of MPAs under the Oceans Act and of National Marine Conservation Areas. Both designation processes of Tuvaijuittuq MPA and Tallurutiup Imanga MNCA took place under collaborative leadership by Qikiqtani Inuit Association and the Governments of Nunavut and Canada (see above). The Qikiqtani Inuit Association was following a “whole-of-government approach” which resulted in additional agreements on infrastructure investments such as harbour developments and food processing units alongside the establishment of the MPAs (Qikiqtani Inuit Association, 2021). Neil Kigutaq, the Qikiqtani Inuit Association's senior Inuit stewardship manager, stated that their “work proved that the future of Inuit and the Inuit Nunangat does not have to be tied to extraction industries at the cost of our environment. We can create jobs in conservation and environmental stewardship and secure opportunities in sustainable industries like fisheries.” (WWF Arctic Programme, 2020)

Moreover, Qauijimajatuqangit (IQ) or Inuit traditional knowledge was integrated as a fundamental premise into different federal and provincial legislation, such as the Canada National Marine Conservation Areas Act, the Nunavut Wildlife Act and the Nunavut Land Claim Agreement (Parks Canada, 2019). It was fundamental to the feasibility assessment of Tallurutiup Imanga NMCA to ensure the involvement of the Inuit perspective. IQ will be used for further management of the National Marine Conservation Areas (Parks Canada, 2019).

Some progress in Indigenous participation has been made in federal legislation. For example, the role of Indigenous participation and knowledge was considered through the two environmental bills C-68 and C-69 (see also the section on oil and gas above). According to the preamble of the Impact Assessment Act (IAA) and the Canadian Energy Regulator Act (CERA), Canadas government commits implementing its obligations under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Indigenous knowledge and rights are integrated through the involvement of Indigenous governmental bodies into the decision-making process, e.g., in the impact assessment process under the Canadian federal law. Corresponding to the preamble of the CERA, it shall reflect Canada’s diversity, taking Indigenous rights, Canada’s bilingual nature and the representation of men and women and gender-diverse people into account.

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