



How icebreaking governance interacts with Inuit rights and livelihoods in Nunavut: A policy review

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ABSTRACT

Sea ice is a contested space when it comes to navigation in ice-covered regions. For Inuit in Nunavut, Canada, sea ice is an integral platform of coastal connectivity, allowing access to areas of subsistence and cultural value. For vessels transiting Arctic waters, sea ice poses potential risks to vessel, crew, and passenger safety consequently, icebreaking is considered an essential service. Yet, many communities in Nunavut have described icebreaking as having, or potentially having significant negative impacts on community and ecological wellbeing. Several policies regulate and provide guidance to icebreakers operating in ice-covered waters. With anticipated increases to icebreaking demand in Arctic waters supporting destination shipping, a policy review was conducted to explore how current regulations governing icebreaking activities in the Canadian Arctic interact with the rights and livelihoods of Inuit who live in Nunavut. Policy instruments governing icebreaking activities were framed, assessed, and aligned to Inuit rights, as set forth by international, national, and territorial provisions. International instruments provide minimal attention to environmental impacts of icebreaking and even less to its cultural and social impacts. Canadian instruments refer to both environmental impacts and Inuit use of sea ice for winter travel routes, framing both as elements that should be taken into consideration during route planning. Despite this, Inuit have had little involvement in developing current icebreaking regulations and guidelines beyond those under territorial jurisdiction. From this review, opportunities and recommendations are identified that could allow for future icebreaking policies to better account for Inuit rights and governance values.

1. Introduction

Sea ice is a critical coastal platform that connects marine and terrestrial regions. Changes to sea ice thickness and extent are being observed throughout the Canadian Arctic. This is due in part to impacts of climate change, which is causing the region to warm at a rate three times faster than the rest of the world [16]. The Canadian Arctic Archipelago (CAA) is typically characterized by landfast sea ice for most of the year, however the area is projected to have extensive ice-free summer periods as early as 2050 [16]. Multi-year ice is projected to remain present in the region north of the CAA and will continue to drift into Arctic waterways during summer [42]. Changes to the sea ice regime can influence social and ecological systems that interact with sea ice in

varying ways. It is a critical habitat for several primary producers that underpin the entire Arctic marine food web [84]. The presence and timing of sea ice influences the abundance, distribution, seasonality, and interactions of marine and terrestrial species that depend on this critical feature.

In addition to serving as an important habitat for coastal, marine and terrestrial species, sea ice can be considered a mobility infrastructure that supports Inuit lives, livelihoods, and cultural practices [3,4,69]. Observed and projected changes to the sea ice regime have major implications for the complex social-ecological systems¹ that exist around sea ice in Inuit Nunangat (Inuit homeland encompassing the land, water, and ice within the four Canadian Inuit regions: the Inuvialuit Settlement Region, Nunavut, Nunavik, and Nunatsiavut [66]). As climate change

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¹ Although the term has also been written as “socio-ecological”, “social-ecological” will be used here to emphasize equal consideration of social systems and ecological systems [10] and to express the complex and multi-faceted linkages between the two.

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continues to impact sea ice and species distributions, Inuit are trying to maintain their culture and traditional practices, which are reliant on the ability to move freely over sea ice and open water [65]. Conversely, reduced sea ice thickness and extent may lead to an extended shipping season by opening Arctic waterways for longer periods of time. An increased presence of marine traffic and the need for icebreaking support may introduce further pressures on communities in Inuit Nunangat.

In contrast to Inuit conceptualizations of sea ice as a platform of connectivity, the transportation industry views sea ice as a potential hazard, posing an obstacle for safe shipping and a barrier to efficient marine transportation [72]. This concern has been growing with increased Arctic shipping through activities such as tourism, community re-supply and coastal resource development, which are occurring in response to declining sea ice [83]. The number of kilometers traveled by ships in Arctic waters almost tripled from 1990 to 2015 (364,179 km in 1990 to 918,266 in 2015), specifically in areas with active mining sites and within the southern route of the Northwest Passage [39,40]. Shipping traffic is presently dominated by cargo vessels and government icebreakers but pleasure craft numbers are also rapidly increasing [39]. Despite expected decreases in sea ice throughout the Arctic, multi-year ice is projected to continue drifting through waterways including the Northwest Passage, which, along with the more unpredictable nature of first-year ice, poses a navigational hazard to shipping [42,43].

Projections indicate that commercial transits through Arctic waters may not increase significantly in coming years as conditions are perceived to be too hazardous from a commercial standpoint. However, destination shipping within the Canadian Arctic for tourism and commercial resource development activities are anticipated to increase² [71]. These trends suggest an increased demand for icebreaking services in the future, especially if shipping activities extend into a longer shipping season [14]. This requires shipping governance to not only consider ship and crew safety but also how icebreaking may impact both aquatic ecosystems and Inuit communities. Potential impacts include ecological changes arising from icebreakers impacting the timing of break-up and freeze-up, disruptions to hunting practices and food sovereignty, and safety concerns for hunters transiting over sea ice [63].

Indigenous peoples in Canada are increasingly asserting their rights to move beyond secondary or tokenistic inclusion in state-led marine policy to take on primary roles in policy development and decision making related to management of and access to marine resources [5,9,100,101]. In the marine policy context, a growing amount of work is exploring how shipping governance and Inuit rights and interests interact in the Canadian Arctic (see for example [4,11,12,31,37,38,46,79]). Such interactions encompass multiple worldviews and are challenged by the dynamic nature of sea ice which is a crucial aspect of Inuit homeland while also posing legal and regulatory challenges to the dominant system of maritime governance [87–90]. While icebreaking impacts for Inuit are addressed to varying degrees by these authors, it has received limited explicit attention in the literature overall. To address this gap, we conducted a policy review to explore how current regulations governing icebreaking activities in the Canadian Arctic interact with Inuit rights and livelihoods in Nunavut. Because of the unique legal and regulatory challenges posed by sea ice, and the ways in which icebreaking takes place for a variety of purposes, resource development in particular is expected to see increased demand for icebreaking services in the coming decades [43,71]. As such, icebreaking in relation to resource development activities in Nunavut is used to focus our analysis, although it is likely that much of our findings would be

² Transiting vessel traffic refers to vessels passing through Canadian waters to reach another destination, whereas destination vessel traffic applies to vessels transiting through Canadian waters to a destination within the Canadian Arctic region. Examples of destination vessel traffic includes community re-supply vessels, tourism vessels, and vessels supporting coastal resource development operations.

relevant to other forms of destination shipping and likely even to some transiting vessels.

We begin the paper by presenting an overview of the relevant international, national, and territorial shipping governance regimes, and current concerns and efforts pertaining to icebreaking in the Canadian Arctic and Nunavut, drawing from the literature and research project reports. Next, instruments governing icebreaking activities in the Canadian Arctic and Nunavut are identified and assessed to understand how sea ice is conceptualized and how these instruments interact with Inuit rights and livelihoods. While understanding these interactions, per se, will not decolonize marine shipping policies, our aim is to identify avenues through which Inuit perspectives and priorities may be brought to bear on the development of future icebreaking policies. We conclude by proposing a number of recommendations to support this approach.

2. Setting the context

2.1. International governance and Canada's obligations: polar shipping and Indigenous rights

The United Nations Convention on the Law of the Sea (UNCLOS) provides a comprehensive legal regime governing all ocean uses and resources. It includes principles and rules for the delineation of maritime boundaries and jurisdictions, and a framework for international navigation and shipping. Coastal states may regulate ocean uses in their internal waters, archipelagic waters, territorial seas, exclusive economic zones, and on their continental shelves while respecting the rights of other states. UNCLOS contains provisions to prevent pollution of the marine environment. Article 1 defines pollution as the introduction of substances or energy into the marine environment “which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.” Article 234 pertains directly to ice-covered areas, which are recognized as requiring special consideration, as climatic conditions and ice cover create obstructions or hazards to navigation, and pollution “could cause major harm to or irreversible disturbance of the ecological balance.” Article 234 grants Arctic coastal states authority to make laws and regulations “for the prevention, reduction and control of marine pollution from vessels operating in ice-covered areas within the limits of the exclusive economic zone” that must be based on science and with due regard to navigation [96]. UNCLOS and Article 234 has served as justification for legislation and regulations adopted by Canada and other Arctic coastal states pertaining to navigation and pollution prevention in ice covered waters [29,93], and ostensibly could include regulations governing icebreaking activities.

Polar shipping is further regulated through the International Maritime Organization (IMO), a specialized agency of the United Nations whose role is to oversee and maintain a regulatory framework for the shipping industry that is universally adopted and implemented. Non-state actors are active participants in IMO deliberations, side-by-side national delegations. In November 2021, the Inuit Circumpolar Council (ICC) became the first Indigenous Organization to receive IMO Provisional³ Consultative Status, which the ICC intends to use to advance their “status, rights, and role autonomously from those whose interests are not always neatly aligned with [their] perspectives as Indigenous peoples” (Dalee Sambo Dorough, cited in [64]). This status will allow the ICC to share information and expert advice on matters of relevance to the IMO, creating an avenue for Inuit perspectives and knowledge to be considered in IMO decision making and policy development [62]. However, consultative status does not entail voting rights at the IMO.

³ Provisional status means that after two years the ICC will provide a report to the IMO illustrating their contributions to the IMO [64].

The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) is an international instrument adopted by a resolution of the United Nations General Assembly [98] which enshrines the rights of Indigenous peoples. While Canada did not endorse UNDRIP until 2016, in 2021, it has since embarked on a path to fully implement UNDRIP in pursuing Reconciliation with its Indigenous peoples. In particular, the *United Nations Declaration on the Rights of Indigenous Peoples Act* [97] was adopted and received the Royal Assent on June 21 2021. The Act provides a roadmap for Canadian law to be consistent with UNDRIP and provides for the adoption of action plans with measures to address injustices and discrimination against Indigenous peoples and to promote mutual respect and good relations, in addition to accountability measures with respect to implementation [48]. Article 25 of UNDRIP includes the “right to own, use, develop and control the lands, territories and resources that [Indigenous peoples] possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired.” Article 29.1 stipulates that “Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources”, which has direct relevance to the protection of ice environments in Inuit Nunangat. Additionally, Article 32.2 directs that “[s]tates shall consult and cooperate in good faith with the Indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their land or territories and other resources, particularly in connection with the development, utilization, or exploitation of mineral, water or other resources”. The rights set out in UNDRIP have implications for the UNCLOS jurisdictional schemes over internal, territorial, and archipelagic waters and can be expected to raise legal considerations as Indigenous involvement in maritime governance evolves [32]. For example, the fundamental duty of state parties to protect and preserve the marine environment can be informed by environmental and resource rights of Indigenous peoples set out in UNDRIP [32].

2.2. Canadian legislation and guidance

The concept of free, prior, and informed consent set forth in UNDRIP Article 32.2 may apply to new developments in Arctic territories. These rights have been further negotiated and affirmed through Canadian courts. For example, in *Qikiqtani Inuit Association v Canada* [86], the Nunavut Court ordered a stay to seismic research by the German research vessel *Polarstern* because in granting the research permit, Canada had not adequately consulted Inuit. Similar issues arose in *Clyde River (Hamlet) v. Petroleum Geo Services Inc.* [33], where it too was decided that the Crown did not fulfill its duty to consult.

Beyond UNDRIP, Indigenous peoples in Canada have constitutionally protected rights, and Canada’s legal system has continually affirmed that the federal government has the duty to consult Indigenous peoples when approving resource development projects located on their land or that could infringe on their rights [13,15]. In Inuit Nunangat, this is often reflected in the language of land claims agreements, which include stipulations for consultation and negotiation of impact benefit agreements in relation to resource development projects. Rights set forth in the Canadian Constitution and land claims agreements position Inuit as rights-holders, rather than stakeholders, when it comes to projects taking place in Inuit Nunangat. The term “stakeholder” describes those whose interests may be impacted by the outcome of a project, whereas “rights-holder” expresses the constitutionally protected rights of Indigenous peoples and the potential for a project to impact those rights. This positioning expresses the essential involvement of Inuit in matters impacting their rights, such as shipping risk governance [46] associated with resource development activities.

The main federal departments that govern Arctic shipping in Canada are Transport Canada (TC) and Fisheries and Oceans Canada (DFO), including the Canadian Coast Guard (CCG) as a separate special

operating agency within DFO. Additionally, Parks Canada with its *Canada National Marine Conservation Areas Act* (CNMCA) [17] has the capacity to substantially influence marine navigation activities. Specifically, section 16.3 of the CNMCA stipulates that “[r]egulations... that restrict or prohibit marine navigation or activities related to marine safety, to the extent that such regulations can be made on the recommendation of the Minister of Transport under the *Canada Shipping Act, 2001* [109] or the *Arctic Waters Pollution Prevention Act* [2], may only be made on the recommendation of the Minister [responsible for the Parks Canada Agency] and the Minister of Transport.” Furthermore, under section 16(5), “[r]egulations made under the CNMCA] prevail over regulations made under the *Fisheries Act*, the *Coastal Fisheries Protection Act*, the *Canada Shipping Act, 2001*, the *Arctic Waters Pollution Prevention Act*, the *Canadian Navigable Waters Act*, the *Aeronautics Act* or the *Wrecked, Abandoned or Hazardous Vessels Act* to the extent of any conflict between them.” This is an exceptional provision. It enables Parks Canada to limit or eliminate shipping from national marine conservation area (NMCA) zones designated to protect sensitive ecological features and cultural sites [80]. This could potentially include activities of icebreaking vessels accompanying destination vessel traffic. As the first Arctic NMCA (Tallurutiup Imanga – located in Nunavut) is yet to have a formalized management plan, the impact of this regulatory power in practice is yet to be seen.

2.3. Nunavut legislation, agreements, and plans

Section 35 of the *Constitution Act, 1982* recognizes existing aboriginal and treaty rights, whereby aboriginal rights recognize the legal right to ancestral lands, and treaty rights include those acquired by way of land claims agreements. While aboriginal rights are recognized and affirmed, they are not legislatively defined, and thus have been defined over time through Supreme Court of Canada cases, evolving to include a range of cultural, social, political, and economic rights. In Nunavut, treaty rights are set forth in the *Nunavut Agreement* [75], which formally established the Nunavut Settlement Area (NSA) based on Inuit “traditional and current use and occupation of the lands, waters and land-fast ice therein in accordance with their own customs and usages” (preamble). Through relinquishing aboriginal title to these lands, under the *Nunavut Agreement*, Nunavut Inuit received defined rights and benefits. One of the objectives for negotiating the Agreement was to provide certainty and clarity “of rights for Inuit to participate in decision-making concerning the use, management and conservation of land, water and resources, including the offshore” (preamble).

Nunavut does not have jurisdiction over waters outside of the NSA and the Outer Landfast Ice zone. Moreover, the Government of Canada maintains jurisdictional authority over vessels transiting through the waters within the NSA. However, the Government of Nunavut (GN) transportation strategy acknowledges that increased icebreaking will affect traditional winter travel and hunting [54]. It also states that future changes in sea ice use should not jeopardize safety, accessibility, or traditional use. As such, the GN intends to work with federal and international agencies to identify and minimize negative impacts associated with increased shipping [54]. This aligns with Article 15 of the *Nunavut Agreement* where divisions of the GN may make recommendations to federal government agencies regarding management of marine areas [75].

Inuit Quajimajatuqangit (IQ) has been broadly defined as encompassing Inuit beliefs, laws, principles, and values along with traditional knowledge, skills and attitudes [68,76]. IQ and governance values therein have been identified as important to influence governance and decision making in Nunavut, which could impact the GN’s approach to destination shipping, including those related to resource development activities. The GN has identified eight IQ principles that express governance values, (1) *Inuuqatigiitsiarniq*: respecting others, relationships and caring for people; (2) *Tunnganarniq*: fostering good spirit by being open, welcoming and inclusive; (3) *Pijitsirniq*: serving and

providing for family or community, or both; (4) *Aajiiqatigiinniq*: decision making through discussion and consensus; (5) *Pilimmaksarniq* or *Pijariuqsarniq*: development of skills through practice, effort and action; (6) *Piliriqatigiinniq* or *Ikajuqtiigiinniq*: working together for a common cause; (7) *Qanuqtuurniq*: being innovative and resourceful; and (8) *Avatittinnik Kamatsiarniq*: respect and care for the land, animals and the environment [55]. These principles and others grounded in IQ are considered in legislation and policies as well as departmental activities within the GN, including land use planning and activities undertaken by the Nunavut Impact Review Board (NIRB) [53,76,81].

Inuit governance values are not limited to the eight IQ principles articulated by the GN. The social and cultural values expressed through IQ contain governance values that are grounded in “a morality that is the base for Inuit existence. It is the knowledge, belief system, principles, and values at the core of Inuit identity and that guide/govern Inuit society” (as defined by [81]). Western institutions have been criticized for their tendency to adopt narrowly focused interpretations/applications of IQ based on management needs, ignoring the cosmological implications [92]. Thus while we present the eight IQ principles and draw on them for our policy review, any consideration of Inuit governance values and their application to maritime policy development requires a nuanced understanding of IQ achieved through meaningful engagement with and by Inuit.

2.4. Social-ecological concerns

The narrative around sea- and icescapes from an Inuit perspective is notably distinct from those conveyed by international and Canadian institutions as well as those residing outside of the Canadian Arctic. For instance, the Arctic often comes to be understood by non-Indigenous Canadians as embodying concepts of transportation and navigation through Arctic waterways [11]. This is in sharp distinction from Inuit conceptualizations of Inuit Nunangat as a homeland encompassing land, water, ice, and human/non-human relations. Dominant Acts and Agreements governing Arctic shipping at national and international levels have been found to focus on the impacts of shipping on the arctic environment, frame sea ice as a potential hazard to/impact on ships and lack consideration of community uses of the marine environment [105]. Updating existing Acts and Agreements offers an important avenue for shipping governance to better account for Inuit uses of the marine environment [105]. However, inherent tensions arise when Western institutions engage Inuit communities and organizations in conversations around Arctic shipping, where very different conceptualizations of marine spaces are encountered. Recognizing and accounting for these tensions within the context of shipping governance is an important step towards harmonizing Inuit rights and safe navigation [4].

One concern that has emerged in tandem with increased icebreaking operations in the Arctic is the potential impact that operations will have on marine species. Species of particular importance to Inuit harvesting and cultural practices in Nunavut include beluga, narwhal, bowhead whale, seal, walrus, polar bear, and caribou, as well as a variety of species of fish and sea birds. Seals and walrus may be more vulnerable to icebreaking activities either through the associated noise levels, and/or through migratory disruptions. For example, icebreaking vessels transiting pupping areas of ice-dependent seals can cause disturbances to habitat and behavior from distances of over 200 km, leading to displacement and mother-pup separation, and direct collisions have also been observed [103,104]. While there have not been specific studies addressing the impacts of icebreaking on walrus, they are observed to be highly sensitive to sea ice changes [70], and any physical impacts from icebreaking to the ice and haul-out areas could disturb walrus habitat or behavior. Communities in Nunavut have also expressed concerns around impacts on polar bears, who rely on seals as an important food source, and who have dens on sea ice that would be destroyed by icebreakers [21–23]. Potential impacts on cetaceans indicate that audible noise levels from icebreaking activities disturb belugas, although local

bathymetry affects the exact distance at which the disturbance occurs [44,57]. Other studies have demonstrated that belugas and narwhals avoid icebreakers [34,45,67]. Icebreaking activities have also been identified as a threat to Dolphin and Union caribou, which along with sea ice loss reduce the connectivity between sea ice and range access and impact population size [56].

As previously noted, resource development is contributing to increased destination shipping activities in Nunavut. For example, after the Baffinland’s Mary River iron mine opened in 2013, there was a marked increase in shipping of ore from a port in Milne Inlet [1]. Shipments during the fall and spring often require icebreaker support vessels, which made up the second highest number of transits in Milne Inlet between 2018 and 2019 (39 icebreaker transits compared to 152 bulk carrier transits) [67]. At the time of writing, a Phase 2 Expansion Project has been proposed by Baffinland, which would expand the mine to at least double its current capacity (from 6 million to 12 million tonnes exported per year) and extend the shipping season from July 1–November 15 [7,41]. The Phase 2 Expansion Project has also projected an increase in the number of vessels transiting through Milne Inlet and Lancaster Sound from approximately 71 unique vessels in 2018, to a maximum of 176 [6]. Expanding the shipping season for the mine outside of the open-water season into break-up and freeze-up seasons will see the need for increased icebreaking support as vessels transit these waters [41]. While some communities support the expansion and the economic opportunities it might bring, impacts on the environment and food security are of great concern [99]. Given local protests in Pond Inlet (one of the communities closest to Milne Inlet), the retraction of Phase 2 support from the Qikiqtani Inuit Association (QIA) in early 2021 [8], unaddressed concerns from Greenland over transboundary effects [74], Baffinland may consider altering planned shipping increases. The final NIRB recommendation on the Phase 2 expansion is expected in early 2022.

2.5. Efforts to consider Inuit within shipping governance in the Canadian Arctic

2.5.1. ICE LAW project

The Indeterminate and Changing Environments Law, the Anthropocene, and the World (ICE LAW) project aims to understand Arctic governance considering Western legal, political, and regulatory systems (including UNCLOS), the reified distinction between land and water, and the difference that ice makes [59,91]. Of importance to this project, is how non-state actors, for example Indigenous peoples, are considered within the governance system. Ice is framed as a medium that constrains and enables differing types of mobilities in polar environments [58], requiring creative regulatory solutions to better account for Indigenous perspectives and livelihoods [91]. The analytical framing of the ICE LAW Project has been adopted for the purpose of this policy review.

2.5.2. Arctic corridors and northern voices

In 2016, the Canadian government released its Oceans Protection Plan (OPP), with the goal of strengthening marine safety systems and protecting coastal ecosystems [52]. The OPP emphasizes Indigenous partnerships to provide advice in understanding the combined effects of shipping; creating local vessel control areas; and updating/modernizing regulations to respond to community-specific issues related to marine traffic. Under the OPP, the Government of Canada introduced the Northern Low-Impact Shipping Corridors (LISC) to develop a network of voluntary transportation corridors in the Canadian Arctic. These corridors are intended to optimize safe transportation while reducing the environmental risks of shipping and minimizing negative impacts on communities [51]. This initiative is a revisioning of the 2014 Northern Marine Transportation Corridors project [19] which sought to develop a network of corridors based on current use patterns and marine safety [28], but which gave limited consideration to environmental protection and Inuit rights [82]. To address this deficiency and strengthen the LISC

initiative, communities across Inuit Nunangat are being engaged through the Arctic Corridors & Northern Voices project. The project has documented local perspectives on the LISC by describing local marine uses, culturally significant areas, Inuit-identified impacts of marine vessels, and potential management strategies [36]. In Nunavut, community-based research has occurred in Iqaluit, Arviat, Resolute, Pond Inlet, Gjoa Haven, Coral Harbour, and Cambridge Bay. Six of the seven community reports described icebreaking impacts on people's ability to travel and access resources/harvesting areas, and five out of the seven communities identified icebreaking as having direct impacts on important species including caribou, seals, polar bears, and walrus [20–26].

Icebreaking is associated with the disruption of sea ice formation and break-up, which often negatively impacts the ability to travel, hunt, and safely interact with the sea ice. Icebreaking before ice break-up naturally occurs has occasionally allowed residents to go boating earlier than usual [26], however icebreaking remains potentially disruptive to harvesting activities that rely on over ice travel in the spring, winter, and fall. There is also an increase in traveling expenses and risk to hunters when unaware of icebreaking activities. Communities consulted for the LISC project have made recommendations for no-icebreaking zones, no icebreaking during freeze-up, and/or emergency only icebreaking during the fall, winter, and spring [21,23,25,26]. As Inuit continue to travel and harvest using the sea ice, it is important that communities are not only informed of icebreaking activities but have a say in how these activities are managed.

2.5.3. Coastal restoration Nunavut

Coastal Restoration Nunavut draws on IQ to document and address the health of marine species and their habitats throughout Nunavut. The project defines 'coastal' as any areas where terrestrial and marine processes meet and interact, and 'restoration' as encompassing actions that return something to its former condition, improve its current condition, or protect it from further or future harm [107]. The project has co-facilitated workshops in 21 of Nunavut's 25 hamlets to identify and mitigate stressors impacting coastal communities. Knowledge shared during the workshops resulted in community-identified coastal restoration priorities and/or potential interventions. Issues pertaining to marine traffic has been one of the most identified themes, particularly as it relates to changes in species behavior and the need for regulations to manage increased destination vessel traffic, both for resource development and tourism (e.g., cruise ships and pleasure crafts). While we do not draw directly on knowledge shared during the Coastal Restoration Nunavut workshops, this policy review was motivated by concerns expressed during the workshops regarding issues related to marine traffic and icebreaking activities.

3. Methods

Policies and practices that currently govern Arctic shipping focus on maritime safety and the natural environment through environmental protection. These policies and practices focus on a safe and secure transportation system [110]. Policies rarely acknowledge the socio-cultural systems that are dependent on the natural environment, or the governance values associated with those systems. There is an emerging recognition outside of the formal federal governance mechanisms that Inuit culture and social systems are integrated with the natural environment, as opposed to being separated from it [11]. To explore this further, we drew from the analytical framework of the ICE LAW project and the Arctic Corridors & Northern Voices project to assess how governance of icebreaking activities related to destination (resource development) shipping in Nunavut might better account for Inuit rights and livelihoods. Shipping governance in Canada currently focuses on a safe and secure transportation system, guided by the imperatives of maritime trade from a settler's perspective. Indeed, the roots of Canada's shipping governance traces back to pre-confederation colonial

policy and legislation [30,73]. While the existing structure cannot simply shift to *encompass* Inuit worldviews, it is essential to consider the context of the ecological, social, and cultural values/uses within which the transportation system operates. The analysis of policies that guide and regulate icebreaking activities in waters around Nunavut was approached from this perspective, seeking to understand how Inuit rights and livelihoods are or are not represented in the existing instruments and mechanisms that govern icebreaking activities.

Instruments were selected to assess the broad range of mechanisms that influence icebreaking activities in the context of increased destination shipping arising from resource development activities and how this may relate to Inuit rights. Instruments were selected to be representative of policies or guidance at different jurisdictional scales (international, national, and territorial), and were included for review provided they addressed transportation through ice covered waters in relation to resource development activities. There are guidelines or policies that were not included as they explicitly applied to passenger carrying vessels (e.g. those transiting for tourism purposes).

A key instrument developed by the IMO is the International Code for Ships Operating in Polar Waters (Polar Code). It provides mandatory measures for ships operating in polar waters aligned with ship and personnel safety, and environmental protection [111]. Part I of the Polar Code requires ships to carry a Polar Waters Operations Manual (PWOM) to address safe operations and decision making. Shortly after adoption of the Polar Code, the IMO released the interim guidance to address the development of methodologies for the assessment of operational limitations in ice to inform the PWOM [61]. Non-legally binding guidance for shipping companies to develop a PWOM has also been published by the International Chamber of Shipping (ICS) and Oil Companies International Marine Forum (OCIMF). At the international level, the Polar Code and the guidelines from the ICS and OCIMF [60] for the development of Polar Waters Operational Manual (PWOM; as required under the Polar Code, Part 1) were reviewed.

Within Canada, key acts, regulations, and guidelines for icebreaking were identified to include the following: *Arctic Waters Pollution Prevention Act (AWPPA)* [2], *Arctic Shipping Safety and Pollution Prevention Regulations (ASSPPR)* [108], and the guidelines set out in *Ice Navigation in Canadian Waters* [18] and *Guidelines for Assessing Ice Operational Risk* [94]. These cover a variety of stipulations, including various aspects of vessel construction, ice class requirements, and the division of Shipping Safety Control Zones [18]. The AWPPA provides measures to prevent pollution from ships, and in particular, the deposit of waste into Arctic waters. The Act also prescribes the Shipping Safety Control Zones, which can prohibit navigation unless the ship has ice-breaker assistance. The ASSPPR provide safety and pollution prevention measures (including vessel construction and navigation requirements) for Canadian vessels operating in polar waters, or foreign vessels operating in the Canadian Shipping Safety Control Zones. However, the regulations do not apply to government vessels. *Ice Navigation in Canadian Waters* [18] provides guidance to assist ships operating in ice in all Canadian waters, including the Arctic. It also provides masters and watchkeeping crew with the necessary understanding of the regulations, shipping support services, hazards, and navigation techniques in ice. This guidance is to be used together with the *Guidelines for Assessing Operational Risk* which describes the application of parts of the ASSPPR and other regulations and standards relevant to reducing the risk of vessels operating in Arctic waters. The AWPPA [2], ASSPPR [108], *Ice Navigation in Canadian Waters* [18] and *Guidelines for Assessing Ice Operational Risk* [94] were reviewed due to their interacting nature at the national level and their application to icebreaking activities related to resource development.

At the territorial level, the *Nunavut Agreement* [75], and the Draft Nunavut Land Use Plan (2021) [53] were reviewed as they have the capacity to influence governance of icebreaking activities related to resource development. The *Nunavut Agreement* is the basis of Inuit rights and sets the territorial governance bodies with the ability to influence

marine activities. The purpose of the Draft Nunavut Land Use Plan (2021) is to protect and promote the existing and future wellbeing of the residents and communities of the NSA, to protect, and where necessary, restore the environmental integrity of the NSA.

The documents were uploaded into NVivo 12 and coded based on keywords used to identify how sea ice is articulated, the various mechanisms addressing icebreaking activities, and if/how those interact with or represent Inuit rights and livelihoods. As icebreaking is not the sole dedication of the governance instruments, the review was structured to identify language around keywords that may be utilized in relation to icebreaking and shipping activities associated with resource development: icebreaking/ice-breaking/ice breaking; ice/frozen/sea ice; development/resource/extraction, and Inuit/Indigenous. These keywords were used to search each instrument, and relevant passages were coded to assess how sea ice as a medium is included/addressed and whether or not Inuit are represented in the policy/guidance related to icebreaking and resource development activities. The results of this review identified if and where Inuit rights and interests/concerns relating to icebreaking (summarized from the literature in Section 2.4) are addressed within these policies and guidelines.

This review was limited to publicly available instruments from international, national, and territorial institutions. Key acts, regulations, and guidance were identified based on their ability to influence operations of ice-strengthened vessels. Other instruments exist that may be applicable to governance of icebreaking activities. Additionally, there may be strategies that have not been publicized which seek to engage Inuit in shipping (or icebreaking) governance in Nunavut. Thus, this review is based on the keyword search results and is limited to what is expressed through the identified instruments and additional documentation made available through associated institutions.

4. Results

The results of the assessment are summarized in Table 1 and discussed based on jurisdictional level. Broadly, the language of national and international instruments characterizes sea ice as a source of risk to safe navigation and environmental protection in ice-covered waters. Thus, icebreaking activities are framed as a measure to help minimize and/or mitigate associated risks. The PWOM Guidelines (ICS and [60]), AWPPA [2], ASSPPR [108], Ice Navigation in Canadian Waters [18] and Guidelines for Assessing Ice Operational Risk [94] all mention consideration of Inuit and/or Indigenous populations. The Guidelines for Assessing Ice Operational Risk [94] mention Inuit land claim agreements as a source of laws and policies that potentially apply to safe operations and environmental protection. The interests and rights of Indigenous populations, including local travel over ice and environmentally sensitive areas are mentioned with regards to voyage planning considerations within all guidance documents. None of the instruments provide detailed guidance on how to avoid/minimize impacts on Inuit while assessing ice and operational risks, other than the Ice Navigation in Canadian Waters text, which suggests adding information to charts for route planning [18].

Focusing on safe navigation and environmental protection through sound shipping governance does not necessarily entail safety for Inuit communities if their rights, perspectives, and concerns are not considered. The language of the international and national instruments reviewed does not provide prescriptive wording around how to account for Inuit rights and livelihood values attached to these spaces. The Polar Code does not mention Inuit or Indigenous populations. However, in the preamble, the Code “acknowledges that coastal communities in the Arctic could be, and that polar ecosystems are, vulnerable to human activities, such as ship operation”, and that safety measures to reduce the probability of an accident will largely benefit the environment (MEPC 68/21/Add.1 Annex 10, page 5). The Code doesn’t address coastal communities beyond this. Sea ice is articulated as a potential hazard to safe vessel operations, requiring adherence to mandatory

Table 1
Key instruments regulating or guiding ice-strengthened vessel operations in Arctic waters adjacent to Nunavut.

Instrument	Sea ice/icebreaking frame	Inclusion of Inuit rights or interests
International		
Polar Code [111]	Sea ice as a unique challenge to mariners and a potential hazard to safe vessel operations (including safety of crew)	Not mentioned
Polar Waters Operation Manual Guidelines([60] ICS and OCIMF guidance)	Sea ice presence requires cautious route planningSea ice as a unique challenge to mariners and a potential hazard to safe vessel operations (including safety of crew)	Interests and rights of any Indigenous populations in the area should be considered and they should be consulted as appropriate (2.1.7)Migration patterns of wildlife should be considered (2.1.8)
National		
Arctic Waters Pollution Prevention Act [2]	Sea ice conditions as a potential hazard to vessels, posing a threat to safe navigation and environmental protection	Natural resources are developed, and Arctic waters are navigated in a manner that takes cognizance of Canada’s responsibility for the welfare of the Inuit and other inhabitants of the Canadian Arctic and the preservation of the peculiar ecological balance that now exists in the water, ice, and land areas of the Canadian arctic (preamble)
Arctic Shipping Safety and Pollution Prevention Regulations [108]	Sea ice conditions as a potential hazard to vessels, posing a threat to safe navigation and environmental protectionSea ice as dynamic environment, requiring spatial and temporal restrictions on navigation	Not mentioned
Ice Navigation in Canadian Waters([18]; guidance)	Sea ice as dynamic changing environment requiring vessel-specific customized planningSea ice as a potential hazard to safe vessel operations (including safety of crew) Sea ice-vessel collisions as a risk that may introduce pollution to Arctic waters	Environmentally sensitive areas where there are limitations as to course, speed, or on-ice activities, such as Inuit winter ice roads [sic], which are recognized as additional information that could be added to charts utilized for route planning (4.10.1).
Guidelines for Assessing Ice Operational Risk([94]; guidance)	Sea ice as a source of risk to safety of vessel operations, including safety of crew and protection of the environment	Inuit Land Claim Agreements described as a potential source of laws and policies that potentially apply to safe operations and environmental protection (pg. 2)Local travel over ice and protected areas and marine mammal migration are mentioned with regards to voyage planning considerations (pg. 5)
Territorial		
Nunavut Agreement [75]	Waters and land-fast ice as a space of traditional and current use and occupation	Inuit as traditional and current users of certain marine areas, especially the land-fast ice zones (15.1.1) Need to develop and coordinate policies regarding marine areas, with the need for Inuit involvement in aspects of

(continued on next page)

Table 1 (continued)

Instrument	Sea ice/icebreaking frame	Inclusion of Inuit rights or interests
Nunavut Land Use Plan [53]; 2021 Draft)	Sea ice as important habitat for marine and terrestrial species Sea ice as space of connectivity between communities and feature enabling year-round harvesting Icebreaking as a potential threat to the aforementioned uses	marine management (15.1.1) Inuit societal values and IQ as integral to land use planning (1.3.6) Protection of Valued Components, including certain ice features and on-ice migration and transportation routes from marine vessels (and icebreaking) (2.2.5, 2.7.2, 2.7.3, 2.8.2, and 4.1.1)

provisions on safety measures and pollution prevention, and development of a PWOM.

As guidance documents, the PWOM Guidelines [60], Ice Navigation in Canadian Waters [18], and Guidelines for Assessing Ice Operational Risk [94] offer more direction to consider the rights and interests of Indigenous populations. The PWOM Guidelines offer more direction than those provided by the IMO in the Polar Code, indicating that the “interests and rights of any [I]ndigenous populations in the area should be considered and they should be consulted as appropriate” when developing a strategic plan (2.1.7), and that migration patterns of wildlife, nature reserves, sites of special scientific interest, particularly sensitive sea areas, and areas to be avoided should all be considered as well (2.1.8) [60]. Ice Navigation in Canadian Waters [18] directs the ship Master to consider marking strategic planning charts with “any environmentally sensitive areas where there are limitations as to course, speed, or on-ice activities. For example [...] traditional Inuit winter ice roads in the Arctic” (p. 109). The relatively soft language of these guidance documents draws attention to the presence of Inuit and frames sea ice as a space of transit for both humans and animals. However, they do not direct action on the part of vessel operators beyond considering this usage in route planning. While the Guidelines for Assessing Ice Operational Risk [94] direct attention to Inuit land claims agreements, stipulations that may apply to navigation are not described, necessitating further independent investigation. These documents offer guidance but do not provide legal requirements as would be found in federal legislation and regulations.

The *AWPPA* preamble recognizes the responsibility of the Government of Canada to ensure the welfare of Inuit and to preserve the ecological integrity of marine spaces. Yet, the provisions of the act make no further reference to Inuit or the social-ecological system within which vessel operations are taking place. The *AWPPA* (alongside the *Canada Shipping Act, 2001* enables the *ASSPPR*, and while the *ASSPPR* does not mention Inuit, its parent Act does. Section 8 of the *ASSPPR* sets out ice-strengthening and entry reporting requirements for Canadian and foreign vessels navigating in shipping safety control zones. These requirements apply to vessels of 300 gross tonnage or more, passenger vessels, vessels carrying pollutants or dangerous goods, vessels towing or pushing a vessel carrying pollutants or dangerous goods, or vessels involved in towing or pushing another vessel if the combined weight is 500 gross tonnage or more. While icebreakers operating for commercial purposes must adhere to navigation periods and shipping safety control zone entry requirements outlined in Section 8–10, federally operated icebreakers, including CCG operations and government research vessels, are excluded.

The language used in territorial instruments characterizes sea ice as a space of Inuit use and occupancy and as habitat for marine and terrestrial species. Icebreaking is constituted as a potential threat in this regard; however, it does not receive explicit attention in the *Nunavut Agreement*. Article 15 of the *Nunavut Agreement* recognizes and reflects that Inuit are traditional and current users of certain marine areas,

including the landfast ice zone and that there is a need to include Inuit in the development and coordination of policies regarding Arctic marine areas (s. 15.1.1). Article 15 also outlines that territorial governance bodies (the Nunavut Impact Review Board (NIRB), Nunavut Planning Commission (NPC), Nunavut Water Board (NWB), Nunavut Wildlife Management Board (NWMB)) can collectively form the Nunavut Marine Council (NMC) for matters outside of their individual responsibilities.

Article 11 specifies provisions for land use planning in the NSA, whereby “land” includes water and resources including wildlife (s. 11.1.2), and land use planning applies to both land and marine areas within the NSA and the Outer Land Fast Ice Zone (s. 11.1.4). Planning priorities and objectives are to be guided by principles that recognize people as a fundamental part of dynamic biophysical environments, whereby social, cultural, and economic endeavors must be central to land use planning and implementation. Article 12 sets out provisions for managing development impact, establishing the NIRB with the primary objective to always “protect and promote the existing and future well-being of the residents and communities of the [NSA], and to protect the ecosystemic integrity of the [NSA]” (s. 12.2.5). Shipping associated with development project proposals is subject to Article 12, where the NIRB can make recommendations to the responsible government Minister(s) with regards to ecosystemic and socio-economic impacts of project proposals (s. 12.2.2). Project proposals must first move through the NPC to ensure it conforms with land use plans, prior to being forwarded to the NIRB for screening.

The NPC is responsible for the Draft Nunavut Land Use Plan (2021), which contains provisions for direction of resource use and development in the NSA, including considerations or prohibition of activities that could disturb Valued Ecosystem Components. Valued Ecosystem Components are any element of the environment identified by Nunavut residents or the NPC as being important to the natural environment, such as iconic animal species or clean water. Valued Socio-economic Components are another element of the Draft Nunavut Land Use Plan, which have economic, social, or cultural significance. Valued Components may be identified in any land use designation, and project proponents are encouraged to consider Valued Components when planning a project, identifying anticipated impacts in project proposals, and reporting on actual impacts [53].

IQ and Inuit societal values are integral to the planning approach contained within the Draft Land Use Plan, which gives explicit attention to icebreaking activities. Section 2.2.5 of the Plan identifies caribou sea ice crossings as a Valued Ecosystem Component, designates several as Conditional Use areas, “within which, except as required for safe navigation, no person is to conduct icebreaking activities” during indicated seasons (p. 19). Icebreaking is further addressed in section 2.7.2–2.7.3, which identifies polynyas and floe edges as known Valued Ecosystem Components, where icebreaking can have negative impacts on polynya structure or other characteristics, can prevent formation of floe edges, or cause early break-up. Transboundary considerations are highlighted with regards to the Sarvarjuaq/Pikialasorsuaq (North Water) Polynya, which is also designated as a Conditional Use area within which no icebreaking activities are to be conducted (with the exception as required for safe navigation; Section 2.8.2–1). On ice travel routes are designated as Conditional Use areas based on their importance to communities, requiring proponent consultation with municipal councils, hunters and trappers organizations, and regional wildlife organizations within a 300 km radius of the route for any project that will disrupt or destroy on ice travel routes during designated seasons (Section 4.1.1–1). Vessels engaged in community resupply or emergency response are exempt from these requirements.

In summary, while the Polar Code and *ASSPPR* do not directly address Inuit use of marine spaces within their text, the PWOM Guidelines [60], Ice Navigation in Canadian Waters guidance [18], and Guidelines for Assessing Ice Operational Risk [94] do. Among the international and national instruments reviewed, the *AWPPA* contains the most robust recognition of the Arctic environment as a social ecological

system. It recognizes the importance of maintaining ecological integrity as a part of Canada's responsibility for the welfare of Inuit. However, this is only recognized in the preamble to the Act. In contrast, the social and cultural values derived from marine spaces are explicit within the *Nunavut Agreement* and the Draft Nunavut Land Use Plan (2021). The Draft Nunavut Land Use Plan provides the most detailed expression of how icebreaking activities can impact valued components of the social ecological system, and how those impacts need to be considered in land use policies and decision making.

5. Discussion

5.1. Icebreaking in Nunavut

The international, national, and territorial instruments reviewed collectively emphasize safe navigation, including environmental protection and human safety, as a requirement to enable access to marine spaces in Arctic waters. However, the governance values and intent of these instruments diverge in how safety is conceptualized and in how sea ice is framed. Under international and national policies and guidance which are underpinned by a 'western' or Eurocentric value system, sea ice is an impediment to access and safe navigation, and vessels with icebreaking capabilities facilitate vessel mobility and are a means of risk management when transiting ice covered waters. In contrast, under territorial policies which are underpinned by an Inuit value system, intact sea ice is viewed as a socio-ecological system that not only enables mobility and coastal access for people and animals, but is integral to Inuit culture and well-being. Vessels with icebreaking capabilities have the capacity to threaten this critical coastal platform. At the same time, icebreakers also support activities and logistics for local economies (including resource development) and can enable the delivery of essential goods to communities. This positions Inuit and Inuit organizations in Nunavut as essential to include in icebreaking governance.

In the Canadian Arctic, icebreaking activities fall under federal jurisdiction, and legislation and regulations have been designed to implement international conventions and agreements, including the Polar Code. Thus, the dominant policies influencing icebreaking governance in the Canadian Arctic are embedded in colonial structures [30,73]. The ways in which the dominant system of governance conceptualizes maritime space allows the application of linear boundaries to represent dynamic and indeterminate environments [59,89]. The challenges of this type of environment are accounted for in part by framing sea ice as a barrier to access and an impediment to vessel and crew safety requiring strategic planning and risk management. The divergence in how sea ice is conceptualized and valued, and the asymmetrical influence international and national policy holds poses a substantial barrier to incorporating Inuit rights, perspectives, and governance values into icebreaking policies. Yet, Inuit rights as affirmed in Section 35 of the *Canadian Constitution Act*, the *Nunavut Agreement*, and the newly legislated *United Nations Declaration on the Rights of Indigenous Peoples Act* provide an imperative for appropriate consideration and consultation when developing shipping policies (or resource development projects) that may impact Inuit rights in Canada.

Valued Components identified in the Draft Nunavut Land Use Plan are not only important ecologically speaking, but also are directly related to Inuit rights and governance values. The ability of the NPC's land use planning and consideration of IQ to influence icebreaking activities was demonstrated in 2015 when it rejected Baffinland's application to ship ore from Mary River mine for 10 months of the year. It was

determined that the proposal was not compatible with the North Baffin Regional Land Use Plan,⁴ as shipping ore in the winter months would require icebreaking support that would damage community hunting and travel routes, and potentially harm wildlife and wildlife habitat [35]. The regulatory reach encompassed commercial icebreaking activities in this case because the icebreaking was taking place to support Baffinland's mining activities (subject to Nunavut regulations). However, territorial jurisdiction does not supersede federal activities and policies, meaning that in theory, the decision *could have* been overturned by the federal government. Considering these events in light of the Baffinland Phase 2 Expansion described in Section 2.4, we may once again see how Baffinland's proposed expansion is considered in light of varying support and opposition from different hamlets and Nunavut's land use planning through the final recommendation of the NIRB, which is expected in 2022 [47]. The recommendation of the NIRB will be subject to approval by the Crown-Indigenous Relations and Northern Affairs Canada minister.

The scope of influence of territorial instruments is weighted more towards commercial icebreaking operations supporting commercial on-land/coastal development projects, whereas federal operations may be beyond the formalized influence of Nunavut policies and institutions. Further, despite Nunavut's ability to influence icebreaking for on-land/coastal resource development projects and Canada's commitment to implementing UNDRIP, all decisions are still subject to federal ministerial discretion. Other Nunavut governance bodies such as the NMC may play an increasingly important role in addressing icebreaking for non-development purposes.

5.2. Future policy directions

While the international and national instruments reviewed do not adequately reflect consideration of the complex social-ecological system that is encompassed by Inuit Nunangat, nor the governance values expressed by the GN's IQ principles, other policies and practices exist that may help move existing mechanisms towards the full inclusion of Inuit rights and governance values. The federal Oceans Protection Plan (OPP) intends to strengthen marine safety systems and protect coastal ecosystems. The OPP is unique in terms of marine transportation governance, with a strong emphasis on Indigenous partnerships for providing advice on updating and modernizing regulations to respond to community-specific issues related to marine traffic [52]. Although icebreaking activities are not specifically mentioned in the OPP, the Plan identifies Indigenous groups as partners, with local communities, marine industry, the scientific community, and other stakeholders described as collaborators [50]. Framing Indigenous groups as partners provides an additional imperative for Inuit rights and IQ governance values to inform the updating and modernizing of existing icebreaking policies in response to community-identified marine traffic issues. However, even as partners, given the current asymmetrical influence of non-Inuit driven policies and practices in place for icebreaking in the Canadian Arctic, incorporating such values remains a challenge.

Another mechanism that could have an impact is Canada's Arctic and Northern Policy Framework (the Framework), which is being co-developed by the Government of Canada and northern partners using a whole-of-government approach. The first phase of the Framework was launched in September 2019 and includes goals and objectives related to protecting the ecosystemic integrity of Arctic waters. Goal 5 stipulates that Canadian Arctic and northern ecosystems are healthy and resilient. Underlying objectives of goal 5 include: ensuring conservation,

⁴ The North Baffin Regional Land Use Plan and the Keewatin Regional Land Use Plan are approved regional plans that provide guidance and direction for land use in those regions of Nunavut. Once the Nunavut Land Use Plan is approved, it will replace the regional plans and guide land and resource use and development throughout the territory [78].

restoration and sustainable use of ecosystems and species; supporting sustainable use of species by Indigenous peoples; approaching the planning, management, and development of Arctic and northern environments in a holistic and integrated manner; and ensuring safe and environmentally responsible shipping [49]. These objectives constitute a more holistic understanding of Arctic marine social-ecological systems, encompassing shipping, species impacts, and Inuit use and occupancy into how future policy actions should be developed. While the implications of this have yet to be seen, the next stage of the Framework will be co-developing governance mechanisms and a co-implementation plan. Thus, northern community partners involved in co-developing the Framework could have influence on the future of icebreaking governance, in some capacity.

The Tallurutiup Imanga NMCA Inuit Impact Benefit Agreement (IIBA) offers a more direct avenue to include Inuit rights and values in shipping governance. Article 10 of the IIBA addresses issues of marine navigation, although it does not explicitly address icebreaking activities. It sets forth objectives to improve communication and collaboration between Transport Canada and Inuit, including establishing a Transport Canada Center in the Qikiqtani region (s.10.4). The spirit of the IIBA clearly demonstrates a commitment to collaborative management of marine shipping [85]. However, it is the content and actual implementation of the pending co-management plan for the Tallurutiup Imanga NMCA that will determine the ability of the CNMCA to manage shipping within waters adjacent to Nunavut. Nonetheless, the degree to which NMCA management measures might affect commercial and federal icebreaking activities remains to be seen.

Based on this review, four IQ principles were identified that could be applicable for governance of icebreaking activities taking place within the NSA. *Inuuqatigiitsiarniq* (respecting others, relationships and caring for people) can be interpreted and implemented to better situate respectful relationships with Inuit as the basis of icebreaking policy development so that governance can be inclusive of Inuit participation and perspectives. *Aajiiqatigiinniq* (decision making through discussion and consensus) can be interpreted and implemented to improve transparency and legitimacy in decision-making. Although consensus may not be achievable, an amicable compromise may be. Decision making through discussions is important so that Inuit are well informed of the shipping routes and icebreaking policies that will ultimately impact their livelihood and wildlife, and so that vessel operators are aware of Inuit use of the marine spaces within which they operate. *Piliriqatigiinniq* or *ikajuqtiigiinniq* (working together for a common cause) can be interpreted as the basis of working together to create policies and decision making that draw from IQ and are respectful to Inuit lives and livelihoods. Through applying *piliriqatigiinniq* or *ikajuqtiigiinniq*, policies can better involve Inuit in collaborative icebreaking governance. Lastly, *avatittinnik kamatsiarniq* can be implemented to develop policies that respect and care for the land, animals, and the environment, which supports Inuit lives and livelihoods. While these IQ principles are suggested based on our analysis, meaningful engagement and respectful collaboration with communities in Nunavut will be essential to establish a legitimate approach.

6. Recommendations and conclusion

Some of the instruments reviewed acknowledge Inuit use of sea ice. However, those that encompass icebreaking activities in waters adjacent to Nunavut do not adequately account for IQ governance values in a way that recognizes the social-ecological system that exists around sea ice in Nunavut and its cultural significance. The OPP and the Framework highlight approaches within Canada that could support moving existing mechanisms towards improved inclusion of Inuit rights and IQ governance values. Nonetheless, how these policies may directly apply to icebreaking activities is yet to be seen. As UNCLOS does not contain provisions pertaining directly to Indigenous knowledge and rights, the legal framework that directs national policy development could be

improved in this regard [4,32]. Thus, to better account for Inuit rights and IQ governance values into existing icebreaking governance mechanisms, the following three recommendations are proposed which should be considered as future icebreaking policies are developed internationally, nationally, and territorially. The recommendations can apply to the development and implementation of management measures, such as the Northern Low-Impact Shipping Corridors. Each of these recommendations are underpinned by the fact that IQ cannot simply be integrated into existing legislative frameworks and policy approaches which are embedded in colonial institutions, and even within Nunavut institutions there are challenges to applying IQ in decision making contexts [81]. To understand how IQ and Inuit governance values can contribute to reshaping icebreaking governance in Nunavut, meaningful engagement with Inuit communities and governance bodies will be essential, along with a willingness to incorporate such knowledge when making policy decisions. The work undertaken by the Arctic Corridors & Northern Voices project offers a model to guide collaborative and partnered work in this regard [27,37,38].

- 1) The *United Nations Declaration on the Rights of Indigenous Peoples Act* aims for Canadian law to be consistent with UNDRIP and provides for the adoption of action plans with measures. Action plans with measures could ensure that shipping regulation in ice-covered waters takes account of impacts on Inuit uses/interests. The federal government could pursue a collaboratively developed action plan to protect Indigenous rights in Canadian Arctic waters which would include mitigating the negative impacts of icebreaking activities. Support for Inuit participation in icebreaking governance can be drawn directly from UNDRIP articles 25, 29.1, and 32.2. In Nunavut, Article 15.1.1 of the *Nunavut Agreement* can also be drawn upon to support this collaboration, where opportunities exist to incorporate IQ principles, for example: 1) *inuuqatigiitsiarniq*, 2) *aajiiqatigiinniq*, 3) *piliriqatigiinniq* or *ikajuqtiigiinniq*, and 4) *avatittinnik kamatsiarniq*.
- 2) Our analysis suggests that potential exists for amendments to the IMO PWOM guidance [61], ICS and OCIMF PWOM guidance [60], and Icebreaking in Canadian Waters guidance [18], and the Guidelines for Assessing Ice Operational Risk [94]. Voluntary safety and environmental protection measures have mixed and context dependent compliance, and often higher compliance is due to a desire to operate responsibly and reduce risk to vessel and crew safety (Huntington et al., 2015). The focus on risk reduction and vessel/crew safety does not intuitively account for potential negative impacts vessels may have on Inuit communities. Thus, in consultation with the Inuit Circumpolar Council and other Inuit and Indigenous organizations as applicable vessel operators could be required (rather than consider) to include Indigenous rights and interests when planning vessel operations in ice-covered waters. There are guidelines for passenger vessels operating in the Canadian Arctic that note best practices to minimize impacts on community use of sea ice, where vessel owners should: mark vessel tracks; install ice bridges; and provide a 24-hour notice prior to icebreaking [95]. Similar guidance could be developed for non-passenger vessel operations. Direct measures for communicating with coastal communities could also be addressed, including establishing formal channels for communities to submit notices to mariners.
- 3) Building on the spirit and intent of the OPP and the Arctic Northern Policy Framework, national icebreaking policies could adopt voluntary no-icebreaking zones, desist from icebreaking during freeze-up, and/or conduct emergency-only icebreaking during the fall, winter, and spring as proposed by the Arctic Corridors & Northern Voices project [21,23,25,26]. These voluntary zones and practices should apply to both commercially and federally operated icebreaking vessels and establish measures to strengthen two-way communication between vessel operators and communities when vessels are unable to avoid these zones. The Canadian Hydrographic Service (I) should update regional navigational charts to reflect these

zones to allow for proper consideration during route planning. Identification of these zones should be based on IQ and ongoing partnership with the NMC and all coastal communities in Nunavut (and Inuit Nunangat more broadly). These should address critical or sensitive habitat, including that of pinnipeds, cetaceans, caribou, and polar bear, as well as culturally significant areas (e.g., on-ice travel routes and other Valued Components contained within the Draft Nunavut Land Use Plan (2021)). Such zonation could be accounted for and managed holistically through future marine spatial planning or other coastal management initiatives that may emerge within the territory.

Shipping governance in Canada is characterized by governance instruments that link horizontally across sectors and vertically between various levels of national and international governance institutions. For example, Canadian shipping policy is primarily the responsibility of TC and the Canadian Transportation Agency, but it also influences or is influenced by DFO, CCG, and other departments within the umbrella of the federal government. These policies are guided by Canadian law and IMO conventions to which Canada is a party. In Nunavut, these systems of governance interact with and influence Inuit social, cultural, and ecological values, yet maritime governance institutions are not structured to formally engage with the integrated nature of social-ecological systems. As noted, current modes of marine transportation governance tend to frame the environment as separate from people and defined by boundaries of abstract maritime zones [4,11]. Here, the land-sea boundary is constituted by the low-water mark and waters are divided to aid in management of marine spaces. The challenge in sea ice is dealt with, in part, by framing it as a risk to safe navigation (which also encompasses environmental protection), requiring strategic planning and risk management through vessels having ice strengthened capabilities, for example.

These conceptualizations contrast those conveyed through IQ, which encompasses all aspects of Inuit knowledge, culture, values, ontology, language, spirituality, social organization, perceptions, and expectations [92,102]. The IQ principles offer a lens to view and understand Inuit approaches to marine governance, which inherently recognize the seamless interconnection of humans, wildlife, habitats, and the importance of sea ice [55,92]. While this approach to marine governance stands in contrast to current approaches demonstrated by non-Indigenous institutions, and they operate at different jurisdictional scales, they are connected through the environment within which they operate. As such, IQ may come to offer creative solutions required to address the challenges that sea ice poses to the existing system of ice-breaking governance, whereby recognizing the permeability of maritime boundaries may allow for the interdependencies and dynamic interactions of human and non-human entities to be better accounted for in icebreaking governance in Nunavut.

It is evident that a complex set of instruments interact in various ways to influence how icebreaking is governed in Nunavut. Specifically, the *Nunavut Agreement* and the Draft Nunavut Land Use Plan (2021) are important instruments that enable Inuit rights and IQ governance values to be considered with regards to icebreaking activities for commercial purposes such as resource development. However, the challenge here is that federal activities remain beyond the reach of these instruments. While federal instruments acknowledge Inuit use of sea ice and the importance of maintaining the ecological integrity of marine spaces, Inuit concerns and IQ principles are not adequately reflected in the existing instruments that govern icebreaking activities. This is not surprising given Canada's colonial history and the dominance of a 'western' epistemology. However, Canada has taken steps, at least on paper, towards reconciliation with Indigenous peoples and nations. The *CNMCA* demonstrates potential for this to occur, although the specific details of what this will look like for governance of marine traffic in the Tallurutiup Imanga NMCA is yet to be seen. The OPP and the Framework both provide a more holistic framing of marine spaces as social-ecological

systems, where rights holders as partners will be critical in protecting coastal ecosystems. Arrangements that emerge through the OPP and the Framework and partnering with the respective Nunavut agencies offer an avenue through which Inuit rights and governance values can be brought to bear in future icebreaking policy development. While this will not be without its challenges, in doing so, coastal and environmental protection initiatives can better account for the ecological, social and cultural risks that icebreaking can introduce.

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Declarations of interest

None.

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