Understanding Arctic shipping impacts and mitigation: Impact assessment as a tool for knowledge brokerage

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Abstract

Arctic shipping is one area that presents challenges for regulators in a rapidly changing Arctic environment; declining sea ice due to climate change, resource development, regional demographics, and tourism trends combine to drive an increase in traffic. Impact assessment (IA) is one regulatory tool used to assess, mitigate, and monitor the impacts of shipping. The complex nature of polar operations, gaps in scientific baselines, and the active use of the marine environment by local resource users means that marine-related concerns can dominate the regulatory process. This research examined how knowledge about Arctic shipping impacts and mitigation are exchanged through IA processes.

Methods involved a document review of past project assessments carried out by the Nunavut Impact Review Board (NIRB) to identify the routine shipping impacts considered in decision-making, the information needs of rights holders and stakeholders about shipping, and how the NIRB addresses impacts and needs throughout its process. Focus groups conducted with the NIRB complemented the review and provided an institutional perspective on how the NIRB assesses shipping as well as challenges and opportunities.

The information needs of rights holders were diverse and dependent on the scale of the project, community dynamics and histories. Regulatory stakeholders were unsurprisingly concerned with topics related to shipping that fall under their respective jurisdictions. Despite the variety of comments submitted to the IA process, some common themes included the presence of uncertainty, concern over the cumulative effects of increasing Arctic shipping, and questions around the appropriateness and effectiveness of existing impact management strategies in Arctic environments. The NIRB manages these concerns through unique process components intended for better knowledge exchange, comprehensive monitoring, and adaptive management in order to enable longer-term learning that extends beyond immediate project assessments. This research contributes to an understanding of Nunavut's unique IA process that is relatively unexplored in the literature as well as builds an understanding of Arctic shipping from an IA perspective. It helps address needs identified by the NIRB for helping advance engagement and knowledge exchange between proponents, intervenors, and communities to support an enhanced understanding of the marine-related impacts considered in IA processes.

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Figure 2.1 and Figure 3.4 were reproduced with permission from Dawson, Pizzolato, Howell, Copland and Johnston (2018) and within the terms of the open source article. Figure 3.2 was reproduced in accordance with its Creative Commons license (CC BY-SA 2.5). Figure 4.7 used the same base map as 3.2 but was altered to include data from this research. All other figures are original works.

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List of Abbreviations

BMP	Best management practices
CBM	Community-based monitoring
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
DFO	Department of Fisheries and Oceans
DIO	Designated Inuit Organization
EA	Environmental assessment
EC	Environment Canada
EIS	Environmental impact statement
FHR/PHR	Final Hearing Report/Public Hearing Report
GN	Government of Nunavut
HTO	Hunter and Trapper Organizations
IA	Impact Assessment
IQ	Inuit Qaujimajatuqangit/ Inuit Qaujimaningit
IPG	Institutions of Public Governance
Mt/a	Million tonnes per annum
NGO	Non-governmental organization
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claim Agreement
NMC	Nunavut Marine Council
NPC	Nunavut Planning Commission
NRCan	Natural Resources Canada
NTI	Nunavut Tunngavik Incorporated
NuPPAA	Nunavut Planning and Project Assessment Act
SBO	Shipboard observers
SMP	Shipping Management Plan
TK	Traditional knowledge

Chapter 1 Introduction

Over the next several decades, Arctic shipping is predicted to increase (Council of Canadian Academies, 2017). This is partly due to a continuation of current trends – in resource development and commodity markets, tourism demand, and changing demographics – as well as declining sea ice cover and a lengthening of the shipping season due to climate change (Pizzolato et al., 2016; Dawson et al., 2018). Increased Artic shipping raises important questions for communities, regulators, governments, and industry about impacts such as ballast water exchange, noise, oil spills, and impacts to coastal ecosystems (Edwards & Evans, 2017). Decision-makers are tasked with balancing an increasing interest in marine development with the wellbeing of coastal communities and the ecological integrity of Arctic environments.

The regulatory approach to Arctic shipping is complex and is dependent on vessel type and jurisdiction. Research focusing on Arctic shipping from a regulatory perspective is often concerned with one vessel type, such as passenger ships (Dawson, Johnston & Stewart, 2017), while others examine Arctic shipping from a national or international perspective, peppered with questions about Canadian sovereignty in the Arctic (Chircop, 2009; Guy & Lasserre, 2016). In the eastern Canadian Arctic, the development of a comprehensive land claim importantly includes the marine environment within the settlement area it creates; this grants local resource users with decision-making power through the creation of a distinct, co-managed impact assessment (IA) process.

IA, in its many forms, is a regulatory tool for assessing a proposed action, policy, or project for their likely biophysical, social, economic and cultural impacts as well as management strategies before major decisions are made (Morgan, 2012). Increasingly, however, societal expectations about IA go beyond simply meeting formal regulatory requirements for project approval to expecting a process capable of delivering sustainability outcomes such as capacity building, social learning, and the co-production of knowledge (Sánchez & Mitchell, 2017; Sinclair et al., 2008). While these substantive outcomes are considered alongside traditional effectiveness criteria (Loomis & Dziedzic, 2018), IA in the Canadian Arctic is often addressing fundamental challenges, such as filling baseline data gaps, managing expectations about IA, and building institutional capacity (Noble & Hanna, 2015). Therefore, an important question is how

effectively current processes are meeting the basic information needs of stakeholders and decision makers.

One approach to exploring how information moves within an agency or institution is knowledge brokerage, or a "process of communication and interaction aimed at knowledge exchange and learning between parties with different knowledge bases" (Saarela et al., 2015). While a small literature exists on knowledge brokerage and IA, it is from a strategic level perspective. Within this literature, as well as the more extensive literature on learning in IA, the question is often raised whether knowledge brokerage and learning are explicitly designed into assessment techniques as a desired outcome or whether they are incidental (Fitzpatrick, 2006; Partidario & Sheate, 2013; Sánchez & André, 2013; Sánchez & Mitchell, 2017; Sinclair et al., 2008). Similarly, there is a growing body of literature on how learning and the co-production of knowledge are enabled in co-management arrangements in the Canadian Arctic (Armitage et al., 2011; Berkes, 2009; Diduck et al., 2005). Co-management boards are "learning to learn through uncertainty" in order to make management decisions that are adaptive to a rapidly changing Arctic environment (Armitage et al., 2011).

In the Eastern Arctic, IA is the most extensive decision-making mechanism used to assess, mitigate, and monitor the impacts of shipping, although this is only for shipping that requires a land-based component – for example, a mine that involves resupply sealifts or the shipping of ore concentrate, or a cruise ship seeking access to a National Park or Marine Protected Area. The complex nature of marine operations and project impacts, as well as the importance of the marine environment to many resource users, means that marine-related issues can often dominate community, regulatory, and industry concerns. Additionally, the information needs of resource users and regulatory stakeholders are often recurrent across projects. IA in the Canadian Arctic, administered in each territory under an assessment board created through land claims, provides an interesting context to explore how knowledge brokerage may take place to support decision-making in project-level assessments.

1.1 Purpose and Objectives

This research set out to develop an understanding of the marine related impacts of Arctic shipping and the routine concerns considered in IA. The **purpose** of this research was to examine

how knowledge about Arctic shipping impacts and mitigation are brokered through IA processes. The **objectives** were to:

i. Identify the routine information needs of rights holders and stakeholders about shipping-related impacts and mitigation;
ii. Assess how these information needs are addressed through the IA process, project design, and mitigation; and
iii. Identify opportunities for enhanced knowledge exchange and capacity building to support decision-making.

This research is part of a larger project developed collaboratively between the Nunavut Impact Review Board, the University of Saskatchewan, and the University of British Columbia. Although knowledge brokerage is the exchange of knowledge across different knowledge bases, an obvious inclusion here is the exchange of Indigenous knowledge and western science in IA processes. Indigenous knowledge was not the focus of this research, but it is addressed as part of the larger project. The focus of this research was on knowledge specifically surrounding impacts and mitigation of shipping, which can include Indigenous knowledge. Collectively, the project's aim is to advance best practices for community engagement in IA and to develop community capacity to engage in co-management decision-making processes.

1.2 Thesis Organization

This thesis is presented in six chapters, beginning with the Introduction chapter. Chapter 2 sets the research context by discussing trends in Arctic shipping and introducing IA and knowledge brokerage. Chapter 3 describes the study area and research methods. Chapter 4 presents the results and Chapter 5 identifies opportunities to enhance knowledge exchange. Chapter 6 offers study conclusions, key research and practical contributions, study limitations, and opportunities for future research.

Chapter 2 Literature Review

The following review introduces the broad context of shipping in Arctic marine environments, its potential impacts and risks, and changes expected in the near future. It then explores IA as the primary tool for assessing impacts and mitigation and how knowledge is created and communicated in the IA process. Several enduring challenges related to knowledge, capacity and stakeholder engagement in IA are explored, and the concept of knowledge brokerage is introduced. The chapter concludes by identifying some key IA research and practice gaps in the Canadian Arctic.

2.1 Arctic shipping and marine environments

Arctic environments are experiencing rapid social, ecological, and environmental change. These changes are largely driven by human activity (Arctic Council, 2016). Climate change plays an important role in changes to Arctic environments, including declining sea ice cover, snow cover extent and depth, thawing permafrost, as well as changes in species distribution for wildlife and plants in terrestrial and aquatic environments, among many others (Larsen et al., 2014). Some of the strongest negative trends in sea ice extent and volume in the Canadian Arctic are in Hudson Bay and Baffin Bay, both of which are regions with heavy shipping activity (Dawson et al., 2018. Globally, marine ecosystems are threatened by the cumulative impacts of overfishing, pollution, habitat destruction and climate change (Edwards & Evans, 2017). Population growth, resource extraction, tourism, and changing political relationships are all reshaping Arctic systems in significant ways (Arctic Council, 2016; Dawson, Copland et al., 2017). Additionally, southern Canada and the rest of the world are becoming more aware of and interested in the Arctic resulting in speculation about the Arctic's utility as an alternate trade route to the Panama and Suez Canals (Council of Canadian Academies, 2017).

These trends and conditions have implications for marine shipping and opportunities related to trade, natural resource development and tourism. Canadian maritime trade was valued at $205 billion in 2015 (Council of Canadian Academies, 2017). Shipping activity has contributed to the development of port cities and coastal regions across Canada. In the Arctic, however, many communities are dependent on marine shipping to meet their most basic needs for essential goods, services, and energy supply. The dependence of many Arctic communities on shipping

has profound implications on the availability and prices of food, construction materials, housing, and fuel for electricity, heating, and transportation (Council of Canadian Academies, 2017).

In addition to community resupply, many other types of marine vessels operate in the Canadian Arctic: government and research vessels; container ships; general cargo ships; bulk carriers; tanker ships; passenger ships; pleasure crafts; tugs and barges; fishing vessels; and oil and gas exploration vessels (Pizzolato et al., 2014). Dawson et al. (2018) found that vessel traffic nearly tripled in the Northern Canada Vessel Traffic Services (NORDREG) Zone between 1990 and 2015 (**Figure 2.1**). The largest portion of traffic was from general cargo

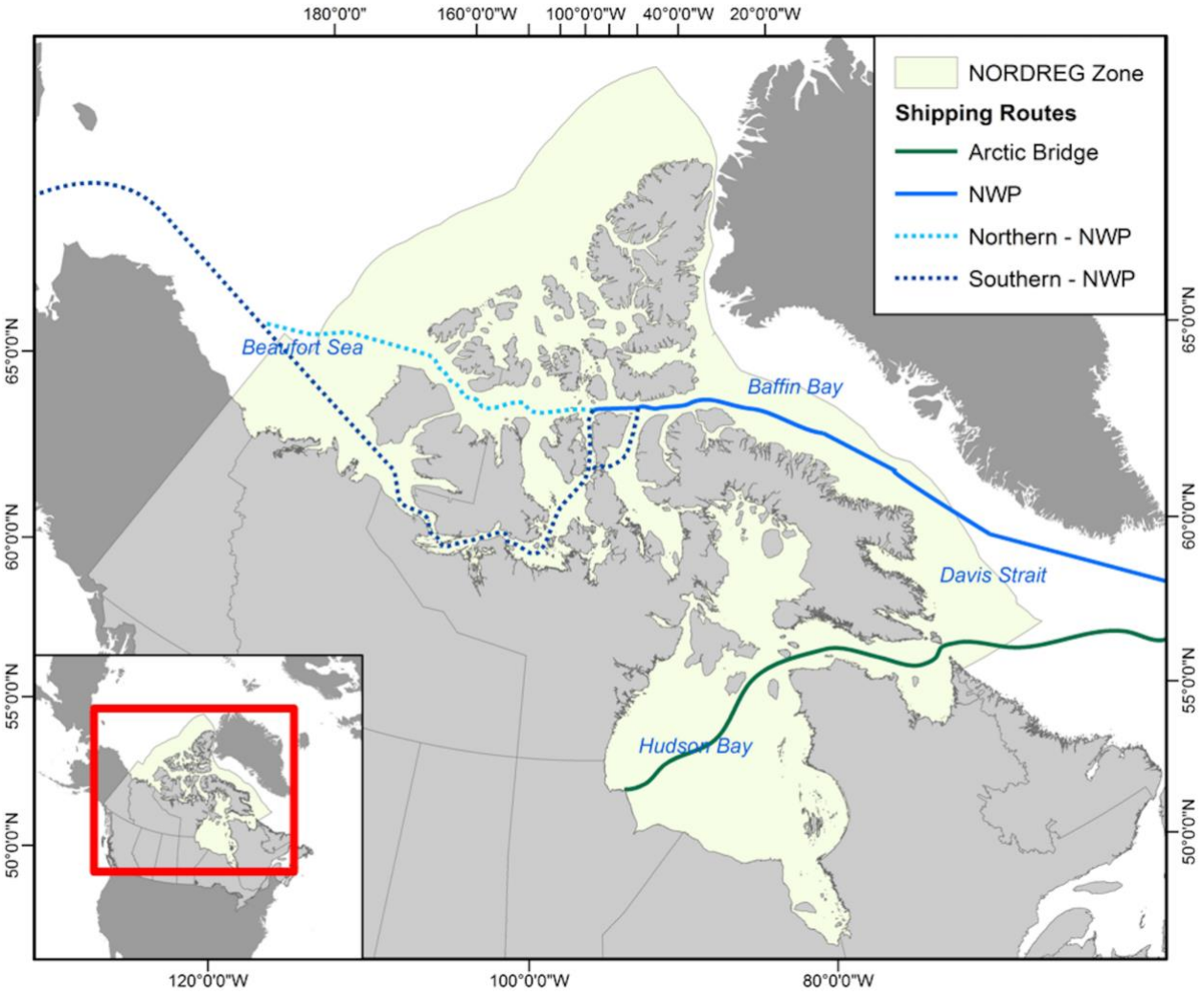

Figure 2.1 Map outlining NORDREG Zone and major shipping routes in the Canadian Arctic.[1]

[1] Source: Dawson et al., 2018.

and government icebreakers including research ships, while the fastest growing segment was pleasure crafts (i.e., private yachts). In a study comparing sea ice change with shipping traffic between 1990 and 2012, Pizzolato et al. (2014) report that, while only weak correlations were found, a lengthening of the shipping season was observed beyond the traditional window of June 25 to October 15. While climate change plays a role in influencing marine traffic trends, resource development, tourism demand, and demographics trends are equally important (Prowse et al., 2009; Pizzolato et al., 2016).

The possibility and reality of increased Arctic shipping raises important questions for local communities, governments, and industry over impacts to both natural and human environments. Environmental impacts from commercial shipping can include localized air and water pollution, effects on marine ecosystems and species, anthropogenic noise and light pollution, traffic congestions, the introduction of invasive species, and risks arising from marine accidents like groundings or fuel spills (Council of Canadian Academies, 2017; Edwards & Evans, 2017). The Arctic region's remoteness, harsh maritime conditions, and the presence of ice hazards presents challenges and increased risk for shipping operations (Guy & Lasserre, 2016). Cumulative impacts to the marine environment from shipping and resource extraction in the Arctic can adversely affect Indigenous peoples and the communities who use and rely on marine resources (Ng et al., 2018). These impacts compound the challenges facing Indigenous hunters who use sea ice as winter highways to access seals, polar bears, beluga and narwhal. The thinning and/or loss of sea ice has put land users at greater risk. Global factors that combine to drive intensified shipping in the Arctic also have the potential to trigger conflict between global supply chains and the local communities who often experience the brunt of the impacts.

The regulatory requirements for licensing and permitting vessels and shipping infrastructure are covered under international, federal, and territorial legislation and regulations. Authorizing vessels and the type of regulatory processes that are triggered are dependent on jurisdiction, vessel type, and the scale of operations. In the eastern Canadian Arctic, shipping activities without a land-based component do not undergo an IA (Barry et al., 2016). Triggering an IA can also depend on *who* is undertaking an activity. For example, in Nunavut, community resupply is not required to undergo an IA screening process to determine if a full IA review is required, but operators are required to have the appropriate permits to operate a sealift. In contrast, the shipping activity associated with a mining operation – ranging from seasonal resupply to

shipping ore concentrate – would be required to undergo an IA as part of the review process for the mine. For mining projects that solely involve seasonal resupply of fuel and cargo, these operations in many cases are functionally identical and even use the same contractors for a community sealift; however, one would be subject to IA (i.e., the mine) while the other would not (i.e., the community). Depending on the extent of the application, tourism or research vessels may be exempt from IA or undergo an IA screening process. Thus, the approach to regulating and managing the impacts of Arctic shipping is context specific.

2.2 Impact Assessment

Impact assessment (IA) is the main regulatory tool for identifying, predicting, assessing, and communicating the impacts and mitigation strategies of a proposed action or project before major decisions are made (Noble & Hanna, 2015). Impact assessment currently exists in many forms: environmental assessment (EA), strategic environmental assessment (SEA), cumulative effects assessment (CEA), social impact assessment (SIA), sustainability assessment (SA), and so on. Project-based EA is the dominant form in practice, and often focuses on environmental or biophysical impacts (Bond & Pope, 2012). However, there is an emerging shift in language from EA to IA to encompass the broader environmental, socioeconomic, cultural, and health impacts often considered in development applications, reviews, and decisions. A notable example are the proposed changes, both in name and in content, from the *Canadian Environmental Assessment Act 2012 (CEAA 2012)* to the *Impact Assessment Act* in Bill C-69 (2018).[2]

EA first emerged as a formal process in 1970 under the United States' *National Environmental Policy Act*. The *Act* established an innovative form of environmental management in response to the changing scale and nature of resource development in the post-war era in the United States, and a growing public interest in addressing the environmental consequences of resource development (Cashmore, 2004). After nearly 50 years since its inception, EA is universally recognized as a key instrument for environmental management (Morgan, 2012). In Canada, EA is currently legislated federally under *CEAA 2012*, and in each province and

[2] Bill C-69, introduced in February 2018, is proposed legislation that would enact the *Impact Assessment Act*, the *Canadian Energy Regulator Act*, and repeal *CEAA 2012* as well as make amendments to the *Navigation Protection Act.* The Bill was passed on June 20, 2019 after amendments made by the Senate Standing Committee on Energy, the Environment and Natural Resources conducted a study and cross-Canada consultation tour.

territory. EA has a long and significant history in the Canadian Arctic: it was the Berger or Mackenzie Valley Pipeline Inquiry (1977) that reinforced the idea that northern development could not proceed without Indigenous involvement and unless land claims were settled. In essence, the Inquiry created "expectations about what an assessment process should be" (Gibson & Hanna, 2016). IA systems were subsequently developed through comprehensive land claims agreements in Nunavik, Nunavut, Northwest Territories (Mackenzie Valley, Inuvialuit Settlement Region), Nunatsiavut, and Yukon, and are administered through regional boards and agencies.

2.3 IA's purpose and theoretical perspective

IA emerged from a political imperative and its practice predates the development of its theory. The diversity of practice in different social, ecological, and political contexts comes with a degree of ambiguity surrounding the purpose and efficacy of IA (Pope et al., 2013). Early research tended to focus on practical or procedural aspects of IA, rather than its nature or purpose and the development of theory (Cashmore, 2004; Loomis & Dziedzic, 2018). While the research agenda has broadened considerably, many of the issues and themes raised by practitioners and researchers in the early days remain the subject of ongoing scholarship and debate.

The basic intent of IA is broadly accepted as the prediction of significant impacts caused by a development proposal before commitments are made (Cashmore et al., 2004). Cashmore (2004) argues that IA operates along a spectrum of philosophies and values concerning how science informs IA. At one end, the scientific method provides the basis for theory and practice. IA is conceived as an analytical, technical tool designed to deliver information about potential impacts and mitigation measures to decision-makers (Cashmore, 2004; Morgan, 2012; Partidario & Sheate, 2013). This information provision model relies on the rigour and objectivity of the scientific method but acknowledges the subjective nature of development planning. However, this recognition of values is often limited in practice to one-way communication, often after the final impact statement has been published (Cashmore, 2004). Effectiveness is determined by factors such as the quantification of data and the presentation of findings in an objective manner (Cashmore et al., 2004).

At the other end of Cashmore's (2004) spectrum, IA is viewed as a civic science responsible for contributing to sustainable development and empowering communities. Here the role of science is still recognized; however, values and stakeholder involvement are viewed as integral to the process. A participation model attempts to reconcile objective facts and subjective values and emphasizes a role for stakeholders in the process (Cashmore, 2004). This approach recognizes the substantive or normative purpose of IA beyond procedural (Cashmore et al., 2004; Loomis & Dziedzic, 2018).

Effectiveness depends entirely upon the perceived purpose of IA processes and the mechanisms of how IA works. The conceptualization of effectiveness has evolved since the early days of IA practice, and is now categorized in the literature in four ways: procedural, substantive, transactive, and normative, each summarized in **Table 2.1** below (Chanchitpricha & Bond, 2013; Loomis & Dziedzic, 2018). The role science plays in an assessment informs the purpose, goals and mechanisms of how IA functions, all of which influence how knowledge is created and communicated in the process. In the information provision model, scientific knowledge flows in a distinctly linear fashion of knowledge transfer, from scientific expert to decision-makers (Partidario & Sheate, 2013). Often in environmental decision-making more generally, knowledge and ways of knowing are implicitly assigned a value and are evaluated for their perceived legitimacy. The same is true in IA: the strong emphasis on technical, expert knowledge often ignores the political and values-based nature of decision-making (Morgan, 2012). The emerging practice of Indigenous-led IA is challenging this approach (Gibson et al., 2018). Nonetheless, how knowledge is created, gathered and communicated in the IA process is closely related to how the purpose of IA is conceptualized and operationalized.

Table 2.1 Effectiveness in IA.

Effectiveness category	Explanation
Procedural	Compliance with policy and institutional standards and procedures Adherence to applicable regulations (federal, territorial, land claims)
Substantive	Extent to which IA leads to changes in processes, actions or outcomes Mitigates negative environmental impacts Ability to influence the decision-making processes

Effectiveness category	Explanation
Transactive	Outcome is worthy of time and costs involved (different for different stakeholders)
	Clarity of stakeholder roles
	Professional capacity with adequate skills
Normative	Level of wider goal or policy achievements (e.g., sustainable development or a democratic participatory process)
	Minimizing trade-offs
	Meeting stakeholder expectations

Adapted from Bond et al. (2018) and Loomis & Dziedzic (2018).

How information is created and communicated in the IA process is not only connected to effectiveness criteria but also to the quality of IA. However, the relationship between quality and effectiveness is uncertain in the literature (Bond et al., 2018). The two terms are often used interchangeably, but Bond et al. (2018) argue that quality is distinct from effectiveness: they identified efficiency, optimacy, conformance, legitimacy, equity, capacity maintenance, transformative capacity, and quality management as dimensions of IA quality. For example, efficiency relates to transactive effectiveness, optimacy (or the use of best practices) and quality management relate to procedural effectiveness, while legitimacy relates to normative effectiveness, and so on. Similarly, Lawrence (2013) relates quality to the inputs of the IA process whereas effectiveness refers to the outputs or outcomes.

One area where this is particularly relevant is in the quality of impact statements. Regardless of where IA sits on the philosophical spectrum, the primary function of IA is to assess the potential significant effects of a project and in most jurisdictions the ultimate responsibility for providing information rests with project proponents. The information generated in IA processes, in the form of impact statements, typically influences decisions relating to impact mitigation and project design (Wood, 2008). Mitigation translates the findings from the IA into recommendations to avoid, minimize, repair, or compensate the impacts of a project. This constitutes a mitigation hierarchy where the first three categories focus on ameliorating the impacts of a project and compensation refers to the creation of new values that are equal or similar to the values lost (Larsen et al., 2018).

However, mitigation measures often do not give any indication of their potential effectiveness in ameliorating significant impacts (Tinker et al., 2005). Furthermore, impact prediction and

significance determinations remain highly complex, contentious and misunderstood elements of an IA and are plagued by uncertainties (Tennøy et al., 2006; Wood, 2008; Leung et al., 2016). Uncertainties in IA are especially pronounced in Arctic environments where baseline data are often limited and the impacts of climate change are rapid and often unpredictable (Arctic Council, 2016). Given such uncertainties, Wood (2008) cautions that IA is often used as "advocacy exercises that are inherently vulnerable to communicative distortion" by those who control the interpretation of information and analyses. The result, according to Leung et al. (2016), can be a

> … communicative disconnect between the information that is presented (or omitted) in EA, and the expectations about, and perceptions and use (or neglect) of, this information; or when the neglect of uncertainties leads to unreliable impact predictions or ineffective mitigation measures.

Of course, not all types of uncertainty in IA can be addressed through more information; some must be addressed through adaptive management plans (Leung et al., 2016). However, an engaged IA process, rather than one based solely on the information provision model, can enable those with an interest or stake in the process to have a greater share in ensuring the quality and success of the IA process (Partidario & Sheate, 2013; Leung et al., 2016).

2.4 Gaps in meeting stakeholders needs

The discontent with the information provision model of IA is directly related to challenges with engagement and community consultation. Engaging communities has been a source of many practical challenges to IA (Morgan, 2012). As communities and ecosystems experience increased pressures from resource development, there are growing demands for a more efficient and effective IA process (Sinclair et al., 2008; Morgan, 2012; Noble & Hanna, 2015). The growing requirements and expectations surrounding engagement at each phase of IA, coupled with an increasing number of IA applications for development in the North, leads to growing concerns about the capacity of northern communities to be meaningfully engaged in assessments (Noble et al., 2013). For example, Fidler and Noble (2013) found capacity and resources as constraints to meaningful participation in marine planning and assessments in Canada's western Arctic. Similarly, McCrank (2008) identified limited institutional and human resource capacity of Indigenous organizations as a hindrance to their ability to participate in the IA process. These challenges can hinder the ability of impacted Indigenous communities to document and interpret

Indigenous knowledge to support decision-making. Udofia et al. (2016) identify community and proponent knowledge about baseline conditions and uncertainties about regulatory processes as major obstacles to both effective IA and meaningful engagement.

In the European context, Tedsen et al. (2014) undertook a gap analysis to understand the information and communication gaps present in Arctic strategic assessments by the European Union. They define 'information gaps' in two ways: a lack of existing knowledge to fill a user's need or insufficient knowledge exchange between producers and users. The failures to convey existing information are considered 'communication gaps.' The report found that a lack of knowledge and understanding of changes in the Arctic are major contributors to information gaps; this included the impacts of resource extraction, marine transport, land use, monitoring efforts, and baseline studies. Communication gaps were generally the result of inefficiencies or confusion in gathering information from multiple sources, failures to communicate between stakeholders or governments, and a perceived lack of understanding about the Arctic and its people. Specific to marine shipping, Tedsen et al. (2014) found a communication gap concerning the preparedness for Arctic shipping in terms of training on navigation, safety, search and rescue, and other operations for polar conditions. While the report provides insights into the information needs of stakeholders in the European Arctic, its recommendations for closing gaps are higher level network-based solutions that do not necessarily provide practical steps for communities, regulators or proponents.

2.5 Knowledge Brokerage

Attention to the processes through which knowledge is exchanged is fundamental in understanding effective environmental management. Knowledge exchange refers to "processes that generate, share and/or use knowledge through various methods appropriate to the context, purpose, and participants involved" (Fazey et al., 2013). Knowledge exchange is related to the substantive outcomes of IA: the co-production of knowledge, social and organizational learning, and the brokerage of knowledge. Saarela et al. (2015) define knowledge brokerage as a "process of communication and interaction aiming for knowledge exchange and learning between parties with different knowledge bases."

One outcome of knowledge brokerage is learning, or the process of identifying and addressing errors. Learning occurs when intentions match outcomes, or when intentions and outcomes do

not align, and can result in fixing routine errors (single loop) or by correcting errors by adjusting values and changing underlying strategies (double loop) (Diduck et al., 2005). Learning can occur at the individual, social and organizational levels. Individual learning underpins the basis of IA through knowledge exchange, whether it is technical, traditional, local or Indigenous. Social learning occurs once individuals have committed what they have learned into memory, and organizational learning occurs in the context of IA when key actors (such as proponents, consultants, regulators, and agencies) embed lessons in an organization's memory and structure (Sánchez & Mitchell, 2017). In order for the knowledge that is exchanged in IA to be used beyond the immediate project, longer-term benefits of knowledge creation and exchange need to be established in order to ensure learning is sustained (Partidario & Sheate, 2013).

Linking knowledge brokerage to the purpose and theory of IA, the information provision model treats knowledge as an inert form where 'facts' are 'transferred' through traditional processes. Viewing knowledge as a more complex, iterative process of reflection, learning, making implicit knowledge explicit, and internalizing the results of sharing tends to lead to approaches that emphasize the co-production of knowledge and more adaptive forms of management (Sheate & Partidário, 2010; Armitage et al., 2011). This is especially important in the context of rapid social and ecological change, and the complexity of Arctic systems (Armitage et al., 2009). Additionally, for the communication of information to be successful, there must be not only the transfer of data, but also a transfer of meaning (Tedsen et al., 2014). This is especially important when contemplating the use of Indigenous knowledge in environmental management (Stevenson, 2006). The context in which knowledge brokerage takes place is important, including attention to factors such as political and social dynamics, power relations, actor's roles, and the predictability of processes (Saarela et al., 2015).

Applying knowledge exchange processes in the Canadian Arctic presents both challenges and opportunities. The capacity challenges noted above can constrain intentions or expectations about knowledge exchange in northern regulatory systems. Other challenges include the high turnover of staff as well as the remoteness of communities (McCrank, 2008). On the other hand, IA in the Canadian Arctic is better integrated into regional development planning when compared to IA in Canada's south (Noble & Hanna, 2015). The collaboration and integration of various institutions of public governance and co-management boards has the potential to alleviate the capacity issues these organizations face (Barry et al., 2016). Additionally, northern

regulatory systems are often mandated to include traditional or Indigenous knowledge into planning and management processes due to comprehensive land claims (White, 2006; Armitage et al., 2011; Gondor, 2016). Land claims also ensure that a wide range of stakeholder groups are involved in decision-making processes. For example, IA in Nunavut involves community members, rights holders and organizations created under the land claims, regulatory agencies, municipal, territorial and federal governments, non-governmental organizations as well as proponents. Each of these entities hold different knowledge bases that can be exchanged or brokered in order to support decision-making.

2.6 Research Gap

Knowledge brokerage has been examined within healthcare or in policy areas like climate change adaptation (Canadian Health Services Research Foundation, 2003; Dilling & Lemos, 2011; Kalafatis, Lemos, Lo, & Frank, 2015), but few have applied it to IA (Sheate & Partidario, 2010; Partidario & Sheate, 2013; Saarela et al., 2015). Learning in IA is an area that has received more attention, with literature focusing on social and organization learning both through IA and in IA (Fitzpatrick, 2006; Sinclair et al., 2008; Sánchez & Morrison-Saunders, 2011; Sánchez & Mitchell, 2017). Within the IA literatures on both knowledge brokerage and learning, the question is often raised whether knowledge brokerage and learning are explicitly designed into assessment processes as desired outcomes or whether they are incidental. In the knowledge brokerage literature, this question has been explored at the strategic level, for policy assessment, but not at the project level – where the majority of IA applications occur.

In addition to a focus on knowledge brokerage at the policy level, case studies within the literature have predominately been based in Europe. However, the co-managed IA processes created through comprehensive land claims across the Canadian Arctic potentially offer a starting point where many of the criteria for knowledge brokerage to take place, such as a range of stakeholders engaged in decision-making or a willingness to use different types of knowledge (Partidario & Sheate, 2013), are already enabled through comprehensive land claims. And as project-based IA is still the dominate form of IA practice in the Canadian Arctic (Noble & Hanna, 2015), it provides an opportunity to examine whether knowledge brokerage is enabled to encourage a learning-oriented process at the project level. Nunavut's process in particular provides a unique opportunity, especially as it relates to shipping: the marine environment is

defined as 'land' under the *Nunavut Agreement* (1993) and a large portion of the NORDREG Zone is within the Nunavut Settlement Area (see **Figure 2.1),** and Nunavut has seen marine traffic double within the last 25 years (Dawson, Copland et al., 2017). The process in Nunavut is also less explored in the IA literature when compared to other jurisdictions in Canada and the Arctic.

While there is a vast literature on shipping in the Canadian Arctic from many perspectives, there is a gap in an IA approach to Arctic shipping. Literature exists on, for example, the many hazards of Arctic operations (Council of Canadian Academies, 2016; Mussells, Dawson, & Howell, 2017), its potential impacts (Halliday et al., 2017; Gong et al., 2018; McWhinnie et al., 2018), on the implications of climate change (Ho, 2010; Pizzolato et al., 2016; Ng et al., 2018), and on different governance approaches adopted by Arctic states (Chircop, 2009; Buixadé Farré et al., 2014; Guy & Lasserre, 2016). Cruise tourism in the Canadian Arctic has received much more attention in the literature when compared to other vessel types (Lasserre & Têtu, 2015; Stewart et al., 2015; Dawson, Johnston, & Stewart, 2017; Johnston, Dawson, & Maher, 2017). However, very little research examines the regulatory processes where decisions about Arctic shipping are made.

In the Arctic, many challenges to IA effectiveness and efficiency are related to marine issues: community capacities and complex information needs, the workloads of community organizations and regulatory agencies, the complexity of project and cumulative effects, and baseline data gaps are key challenges in ensuring effective and efficient project assessments. Examining the IA process may provide insight to how Arctic shipping is regulated, its impacts, and how impacts are managed. Concerns over marine resources and environments can dominate the regulatory process given the active use of marine areas for travel, culture, and economic development. Public unfamiliarity with the complexity of marine operations and regulations can add time and potentially increase information requests, but the required information about impacts and mitigation can often be recurrent. While the chronic information needs and communication gaps experienced by stakeholders and policymakers has been explored in the European context (Tedsen et al., 2014), no similar study has been conducted in the Canadian Arctic. Arctic regulatory systems are tasked with balancing an increasing interest in marine development with the wellbeing of coastal communities and ecological integrity. IA in the

Canadian Arctic provides an interesting context to explore how knowledge brokerage may take place to support decision-making in project level assessments.

Chapter 3 Research Methods

This research employed qualitative methods for data collection and analysis. The project was designed in collaboration with the Nunavut Impact Review Board (NIRB), the University of Saskatchewan, and the University of British Columbia to address the needs of the NIRB related to marine shipping assessments.

3.1 Study area

The area of study is the Nunavut Settlement Area (NSA) within Inuit Nunangat, the Inuit-preferred name of the geographic, political, and cultural region that encapsulates the Inuit Homeland (Inuit Tapiriit Kanatami, 2018). Nunavut is a unique region of Canada: the 1993 *Nunavut Land Claims Agreement* (NLCA) established the territory as an experiment in devolution of authority to its Inuit inhabitants (Government of Canada and Tunngavik Federation of Nunavut, 1993). This trajectory, from land claims to the creation of a new territory and new governance system, makes Nunavut's regulatory environment unique: the institutions of public governance (IPGs) are mandated through land claims, which promote and protect the rights and interests of Nunavummiut (or the people of Nunavut), where 85% of the population is Inuit (Statistics Canada, 2017). Comprehensive land claims across Inuit Nunangat establish governance arrangements between the Government of Canada and Inuit in areas such as self-government powers, control over social services like education and health, compensation payments, IA, land use, and the management of lands and resources (Berkes et al., 2007).

The NIRB is responsible for conducting IA of project proposals. Its function is to "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]" (Government of Canada and Tunngavik Federation of Nunavut, 1993). The NIRB has nine seats, one of which is the chairperson: four members and the chair are appointed by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) based on nominations by Nunavut Tunngavik Incorporated and Designated Inuit Organizations; two members are selected by the Government of Canada; and two members by the Government of Nunavut. Although not a formal requirement under the *Nunavut Agreement*, the board has primarily been comprised of Inuit. Where exceptions have been made, it has been for board members who have been long-time northern residents or have extensive

experience working in Nunavut or in IA, such as the previous legal counsel for the NIRB. The composition of the board contributes to the NIRB's understanding of issues affecting communities, particularly as many board members are native Inuktut speakers and live in communities in each region of Nunavut. Inuktut is the term used by the Government of Nunavut to refer to all of the Inuit dialects spoken across Nunavut, the most common being Inuktitut and Inuinnaqtun (Inuktut Tusaalanga, n.d.).

The NIRB is responsible for projects within the NSA and the outer land-fast ice zones on the east coast of Baffin Island (**Figure 3.2**). Importantly, 'land' includes freshwater and marine areas within the NSA under Article 3 of the *Nunavut Agreement*. The NSA consists of three regions – the Kitikmeot, Kivalliq, and Qikiqtani regions – each with distinct environments, wildlife, and geography resulting in subtle differences in culture, diet and hunting techniques as well as dialects.[3]

[3] Qikiqtani (Inuinnaqtun) is sometimes referred to as Qikiqtaaluk (Inuktitut) as well as Baffin Region. For example, the Inuit regional development corporation is the Qikiqtaaluk Corporation while the regional Inuit association is the Qikiqtani Inuit Association. The map below (Figure 3.2) uses Qikiqtaaluk; however, this thesis uses Qikiqtani, as this was the preferred term used by the NIRB during fieldwork.

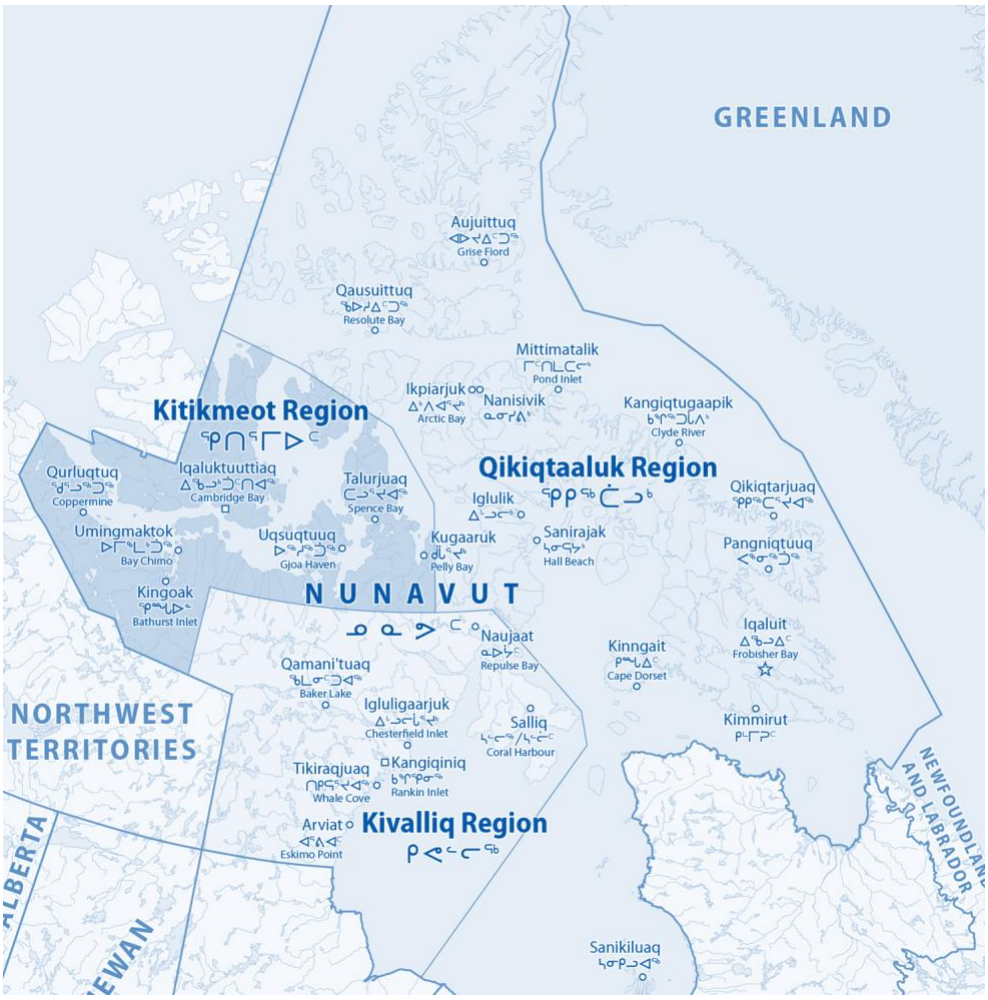

Figure 3.2 Nunavut Settlement and Marine Area.[4]

The NIRB is also a member of the Nunavut Marine Council (NMC), an organization that exists to advise and make recommendations to other agencies regarding marine areas. The MNC is made up of four IPGs: the NIRB, the Nunavut Planning Commission, the Nunavut Water Board, and the Nunavut Wildlife Management Board. However, the Council is under-utilized and under-funded but has the potential to contribute to the integrated management of marine areas (Barry et al., 2016).

While the *Nunavut Agreement* provided guidance for the initial years of operation and institutional development, the *Nunavut Project Planning and Assessment Act* (NuPPAA) (Government of Canada and Tunngavik Federation of Nunavut, 2013) entered into force in 2015

[4] Map source: Dorrbecker, *Wikipedia,* n.d..

which furthered the 'one-window approach' to land and resource management envisioned under the *Nunavut Agreement*. This approach established an integrated resource management system for wildlife management, land use planning, IA, water licensing, and dispute resolution (NIRB, 2018d). Under *NuPPAA*, project applications are received by the Nunavut Planning Commission (NPC) where projects are assessed for their compliance with regional land use plans. Currently, only two regions have approved plans (Barry et al., 2016).

If the NIRB receives a referral from the NPC or other responsible authority (such as Parks Canada), the application is screened to determine if a review is required. If a review is undertaken, the NIRB makes a recommendation whether or not projects should proceed, and if so, under what terms and conditions. The decision is ultimately made by federal ministers, most often a Minister within CIRNAC. Historically, the Minister has followed NIRB's recommendations for approval or rejection, with a recent exception of a production increase for Baffinland's Mary River iron ore mine (Frizzell, 2018).

Following project approval and licensing, the NIRB plays a unique role in monitoring. Under section 12.7 of the *Nunavut Agreement*, NIRB is empowered to establish project monitoring programs in order to measure project effects on ecosystemic and socioeconomic components within the NSA, to ensure operations are in compliance with the terms and conditions of the project license, and to assess the accuracy of the impact predictions made in the IA. Two types of monitoring can be established through the NIRB's monitoring program: effects monitoring (a process of measuring and interpreting changes to environmental and socioeconomic parameters to identify project effects and to test impact predictions) and compliance monitoring (a process of determining if the land or resource use in question meet regulatory compliance) (NIRB, 2018d). While the ultimate responsibility for monitoring is primarily the Proponent's responsibility, both effects and compliance monitoring can be considered shared responsibilities among the Proponent and regulators. Similar monitoring requirements may exist with responsible authorities (i.e., as part of DFO's fisheries authorizations), but NIRB's monitoring program is meant to coordinate monitoring activities and set the specifics of programs, rather than duplicate efforts. If there is an area where no regulatory instrument is in place to capture monitoring requirements, NIRB assumes the responsibility of ensuring project-specific monitoring takes place (Barry et al., 2016). Project certificates specify responsibilities for the NIRB, the proponent, and responsible authorities; while the ultimate responsibility for carrying

out monitoring lies with proponents, it is a shared responsibility with responsible authorities with specific jurisdiction or expertise in specific areas (NIRB, 2018d). Proponents are required to submit an annual report to the NIRB once pre-construction commences until the post-closure phase. These reports generally include a summary of community consultations or where IQ was engaged. In response to unanticipated project effects, unexpected monitoring results, or management actions that are not as effective as anticipated, the NIRB has the ability to reconsider mitigation measures, monitoring programs, and even existing project certificate terms and conditions to address these issues. The NIRB also ensures that the information generated from project-specific monitoring is publicly available, both on the Public Registry as well as through proponent-maintained websites.

Whether at the screening, review or follow-up stage, intervenors in NIRB's process include federal and territorial responsible authorities, organizations and individuals representing Inuit or communities, and non-governmental or transboundary groups (**Figure 3.3**).

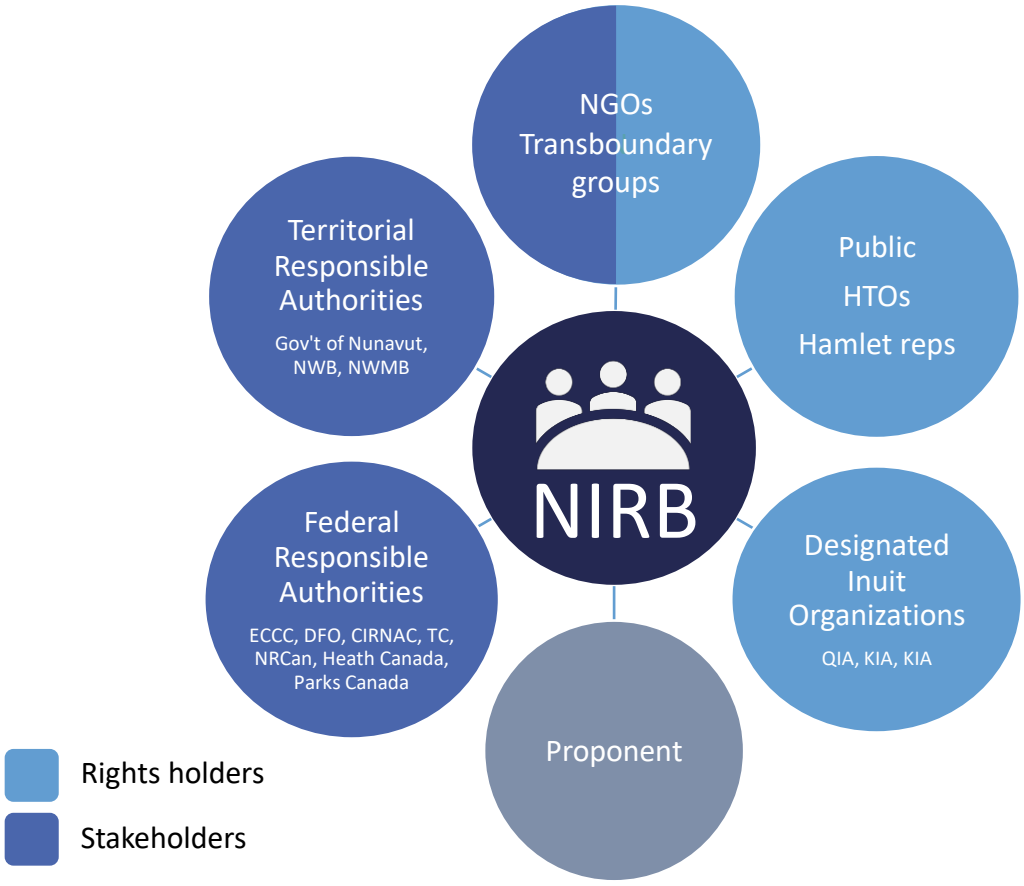

Figure 3.3 Rights holders and stakeholders involved in NIRB's processes.

As part of an integrated system, the NIRB's review process is meant to support the regulatory processes of Authorizing Agencies who are responsible for issuing licenses, permits, approvals, leases, and so on. While in many jurisdictions this is often limited to government agencies, in Nunavut this includes Designated Inuit Organizations who may exercise authority as landowners, permit issuers, and negotiators of Inuit Impact Benefit Agreements. At the territorial level, the Government of Nunavut regularly participates in various capacities depending on the scope of the project. At the federal level, agencies with a mandate covering a specific aspect of projects are regular intervenors. In terms of projects with a marine component, these responsible authorities include CIRNAC, the Department of Fisheries and Oceans (DFO), Environment Canada (EC), Transport Canada (TC), and Natural Resources Canada (NRCan). More recently, Health Canada has been able to participate in reviews; although they do not perform a role in licensing, their expertise in health is welcomed. Parks Canada may participate in assessments that seek access to a National Park or transit through a Marine Protected Area. A major challenge for NIRBs effectiveness in decision-making is having the right representation from responsible authorities present for meetings, as most federal agencies are not based in Inuit Nunangat.

At the community-level, individual members of the public, community organizations like heritage societies, Hamlet representatives, and Hunter and Trapper Organizations (HTOs) are involved in various capacities representing the views and interests of Nunavummiut. Rights holders specifically refer to beneficiaries under the *Nunavut Agreement*. Where applicable, rights holders can include transboundary groups outside of Nunavut who are beneficiaries of their own land claims and subject to potential project impacts, such the Makivik Corporation that represents the Inuit of Nunavik. NIRB's process aims to create opportunities for meaningful public engagement at multiple stages, and importantly, to enable the consideration of Inuit Qaujimajatuqangit, Inuit Qaujimaningit (collectively IQ), and local and traditional knowledge (TK). The NIRB uses IQ alongside the scientific methods to make decisions.

IQ can refer to two aspects of Inuit knowledge systems, but the acronym is often used interchangeably: "Inuit Qaujimajatuqangit refers to Inuit 'Traditional Knowledge' while Inuit Qaujimaningit refers to Inuit [TK] as well as Inuit epistemology without reference to temporality" (NIRB, n.d.). IQ encompasses a body of knowledge, worldviews, experiences and values rooted in the daily life of the Inuit across Inuit Nunangat beyond a narrow conception of

TK (Barry et al., 2016). IQ offers a set of laws, beliefs and values that serve as guides and expectations about "how to live a good life" (Karetak & Tester, 2017). IQ, like Indigenous knowledge, is not homogenous with differences in detail across Inuit Nunangat. Herein lies the advantage of maintaining representation from each region within Nunavut as board members of the NIRB.

The importance placed on IQ throughout Nunavut cannot be overstated: the very creation of the territory is an ongoing attempt to integrate IQ into the workings of a modern governance system. The NIRB uses the guiding principles of IQ developed by the Government of Nunavut (n.d.):

- *Inuuqatigiitsiarniq*: respecting others, relationships and caring for people;
- *Pijitsirniq*: serving and providing for family and/or community;
- *Pilimmaksarniq/ Pijariuqsarniq*: development of skills through observation, mentoring, practice, and effort;
- *Piliriqatigiinniq/ Ikajuqtigiinniq*: working together for a common cause;
- *Tunnganarniq*: fostering good spirits by being open, welcoming and inclusive;
- *Aajiiqatigiinniq*: decision making through discussion and consensus;
- *Qanuqtuurniq*: being innovative and resourceful; and
- *Avatittinnik Kamatsiarniq*: respect and care for the land, animals and the environment.

In IA, proponents are required to demonstrate their use of IQ, what knowledge was gained and how, and how this was applied to the project to identify potential environmental and socioeconomic effects, cumulative effects, mitigation measures and potential residual impacts. Furthermore, routine public consultations are not to be used as a substitute for the design of appropriate studies and IQ data collection (NIRB, 2018d).

3.1.1 Shipping trends in Nunavut

Nunavut is highly dependent upon marine resources and transportation; of the 25 communities within the territory, all but one (Baker Lake) are coastal, and all are connected by air and sea (Dawson, Copland et al., 2017). Since the 1990s, most communities have experienced an increase in shipping activity, with the communities of Pond Inlet, Baker Lake, Cambridge Bay, and Chesterfield Inlet experiencing the largest increase (Dawson et al., 2018). **Figure 3.4** illustrates the increase in total annual kilometres traveled by vessel types in the Nunavut Marine Area, with total traffic doubling within 25 years, increasing from 345,567 kilometres in 1990 to 793,684 kilometres in 2015 (Dawson, Copland et al., 2017).

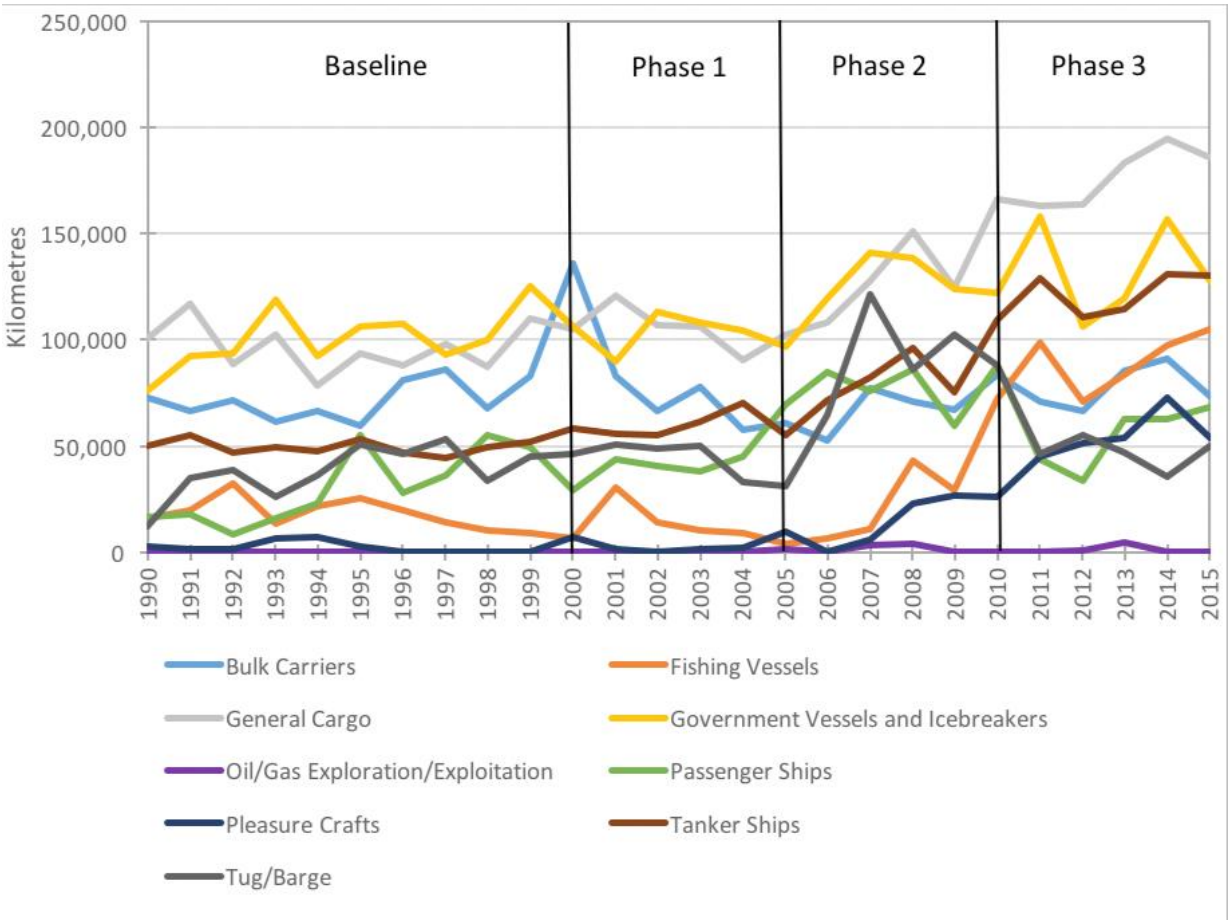

Figure 3.4 Total annual kilometres travelled in the Nunavut marine area, by vessel type, from 1990 to 2015.[5]

Since 1990, the average traffic volume has consistently increased, with variation from year to year. General cargo (community or industry resupply), research vessels, and government icebreakers travelled the greatest number of kilometres year over year. Between 2005 and 2015, tankers, fishing vessels, and pleasure crafts (private yachts) have seen an increase, while passenger vessels (cruise ships) have had more variation year to year. Spatially, the intensity of traffic has seen an increase along the southern route of the Northwest Passage, through Hudson Strait towards Baker Lake, and along the east coast of Baffin Island (Dawson, Copland et al., 2017)

Over the past decade, shipping in Nunavut has increased due to exploration and extraction of natural resources, an increase in cargo transport, a rise in fishing and tourism industries, and an

[5] Source: Dawson et al., 2018 and Dawson, Copland et al., 2017.

increasing demand for community re-supply needs (Dawson, Copland et al., 2017). Minerals, metals and petroleum, furs and fish resources, tourist destinations, and culture are potential sources of economic development for Nunavut; however, infrastructure has been a major obstacle for development (Government of Nunavut, 2008). Although not unique to Nunavut's marine area, shipping in the Arctic comes with its own set of unique challenges: the seasonality of routes; the presence of ice hazards; climate variability; requirements for specific equipment; the availability of navigational and bathymetric data; and the availability of and proximity to emergency response capabilities (Council of Canadian Academies, 2016; Guy & Lasserre, 2016).

In terms of making decisions related to shipping, while the NIRB's mandate includes marine areas, shipping activities typically do not trigger the screening process unless they include a land-based activity that requires authorization (Barry et al., 2016). For example, land-based activities with shipping components include shipping associated with mines (ranging from the resupply of cargo and fuel to the shipping of ore). Project applications for cruise ships, research vessels, or private yachts are only referred to the NIRB by the Nunavut Planning Commission or Parks Canada if they request access to National Parks or transit through a Marine Protected Area. Given the challenges of Arctic shipping and the increase in traffic, there is public concern over managing and monitoring the environmental, social, economic, and cultural impacts of shipping.

3.2 Data collection

Tedsen et al. (2014) define 'information gaps' in two ways: a lack of existing knowledge to fill a user's need, or insufficient knowledge exchange between producers and users. The failures to convey existing information are considered 'communication gaps.' The second type of gap, insufficient exchange, is the focus of this research. Information needs about shipping can thus be characterized in two ways: first, identifying the routine topics surrounding shipping that are of concern to rights holders and stakeholders (for example, marine mammals), which is the focus of this research; second, information needs identified through gaps in marine baseline data (for example, the hearing frequencies of arctic marine mammals), which is the focus of the larger project led by the University of British Columbia Center for Environmental Assessment Research.

This research used two qualitative methods to explore how knowledge about Arctic shipping impacts and mitigation are brokered in IA processes: a document review and focus groups. Each are discussed below, followed by an explanation of how the data analysis was conducted.

3.2.1 Document review

Document reviews provide a systematic method to identify the core elements of written communication by categorizing and classifying a cross-section of data through content analysis (Curry et al., 2009). It is a method often employed by IA scholars: Sinclair and Diduck (2001) used a document review to understand how participants learn in the EA process; Noble and Hanna (2015) undertook a review of government research and policy documents in their gap analysis of EA in eight Arctic nations. As an iterative process, document analysis combines elements of content analysis (organizing information into categories related to the central research questions) with thematic analysis (the recognition of emergent themes) (Bowen, 2009).

The first phase of data collection involved a review of IA documents available through the NIRB's Public Registry where all records from past and ongoing assessments are publicly available. The purpose of the document review was to determine which Arctic shipping impacts and mitigation measures are routinely raised, what are the information needs of rights holders and stakeholders surrounding shipping, and how the comments are addressed through the decision-making process. From the Public Registry, 12 projects were selected based on their interaction with the marine environment, in some capacity, which included seven mining developments, one infrastructure project, and four cruise tourism applications (**Table 3.2**). Six of the projects (all mining) underwent a full IA review, while the other 6 underwent a more streamlined screening process. For projects that underwent screening only, the Screening Decision Report (SDR) as well as any relevant supporting documents in the project's application were reviewed.

Table 3.2 Projects and documents selected for the document review.

Project Name NIRB Ref #	Project Type	Region	Status	Marine Component	Documents Selected
Mary River 08MN053	Iron mine	Qikiqtani (North Baffin)	Active Monitoring Project Cert. 005 issued 2012-12-28	Original application: Milne Port north of the mine site, and Steensby Port south of the mine site with year-round shipping of ore with icebreaking vessels.	Final EIS: - Vol 4: Human Environment - Vol 8: Marine Environment - Vol 9: Cumulative Effects - App 10D: Shipping Management Plan (SMP) Technical Comments Final Hearing Report
Early Revenue Phase (ERP)			ERP Amendment 2014-05-28	Phase development application: seasonal shipping of ore at Milne Port as part of Phase 1 of ERP.	Final EIS Addendum (FEIS-A) - Vol 8: Marine Environment Final EIS-A Public Hearing Report
Kiggavik 09MN003	Uranium mine	Kivalliq	Not approved after review 2017-03-08	Dock facilities in Baker Lake (new). Marine shipping of fuel and dry cargo during open water season.	Final EIS: - Vol 2-2J: Marine Transportation - Vol 7: Marine Environment - Vol 9: Socioeconomic Environment - Vol 10: Accidents, Malfunctions, and Effects on the Environment Technical Comments Public Hearing Report
Meliadine 11MN034	Gold mine	Kivalliq	Active Monitoring Project Cert. 006 issued 2015-02-26	Port facilities in Melvin Bay near Rankin Inlet (existing). Marine shipping of fuel and dry cargo during open water season.	Final EIS: - Vol 8: Marine Environment - Vol 9: Socioeconomic Environment - SD 8-1: SMP Technical Comments Public Hearing Report
Meadowbank/ Vault Pit 03MN107 Whale Tail Pit and Haul Road 16MN056	Gold mine Pit expansions	Kivalliq	Active Monitoring Project Cert. 004 issued 2006-12-28 Amend. 2016-08-12 Project Cert. 008 issued 2018-03-15	Dock facilities in Baker Lake (existing). Marine shipping of fuel and dry cargo during open water season.	Final EIS: Fish Habitat Final EIS-A - App 3-A: Marine Environment Summary - App 8-D: Addendum Emergency Response Management Plans Technical Comments Public Hearing Report

Project Name NIRB Ref #	Project Type	Region	Status	Marine Component	Documents Selected
Back River Project 12MN036	Gold mine	Kitikmeot	Active Monitoring Project Cert. 007 issued 2017-12-19	Bathurst Inlet dock facilities (new). Marine shipping of fuel and dry cargo during open water season.	Final EIS: - Vol 7: Marine Environment - Vol 8: Human Environment - Vol 9: Effects and Accidents - Vol 10: SMP Technical Comments Public Hearing Report
Phase 2 Hope Bay 12MN001	Gold mine Expansion to Doris Mine (NIRB project certificate 003)	Kitikmeot	Active Monitoring Project Cert. 009 issued 2018-11-10	Roberts Bay dock facilities (existing and new). Marine shipping of fuel and dry cargo during open water season.	Final EIS: - Vol 5: Marine Environment - Vol 6: Human Environment - Vol 10: SMP Technical Comments Public Hearing Report
IZOK Corridor 12MN043	Base metal mine	Kitikmeot	Active Review (file effectively closed) Completed Screening 2012-12-14	Port facility at Grays Bay (new). Marine shipping of fuel, concentrate, and dry cargo during open water season.	Screening Decision Report - App A Comment Submissions Project Proposal: - Vol 1 Sec 7 Potential Environmental Effects - Vol 1 Sec 11 Accidents and Malfunctions
Iqaluit Deep Sea Port 17XN021	Infrastructure	Qikiqtani (South Baffin)	Completed Screening 2017-10-02	Deep sea wharf, small craft harbour, sealift cargo laydown area, and supporting infrastructure.	Screening Decision Report Project Application Technical Comments
Crystal Serenity 16TN039	Tourism	Transboundary, Kitikmeot, North Baffin	Completed Screening 2016-08-23	1 passenger vessel, 1 icebreaker Up to 2 helicopters, 15 zodiacs, 1 UAV Up to 1,670 people	Screening Decision Report Project Application Technical Comments
One Ocean Expeditions 12AN025	Tourism	Kitikmeot, North Baffin, South Baffin	Completed Screening 2017-07-28	1 passenger vessel Up to 100 people	Screening Decision Report Project Application Technical Comments
LE SOLEAL 2017 13AN028	Tourism	North Baffin, South Baffin	Completed Screening 2017-07-20	1 passenger vessel Up to 10 zodiacs Up to 403 people	Screening Decision Report Project Application Technical Comments
MS Silver 16TN052	Tourism	South Baffin	Completed Screening 2016-09-01	1 passenger vessel Up to 10 zodiacs Up to 263 people	Screening Decision Report Project Application Technical Comments

For projects that had undergone a full NIRB review, relevant chapters of the project final environmental impact statements (EIS) were reviewed. This included the marine environment volume, sections of the socioeconomic volume that dealt with the marine environment, and relevant appendices such as Shipping Management Plans and Spills, Accidents and Malfunctions reports. The EIS was mainly used to identify the routine impacts and mitigation measures of Arctic shipping. Technical comments on the draft EIS and Public or Final Hearing Reports (PHR and FHR respectively) were reviewed to identify the comments of rights holders and stakeholders. Projects that used FHR were requesting a new project certificate (such as Mary River), while PHR is used when a modification to an existing certificate undergoes a review (such as the application for an Early Revenue Phase of Mary River). The technical comments on the draft EIS were selected to cover comments made earlier in the regulatory process, while the FHR provided a summary of outstanding comments made by intervenors after the final EIS was submitted. The documents were downloaded through the Public Registry and then coded in NVivo 12.

3.2.2 Focus Groups

The second phase of data collection involved two focus groups held during a week-long, quarterly meeting of the NIRB in Cambridge Bay, Nunavut in July 2018. Focus groups are guided discussions among individuals who share a common characteristic central to the research topic (Curry et al., 2009). The strengths of focus groups in IA is the ability to generate a rich understanding of perceptions and experiences (Wascher, 2013). However, the main purpose of the focus groups was not to report on individual opinions of the NIRB's board and staff; instead the intention was to gain an institutional perspective on how the NIRB assesses shipping.

The focus groups, as part of a larger project with the University of British Columbia, were facilitated by a graduate supervisor and moderated by two graduate students. As a research team, we were able to introduce ourselves to the board and staff in the days leading up to the focus groups, giving us a chance to build a rapport with the NIRB. We attended a NIRB family BBQ, sat in on Board meetings, toured the new Canadian High Arctic Research Station together, and spent time on the land visiting Ovayok Territorial Park. Given the colonial legacy in Inuit Nunangat of researchers from the 'south' imposing research on northern communities, this was an important step (Inuit Tapiriit Kanatami, 2018). Furthermore, willingness to fully engage in a

group discussion in a focus group is instrumental in generating useful data (O.Nyumba et al., 2018). It also gave us the opportunity to attend the non-confidential portions of technical meetings, giving the team a greater chance to familiarize ourselves with the work of the NIRB and some of the challenges they face.

The first focus group was held with eight board members and the discussion lasted 2 hours. At the time fieldwork was conducted, this was the full representation of the NIRB with a ninth member appointed in October 2018. The second focus group was held with 10 members of the NIRB's staff, mainly from the technical and executive departments, and lasted 3 hours. The questions for each focus group were developed by the research team and in consultation with the NIRB (Appendix A). Each focus group was recorded with permission of the participants and was transcribed and coded in NVivo 12 to facilitate data analysis.

3.3 Data analysis

Initial coding of both IA documents and focus group transcripts used pre-defined topic codes to identify impacts, mitigation, and information needs, but also allowed for an exploratory approach to identify new codes, such as communication gaps or opportunities for better knowledge exchange. This functions to identify data for later retrieval and description, categorization, or reflection (Richards & Morse, 2013). This first round of coding was completed in NVivo 12.

Since qualitative analysis is highly subjective and influenced by the characteristics of the researcher and their disciplinary paradigms, critical reflection throughout the research process was important (Richards & Morse, 2013). In the first round of coding, impacts and mitigation were coded with a simplified approach based on the researcher's background in a non-technical discipline and the objectives of this research. From this standpoint, impacts can often be obscured within the details of baseline data and the sheer volume of information presented in an EIS. Therefore, impacts and mitigation were often coded from summary tables to identify the routine impacts and how these impacts are managed, rather than taking a more detailed or quantitative approach. For example, multiple pages of information and baseline data are presented in IA documents on the hearing capacity of a fish species and the projected underwater noise from construction activities like blasting or pile driving. However, the summary table would state 'hearing impairment' as a potential effect of dock construction along with mitigation

measures, without the specific projections from the acoustic model of fish interacting with the blasting events. While the summary tables provided a simplified effects statement, they did not necessarily contain enough information to include a deeper level of analysis, for example, the degree to which impacts were quantified or able to be verified through monitoring.

In the second round of coding, the impacts and mitigation that were coded were compiled in a spreadsheet matrix and organized by project name, project phase (construction, operation, decommissioning), project activity or pathway, the project effect, the valued component, and mitigation measures. The mitigation measures were categorized based on the mitigation hierarchy (Tinker et al., 2005): compliance-based, avoid, minimize, or compensate. The compensation of unavoidable negative impacts are often negotiated through Impact Benefit Agreements between proponents and affected communities, and thus not always a part of the public IA record. After the matrix was developed, the 'routine' impacts and mitigation measures were identified after duplicate codes were removed within the same project. An impact was considered routine if it was common across at least 3 projects.

Information needs were coded throughout the final EIS, in technical comments and written submissions, as well as in hearing reports. In this research, the definition of *information needs* was developed based on the language used by the NIRB when summarizing comments made by community members through its various consultation mechanisms. Information needs were identified when a rights holder or stakeholder expressed a concern, asked a question, identified an issue or made an information request in a written submission or in an oral comment transcribed in a public hearing report. No distinction was made in IA documentation as to whether community members were Inuit or *qallunaat* (non-Inuit), so the comments identified from community members were taken to represent the views of Nunavummiut generally.

After the initial round of coding, comments were re-coded using a spreadsheet matrix with an 'open coding' approach to identify the keywords that capture the crux of the comment. This type of analytic coding was used to identify emergent themes and to categorize data to pursue comparisons (Richards & Morse, 2013). In terms of what the keywords indicate, consider the example of polar bears. The Government of Nunavut commenting on polar bears in technical comments was coded the same as a comment expressed by community members in public meetings over polar bears in the sense that it indicates that polar bears are part of the information needs of an assessment process involving shipping. However, the analysis also sought to

understand what it is about polar bears that the Government of Nunavut or communities might be concerned about. For example, a comment from a community member may ask how community harvesting quotas will be affected if project activities result in polar bear mortality. Therefore, the keywords that were coded for that comment would have been 'polar bear', 'mortality', 'Inuit harvesting activities', and 'compensation.' Alternatively, a comment from the Government of Nunavut may identify baseline deficiencies in polar bear population structure, litter sizes and recruitment rates that limit the accuracy of impact predictions. In this case, 'polar bear', 'baseline data', and 'impact predictions' would have been coded. After coding was completed, a total of 196 keywords were compiled and sorted into 10 categories (full list in Appendix B):

- **IA process elements** including baseline data, cumulative effects, impact predictions, impact significance, mitigation, management plans and monitoring;
- **valued components** covering both ecological and socioeconomic components;
- **project design** details such as shipping season, shipping volume, operational flexibility, or phase development;
- **project activities** or operational details such as ballast water exchange or construction, and ship speed or lighting;
- **project effects** such as fuel spills, disturbance, or sedimentation;
- **specific management plans/actions** such as bubble curtains or fisheries offsetting;
- **technical topics** such as modelling and methodology;
- **regulatory**-based topics such as compliance or regulatory capacity;
- **community**-based topics such as engagement and communication; and lastly,
- a few **other** topics such as external trends outside of the IA process.

Comments from IA reviews and screenings were separated for analysis. For screening comments, keywords were analyzed for frequency based on project type: port, mine, and cruise tourism. For review comments, the keywords were analyzed for frequency across all review comments, by IA process elements, by the source of the comment, and by region.

The focus group data were coded in NVivo 12 to identify or validate themes that emerged in the document review. Based on the most frequent topics expressed in comments and the focus group discussions, several questions framed the analysis of the routine impacts of shipping and mitigation measures: i) how are concerns addressed through project design or specific mitigation

measures? and ii) how are adaptive management and best management practices (BMPs) used when there is uncertainty or gaps in scientific baseline data? Importantly, the focus group data illuminated how the NIRB makes decisions around shipping impacts and mitigation in project assessments.

3.4 Limitations

There are limitations with both the document review and focus groups. A primary limitation of this research was the amount of time spent in Nunavut. Working in the Inuit Nunangat inevitably comes with logistical or practical challenges, such as the remoteness of communities and the high cost of fieldwork. During the focus groups, the NIRB was able to comment on the roles of responsible authorities and communities in their process; however, engaging directly with communities and agencies could have provided valuable perspectives. Instead of directly consulting with rights holders and stakeholders, this research tapped into the wealth of comments and documents already available through the NIRB's Public Registry while the NIRB shared their institutional perspective on how needs are addressed in decision-making.

For the document review, the sample size of documents used is relatively small. For projects that underwent review, the six mining projects selected were those that have gone through a complete IA review by the NIRB (with the exception of the original Doris North project, now known as Hope Bay). For screenings, the Iqaluit port was the only completed screening for this type of application; the IZOK mining project was the only mining application stalled at the screening phase; and the four cruise tourism applications were selected based on a passenger capacity of at least 100 passengers and crew. These applications had more comments associated with each application than smaller vessels; therefore, bounding the selection of tourism applications was necessary to ensure consistency in the availability of documents to review.

A limitation of the document review was the highly subjective nature of qualitative data collection and analysis. For the information needs portion, coding the comments in smaller codes by breaking up statements could have potentially provided greater detail on the topics most frequently raised in comment. However, results show that information needs are complex, and topics are linked or nested in one another. For the routine impacts and mitigation measures, given a background in a non-technical discipline, impacts and mitigation were narrowly coded to identify those that are routine. A more detailed or technical approach could have included coding

how impact predictions were presented and the extent to which they are verifiable and quantified. Additionally, the calculations of the frequency of topics in comments was done manually in excel with the potential for human error. However, these errors would not likely change the outcomes of the research.

3.5 Ethical Considerations

A research license was granted by the Nunavut Research Institute. This research was exempt from requiring ethics approval through the University of Saskatchewan Research Ethics Board, given the low risk of participation and that the focus of the research was not on personal opinions or to collect IQ, but rather to gain an institutional perspective on the IA process, and to validate or supplement information reported in the public IA record.

Chapter 4 Results

This chapter presents results from the document review of past IA reviews and screenings, and two focus groups. The document review is presented in two sections: the first identifies the routine impacts and mitigation measures of Arctic shipping in Nunavut, while the second identifies the information needs of rights holders and stakeholders regarding shipping. Discussions from the focus groups inform the final section on how the NIRB exchanges knowledge in decision-making. Overall, the results show how knowledge is exchanged to support the decision-making process for the NIRB concerning marine shipping.

4.1 Routine shipping impacts and mitigation

After a project has been recommended for IA review, part of the scoping phase involves selecting valued components (VCs), both ecological (VECs) and socioeconomic (VSECs). Project activities are then assessed for their potential impact on these components. Impact predictions are made, mitigation measures are identified, and potential residual impacts are evaluated for their significance. These steps form the basis of decision-making on whether or not the project will proceed.

Across the six projects that underwent full IA review, the marine VECs were similar (**Table 4.3**) – namely marine water quality, marine fish and fish habitat, and marine mammals. Marine sediment quality and marine birds were assessed in five of the IAs, although birds were assessed as part of the terrestrial environment in Mary River; benthic invertebrates were selected in two IAs. Ringed seals were selected as a species across all assessments. Other species were included based on their presence in the local or regional study area; these included bearded seals, narwhals, beluga whales, bowhead whales, walrus, and polar bears. Sea ice was included as a VEC in Mary River, the only project that involved year-round shipping and icebreaking. For socioeconomic VCs, the language or terminology used varied across assessments but the common VSECs relevant to the marine environment included: country food, resources and land use, and Inuit harvesting activities and mobility.

Table 4.3 Marine-related valued ecological components assessed in NIRB reviews.

Region	Project	Valued Ecological Component							
		Sea Ice	Water Quality	Sediment Quality	Marine Mammals	Marine Fish Communities	Marine Fish/ Aquatic Habitat	Marine birds	Marine benthic invertebrates
Qikiqtani	Mary River	✓	✓	✓	✓	✓	✓	*	
Kitikmeot	Back River		✓	✓	✓	✓	✓	✓	
	Hope Bay		✓	✓	✓	✓	✓	✓	
Kivalliq	Kiggavik		✓	✓	✓	✓	✓	✓	✓
	Meliadine		✓		✓	✓	✓	✓	✓
	Original Meadowbank**					✓	✓	✓	

* Assessed as part of the terrestrial environment.
** Limited documentation available compared to more recent reviews.

A total of 625 potential impacts of shipping and 534 proposed mitigation measures were identified from the sample of IA documents selected for all twelve projects. After duplicates were removed and impacts were organized in a matrix with their corresponding mitigation measures, 454 potential impacts were identified. A total of 71 biophysical impacts were common to *at least three* projects and thus considered 'routine' impacts of project shipping associated with mines and port or dock infrastructure in the Nunavut Settlement Area (NSA), whereas there were only a few 'routine' impacts to the human environment. For cruise tourism operations that underwent an IA screening, a total of 10 potential impacts were identified.

4.1.1 Shipping Impacts

Results show several common, potential impacts of Arctic shipping and associated infrastructure for mining projects in the NSA across the sample of IA documents. Due to the inclusion criteria, at least three projects, the impacts do not include the specific effects or pathways of year-round shipping such as icebreaking or the large amounts of ballast water exchange required in the transport of ore as only one of the six projects (Mary River) involved this type of shipping. However, the unprecedented scale of Mary River, the effects of

icebreaking and the volume of ballast water were important topics discussed in comments from rights holders and stakeholders (Section 4.2).

4.1.1.1 Shipping Impacts – IA reviews

Biophysical Environment: **Table 4.4** shows the potential, routine biophysical impacts of Arctic shipping in the NSA along with the common mitigation measures for each impact or group of impacts. Mitigation is further discussed in Section 4.1.2. Typical project activities that were assessed included: construction activities for in-water and supporting infrastructure; project footprints including infrastructure and the shipping route; routine shipping activities such as ballast water exchange, fuel transfers, and discharges; site discharge and contact water; and accidents and malfunctions such as fuel spills and grounding events. Proponents were also required to consider transboundary effects where applicable, cumulative effects, and climate change in their impact statements.

Where VCs are grouped, such as water quality and sediment quality, some projects assessed these VCs together and some separately; however, if assessed separately, the impacts and mitigation measures were often the same for both components. Therefore, they are presented together in the table below. Where multiple effects are listed for a VC, these were counted individually rather than by project activity or causal factor yielding a total of 71 potential impacts.

Table 4.4 Potential biophysical impacts and common mitigation measures of Arctic shipping identified in IA reviews for mining projects in the Nunavut Settlement Area, by project activity or causal factor.

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
Anti-fouling coating of vessels hulls	(1) Increased concentrations of tributyltin (TBT) in marine water and sediment.	Water quality Sediment quality	*Compliance:* Canada Shipping Act; IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. Regulations prohibit the use of TBT and require the application of non-TBT or organotin chemicals in anti-fouling coatings on ships.
Ballast water exchange	(2) Localized increase in temperature and reduction in nutrient concentrations in water column. (3) Localized salinity guidelines exceedance during open water period.	Water quality Sediment quality	*Compliance:* Canada Shipping Act; Ballast Water Control and Management Regulations. *Avoidance*: projects with seasonal resupply do not discharge ballast water, but if there is an instance where exchange is required, any vessel must comply with the above regulations.
	(4) Changes in water and sediment quality, reducing benthic productivity with food chain effects. (5) Invasive species: potential for disease transmission, changes to native populations including abundance, and alterations to habitat.	Marine fish Marine fish habitat	
Discharge from ships: bilge, sewage, greywater	(6) Increase in biological oxygen demand. (7) Increase in concentrations of total suspended solids (TSS), nutrients and metals.	Water quality Sediment quality	*Compliance:* Arctic Waters Pollution Prevention Act; MARPOL Convention; Nunavut Guidelines for Burning and Incineration of Solid Waste (GN, 2012); Canada-wide Standards for Dioxins and Furans; Canada-wide Standards for Mercury Emissions. *Avoidance:* solid waste incinerated to standards or stored until disposal or recycled at home port; vessels fitted with sewage treatment plants and capacity for grey and black water requirements; hazardous waste (e.g. oil products) to be stored onboard until disposal at home port; oily bilge water to be retained for discharge at a licensed reception facility. *Minimization:* ship decks to be kept clean to prevent drainage from mixing with contaminants, and any collected water routed through an oil-water separator and monitored for oil concentrations prior to discharge.
	(8) Potential increase in metal and hydrocarbon concentrations in fish tissue and reduction in fish health due to altered water and sediment quality. (9) Increase in turbidity, resulting in habitat alteration.	Marine fish Marine fish habitat	

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
Site contact water (all phases): camp greywater, sewage, runoff, snowmelt, ore stockpiles, etc.	(10) Sediment resuspension (11) Changing pH from interaction with surficial material. (12) Contributing TSS to water column through erosion and disturbance. (13) Increase in metals concentrations from TSS and dissolution. (14) Increase in nutrients from vegetation removal and blasting residue during construction.	Water quality Sediment quality	*Avoidance:* minimize overall footprint of infrastructure; 30 m setbacks from the marine environment. *Minimization:* infrastructure located on appropriate base material; preservation of riparian zones to reduce flow velocities; slope texturing and grading; non-contact water and snow managed and diverted around infrastructure to natural drainage networks; permeable barriers and/or fibre rolls to reduce runoff velocities and retain sediment.
Dock/port/wharf construction *Activities*: may include piling, blasting, dredging, extraction, rock filling, and drilling	(15) Sediment suspension and redeposition. (16) Increase in TSS, nutrients and metals. (17) Introduction of ammonium nitrate from explosives. (18) Increase in hydrocarbon concentrations from the mechanical use of fuel, oil, and grease. (19) Disruption to natural sedimentation patterns could affect near-shore subsea permafrost.	Water quality Sediment quality	*Minimization:* silt curtains during blasting events; use of vibrating pile drivers to minimize tremor effects; building on competent bedrock or appropriate base material that will limit permeability and transport of potentially poor-quality water into the active layer; only geochemically suitable rock quarries used in construction.
	(20) Increased turbidity. (21) Direct loss or change in quality of fish habitat by harmful alteration, disruption or destruction (HADD).	Marine fish habitat	*Compliance:* HADD provisions under the Fisheries Act (prior to 2012); *Avoidance:* site location to avoid sensitive habitat; 30 m setbacks from the marine environment; reduce overall dock/port footprint; locating dock/port components out of water where possible; construction during open-water period to avoid sensitive periods for fish. *Minimization:* building on competent bedrock to avoid erosion; use of silt curtains during blasting events.
	(22) Underwater pressure and vibrations from blasting, resulting in direct fish mortality, injury or behavioural change in fish and/or fish eggs and larvae; changes to population abundance. (23) Fish avoidance. (24) Indirect effects through decreased health.	Marine fish	*Compliance:* DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat; DFO recommendations on 'Guidelines for the use of explosives in or near Canadian fisheries waters.' *Avoidance:* fish salvage to remove and avoid direct mortality of fish within worksite

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
			Minimization: as per guidelines, minimum setbacks based on habitat type; minimum overpressure threshold of 100 kPA with a recommended 50 kPA limit; critical timing windows; no explosives to be detonated that produce a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation; hydroacoustic monitoring during blasting events; established underwater noise thresholds to not be exceeded outside the isolated work area; if thresholds are exceeded, use of a noise attenuation device such as bubble curtain; use of vibratory pile instead of impact pile driving.
	(25) Disturbance effects such as subtle changes in behaviour. (26) Changes in habitat use (avoidance). (27) Hearing impairment and masking of environmental sounds, especially in enclosed areas such as port sites during construction. (28) Potential for direct mortality.	Marine mammals	*Compliance:* meeting 100 kPA overpressure limit. *Minimization:* similar to those for fish: timing of blasting events or drilling to avoid sensitive periods; monitor for mammals in the area of blasting area; bubble curtain system; discourage mammals from blast area with acoustic deterrent device; soft-start procedures; stop work when sound levels surpass thresholds for marine mammals outside of the 200 m exclusion zone.
Causal factor: dust deposition *Activities*: ship loading, vehicle traffic, airstrip activities, blasting, quarry operations, ore stockpiles, etc.	(29) Increase in TSS, nutrients, dissolved oxygen, hydrocarbons, and metals in water column and sediment.	Water quality Sediment quality	*Compliance:* dust suppressants applied in accordance with Nunavut Environmental Guidelines for Dust Suppression (GN, 2002). *Minimization:* use of water (summer months) or other non-toxic and biodegradable additives for dust control on the port/dock sites and access roads; speed limits for vehicles travelling on roads to reduce dust.
Project footprint: in-water structures and marine laydown area	(30) Direct loss or change in quality of fish habitat by harmful alteration, disruption or destruction (HADD). (31) Indirect effects through changes in benthic and foraging habitat.	Marine fish habitat	*Compliance:* HADD provisions under the Fisheries Act (prior to 2012); *Avoidance:* site location to avoid sensitive habitat; 30 m setbacks from the marine environment; reduce overall dock/port footprint; dock/port components located out of water where possible.

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
			Minimization: building on competent bedrock to avoid erosion; use of silt curtains during blasting events.
Project lighting (on vessels and infrastructure)	(32) May cause sensory disturbances altering the behaviour of marine birds. (33) Change in bird health or mortality due to collision with infrastructure or vessels.	Marine birds	*Minimize:* shield or angle lighting to minimize direct illumination and reflection of the sea; schedule activities during daylight hours when practical (for open-water shipping only, shipping takes place in summer months with extended daylight hours); selection of shipping route to avoid key marine habitat areas for migratory birds and bird sanctuaries where possible, as safe navigation allows; aggregations of marine birds to the extent possible.
Causal factor: airborne noise; vessel presence *Activity:* shipping	(34) Disturbance of open-water marine foraging and brood-rearing areas. (35) Disturbance during molting and staging periods (mid-July through early October) coincides when seasonal resupply is planned. (36) Functional habitat loss due to disturbance (birds may move upwards of a kilometre or more).	Marine birds	*Avoidance:* buffer from key migratory bird habitat sites (ranging from 2km-30km depending on the project); open-water shipping so project will not interact with marine birds using open water leads. *Minimization*: use of established shipping lanes; maintaining constant speed; maintaining the same course to the extent possible; avoid rapid accelerations; ocean-going vessels to anchor at deep water if necessary; where possible vessels shut down engines and propellers while anchored.
Causal factor: underwater noise; vessel presence *Activity:* shipping	(37) Anthropogenic noise, causing stress induced reduction in growth and reproductive output, and interference with critical functions such as acoustic communications, predator avoidance, and prey detection. (38) Area avoidance. (39) Habitat alteration.	Marine fish Marine fish habitat	*Avoidance:* vessels to maintain a buffer from sensitive habitat areas (ranging from 2km-30km depending on the project). *Minimization:* use of established shipping lanes; maintaining constant speed; maintaining the same course to the extent possible; speed restrictions in sensitive habitat areas or areas of restricted depth; avoid rapid accelerations; ocean-going vessels to anchor at deep water if necessary; where possible vessels will shut down engines and propellers while anchored.
Causal factor: underwater noise and airborne noise; vessel presence	(40) Alteration to marine mammal behaviour or health due to underwater noise; range from subtle changes at low received levels to strong	Marine mammals	*Avoidance:* for open-water shipping only, shipping season avoids periods where mammals are dependent on sea ice; vessels to maintain a minimum 2 km buffer from sensitive habitat areas.

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
Activity: shipping	effects of temporary/permanent hearing impairment at high received levels. (41) Disturbance due to food chain effects. (42) Habitat avoidance which may include disruptions to annual migration. (43) Masking of environmental sounds and in extreme cases can affect migration, reduced foraging efficiency, increased energy expenditure, and reduced fecundity and population health. (44) Cumulative effects causing longer term avoidance by mammals and habitat change.		*Minimization:* vessels not to approach within 300 m of walrus, polar bears, or ringed seals on sea ice, haulouts, or mammals engaged in feeding activities; reduce vessel speed as mammals approach within 100m and, if safe, detour to avoid mammals; vessels not to separate an individual member(s) of a group of marine mammals from other members; use of established shipping lanes; maintaining constant speed; maintaining the same course to the extent possible; speed restrictions in sensitive habitat areas or areas of restricted depth; avoid rapid accelerations; ocean-going vessels to anchor at deep water if necessary; where possible vessels will shut down engines and propellers while anchored.
Causal factor: propeller wash *Activity:* shipping	(45) Sediment suspension and redeposition. (46) Increase in TSS, nutrients, and metals in the water column. (47) Disruption to natural sedimentation patterns effect on near-shore subsea permafrost.	Water quality Sediment quality	*Minimization:* maintain a constant speed; reduce speed in areas of restricted depths; when possible, vessels to shutdown engines and propellers when anchored or tied to spud barge.
Causal factor: ship wake *Activity:* shipping	(48) Alter water and sediment quality through erosion from wave energy and deposition of sediments. (49) Increase in TSS, nutrients, and metals in water column. (50) Changes to intertidal habitat with potential changes in benthic productivity. (51) Disruption to natural sedimentation patterns, affect near-shore subsea permafrost.	Water quality Sediment quality	*Minimization:* maintain a constant speed; reduce speed in areas of restricted depths and when near sensitive habitat areas; 2 km buffer from shorebird habitat.
Causal factor: propeller wash and ship wake *Activity:* shipping	(52) Sediment suspension and redeposition causing habitat alteration (53) Altered seabed sediment composition and its effects on benthic biotic can alter fish habitat.	Marine fish habitat	*Minimization:* maintain a constant speed; reduce speed in areas of restricted depths.
Causal factor: ship strikes *Activity:* shipping	(54) Collisions with marine mammals may result in change in health or mortality.	Marine mammals	*Minimization:* maintain a constant speed and course; reduce speed in areas of restricted depths and in sensitive habitat areas; vessels not to approach within 300 m of walrus, polar bears, or ringed seals on sea ice, haulouts, or

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
			mammals engaged in feeding activities; vessels to reduce speed as mammals approach within 100 m and, if safe, detour to avoid mammals; vessels not to separate an individual member(s) of a group of marine mammals from other members.
Causal factor: accidental fuel spill, spill of dry cargo *Activity:* transportation, transfer, storage, handling, and use of fuels and other petroleum products; Lightering of cargo	(55) Spill of Arctic diesel or other petroleum products in the marine environment.	Water quality Sediment quality	*Compliance:* Canada Shipping Act; Arctic Waters Pollution Prevention Act; MARPOL Convention Protocols and Annexes by the IMO; Required to develop Spill Contingency Plan; Oil Pollution Prevention Plan; Shipboard Oil Pollution Emergency Plan. i.e. all fuel tankers must be double-hulled; ships equipped with duel back-up systems such as twin engine or radar, redundant navigational and communication systems; vessels must have plans and specifications approved by Transport Canada; use of standardized connections and piping systems that meet international standards; vessels are equipped with required navigation, safety, and communication equipment. *Avoidance:* shipping routes selected to avoid sensitive habitat areas and migratory bird sanctuaries. *Minimization:* shipping route selected to avoid sensitive habitat areas and migratory bird sanctuaries; speed restrictions, especially in areas of restricted depth; routine hazard identification and risk analysis addressing navigational safety; BMPs in refuelling and bulk fuel; i.e. secondary containment of bulk fuel storage areas; use of drip trays under transfer equipment; transfer equipment regularly inspected and maintained (with complete documentation).
	(56) Potential direct (change in health or mortality) or indirect effects (food chain effects) on wildlife: (57) Direct contact of oil/fuel on skin or coat, affecting thermoregulation abilities (i.e. seals, or polar bears) and cause inflammation and irritation; (58) Inhalation, resulting in inflammation of mucous membranes, pneumonia, and neurological damage; (59) Ingestion, resulting in toxicological effects, gastrointestinal inflammation, ulcers, bleeding, diarrhea, or maldigestion; (60) Oil, fouling the baleen of baleen whales, leading to reduced filtering/feeding efficiency; (61) Temporary displacement; (62) Reduced prey availability through prey displacement; (63) Contamination and/or loss of food sources causing contamination or mortality of fish and lower trophic organisms; i.e. fish species in shallower and nearshore areas (64) Coating of plumage by hydrocarbons resulting in loss of insulating properties as well as loss of buoyancy leading to hypothermia and potentially drowning events.	Marine wildlife	

Project Activity or Causal Factor	Potential Impact/Effect	Valued Component	Common Mitigation Measures, by Mitigation Type/Hierarchy
Cumulative effects	(65) Air emissions from vessels affecting air quality. (66) Change in health and mortality risk for marine wildlife due to collisions with vessels. (67) Change in behaviour of wildlife due to underwater noise from vessels. (68) Changes to water and sediment quality, resulting in change in habitat quality; direct effects like mortality or reduction in health for wildlife; indirect effects such as food chain effects; exposure to contaminants from interaction with project. (69) Change in health and mortality risk for marine wildlife due to potential exposure to fuel spills. (70) Surface noise from vessels causing sensory disturbance and energetic stress in marine birds. (71) Effects on marine wildlife combine to affect Inuit harvesting activities, harvesting culture, and quality of country foods.	Water quality Sediment quality Marine wildlife Inuit harvesting activities Country foods	Mitigation measures and management plans to address respective VCs.

Human Environment: Across the sample of IA documents reviewed, there were few impacts to the human environment that were considered 'routine' (common across at least 3 projects). The VCs related to the marine environment that were assessed ranged from marine resources such as country foods or materials for arts and crafts like soap stone; Inuit harvesting activities including hunting, fishing, and foraging; cultural resources such as archeological sites; travel; and land use. The social, cultural and economic impacts of shipping were more specific to the context of the local communities. One routine impact identified across IA reviews was the combination of effects to water and sediment quality, marine bird, fish and mammals affecting Inuit harvesting activities and harvesting culture. Biophysical effects can combine to ultimately affect the quality or abundance of harvested species. Project footprints can also cause the disturbance or removal of archeological sites, although pre-development surveys are carried out to identify sites while protocols and systematic data recovery are in place if previously unknown sites are discovered during development.

4.1.1.2 Shipping Impacts – tourism IA screenings

The potential impacts identified in IA screenings from cruise tourism were similar to the shipping operations of mines, although the level of detail contained in screenings was limited compared to IA reviews. Additionally, the level of detail in screening applications varied depending on the scale of the project. For example, Crystal Serenity was the largest tourism operation at 1,600 passengers and crew; this application contained much more detail in screening documents when compared to the 100-person One Ocean Expedition. Given the disparity in detail, the impacts of tourism screenings were gathered from the 'potential impacts' the NIRB considers in its Screening Decision Reports. The common mitigation measures were identified in the terms and conditions the NIRB issues when a project is approved. Out of the four projects, impacts and mitigation were considered routine if they appeared in at least three projects.

Results show 10 routine biophysical and social impacts and common mitigation measures of cruise tourism in the NSA sample of screening documents (**Table 4.5**). Similar impacts included potential negative impacts to marine wildlife from vessel presence and noise; negative effects to water quality from waste and discharges; emissions to the water from accidents and malfunctions; and the introduction of invasive species or the translocation of diseases. While the pathways of these effects were similar to shipping for mines, tourism introduces some new

pathways and effects through land-based excursions. This includes the use of zodiacs, helicopters, unmanned aerial vehicles, and land-based tourism activities. Identified effects included damage to the sea floor and biota from improper landing procedures, potential negative impacts to soil quality and terrestrial ecosystem integrity, and potential negative impacts to marine wildlife (for example, disturbance to nesting birds or hauled out seals and walrus). Many of the mitigation measures for the potential biophysical impacts of tourism were similar to those identified from IA reviews for mine-based shipping, which are discussed in the following section. Mitigation focused on compliance-based measures alongside best management practices related to the tourism industry, with both territorial and international best practices for Arctic marine-based tourism.

Table 4.5 Potential impacts and common mitigation measures of Arctic cruise tourism in IA screenings within the Nunavut Settlement Area.

Potential Impact	**Common Mitigation**
(1) Public concern over the scale of the activity and the cumulative effects of large-scale cruise tourism.	*Minimization:* Engage with local residents regarding planning activities in the area; Solicit available Inuit Qaujimaningit and information regarding current recreational and traditional use of areas; Positing of translated public notices.
(2) Positive impact through economic contributions.	*Minimization:* Sufficient notice for communities of the planned visits to encourage collaborative engagement of local services and goods providers; Hire local guides, to the extent possible.
(3) Impact to public and land use areas from vessel, helicopter and tourism activities, particularly in areas adjacent to the communities to be visited and areas of ecological sensitivity.	*Minimization:* Sufficient notice for communities of the planned visits; Engage with local residents; solicit available IQ and information regarding current and traditional land use; posting of translated public notices.
(4) Impacts to historical, cultural, and archeological sites as well as contemporary traditional use and hunting sites.	*Compliance:* Nunavut Act; terms of Archeological Permits issued by Nunavut's Department of Culture and Heritage. *Minimization:* Ensure that all passengers are aware of the Proponent's responsibilities for interaction with archaeological or palaeontological sites prior to conducting tourism activities; Ensure that affected communities and organizations are informed.

Potential Impact	Common Mitigation
(5) Impacts to marine wildlife from vessels, zodiacs, helicopters, icebreaking, anchoring, and land-based excursions (i.e. disturbance to polar bears, nesting birds, hauled out seals or walrus); (6) Increased noise associated with tourism activities.	*Compliance:* Migratory Bird Convention Act; Fisheries Act: Aeronautics Act; SARA; Nunavut Wildlife Act. *Avoidance:* vessels are prohibited from anchoring within marine protected areas or marine reserves; vessels have dynamic positioning systems that can be used as an alternative to anchoring. *Minimization:* ensure that project personnel and passengers are properly briefed on wildlife protocols, sensitivities, and management procedures prior to undertaking project activities; limits on viewing time of each concentration of marine mammals to a maximum of 30 minutes in order to minimize disturbance; positioning the vessel ahead of the path of marine mammals is prohibited; visitation to cliffs used by nesting and breeding birds restricted to zodiacs and during the morning and early afternoon, with noise kept to a minimum; maintain a distance of 100m if a polar bear is encountered on land or ice; engines on zodiacs selected to minimize noise.
(7) Impacts to marine water quality from vessel operations, storage and use of fuels, storage and disposal of wastes, and tourism activities.	*Compliance:* Transportation of Dangerous Goods Act and regulations; Canadian Environmental Protection Act; Arctic Waters Pollution Prevention Act; Canada Shipping Act; Marine Liability Act. *Minimization:* spill prevention measures and operational waste management similar to those for mine shipping; manage wastes on board the vessel prior to final disposal at approved port facilities; refueling of zodiacs will take place on board not in the auxiliary boats (i.e. on the water).
(8) Impacts to soil quality and terrestrial ecosystem integrity from land-based excursions; (9) Impacts to vegetation, compaction of surface sediments, and soils, and permafrost from land-based excursions; (10) Damage to sea floor and biota from improper landing procedures.	*Minimization:* limiting group sizes for land-based excursions; passenger briefings on appropriate movement patterns to mitigation soil erosion and impacts to sensitive ecosystems during excursions; use of existing trails wherever possible; measures to mitigate the introduction of foreign and non-native species to local environments (i.e. boot, clothing, and equipment decontamination); proper supervision of all expedition participants by experienced guides.

4.1.2 Impact management

Mitigation translates the findings of the IA into recommendations to avoid, minimize, repair or compensate impacts. This constitutes a mitigation hierarchy where the first three categories focus on ameliorating the impacts whereas compensation refers to the creation of new values,

which are equal or similar to the value lost (Larsen et al., 2018). As shown in **Table 4.4** and **Table 4.5**, managing the impacts of Arctic shipping relies heavily on compliance-based measures. Measures to avoid impacts are typically adopted through project design, by locating infrastructure or setting the timing of operations. Minimizing measures are found primarily in shipping management plans, coupled with best practices to minimize risk and meet regulatory compliance. Compensation was least common, used to compensate for impacts that affect Inuit harvesting activities and land use.

Compliance: Compliance-based measures mean project components and activities must operate in accordance with applicable legislation and regulations, both at the territorial, federal and international levels. Federally, the *Canada Shipping Act* (SC 2001, c.26) is the most extensive, with 59 regulations under the Act covering areas from *Anchorage* (SOR/88-101), *Ballast Water Control and Management* (SOR/2017-286), *Navigation Safety* (SOR/2005-134), and *Hull Construction* (CRC c.1431). For example, mitigation measures for ballast water exchange in the sample of IA reviews were solely compliance-based, where federal and international regulations determine the conditions under which ballast water can be exchanged (at sea in deep water, away from coastal zones) and identify approved ballast water treatment systems, although treatment is part of a precautionary approach. As another compliance-based measure, Transport Canada requires that proponents prepare an Oil Pollution Emergency Plan for addressing effects of a potential fuel spill or other hazardous substance. Similarly, all ships must prepare a Shipboard Oil Pollution Emergency Plan, which describes the equipment, training, and procedures that must be onboard as required by the International Maritime Organization (IMO) for all ships transporting fuel. The required plans are compliance-based measures that are intended to minimize risk and include best practices in fuel transport and bulk fuel storage, such as the use of an impermeable lining as secondary containment and the use of conventional, and required, double-hulled compartmentalized petroleum tankers. In the case of a fuel spill, proponents must operate on a 'polluter-pays' principle as ship owners must carry liability and compensation insurance as required by the *Marine Liability Act* (SC 2001, c.6).

Another important legislation, the *Arctic Waters Pollution Prevention Act* (RSC 1985, c A-12), provides two regulations that aim to prevent pollution in Canadian Arctic waters. The Act is effectively a 'zero discharge' act, which states "no person or ship shall deposit or permit the deposit of waste of any type in the Arctic waters" (Arctic Waters Pollution Prevention Act, RSC

1985, c A-12, s 4(1)). Where VCs are concerned, in addition to specific regulations surrounding shipping operations, proponents are also subject to the *Fisheries Act* (RSC 1985, c.F-14), *Migratory Birds Convention Act* (SC 1994, c. 22), and the *Species at Risk Act* (SC 2002, c. 29), among others. These acts and regulations were found to be routinely referenced in shipping management plans (SMP) and in specific mitigation measures in the sample of projects reviewed.

Avoidance: Impact avoidance starts in the project design phase and is most effective when it is considered early on in the IA process, such as in the scoping phase, to identify alternate locations, project designs or strategies. Of the avoidance measures identified in IA documents, most involved project design decisions such as locating in-water infrastructure to avoid fish bearing water and on competent bedrock or appropriate base materials to minimize the negative effects to sediment and water quality from construction activities. For projects with open-water shipping only, the proponents of Back River and Hope Bay presented the shipping season as an avoidance measure for impacts to, for example, the winter habitats of certain marine mammals; although, the selection of shipping season often has more to do with community opposition to the year-round shipping of ore concentrate, such as in the case of Kiggavik where public concern was high over a potential uranium spill into the marine environment.

Minimization: Measures to minimize impacts are often part of a project's SMP and are presented as following BMPs in addition to compliance-based measures. SMPs outline management practices and procedures for shipping and lightering activities and most often cover construction, operations, navigational safety, accidents and collisions, spill prevention and response, pollution prevention measures, ballast water management, waste management, wildlife management, radio equipment and communications, and occupational health and safety. Many of these impact management plans are inter-related: for example, measures to minimize adverse effects on water and sediment quality, such as managing site contact water and runoff, are often cited as measures to minimize adverse food chain effects for marine fish.

Impact management plans varied in the extent to which mitigation measures are precise and possible to be verified for their effectiveness. Construction is one area where measures were observed to be precise and present specific best practices, such as the use of bubble curtains during blasting events, following DFO guidelines for overpressure thresholds to protect fish, the use of vibratory pile drivers, or the use of silt curtains. In areas such as wildlife management,

proponents applied specific windows for activities, such as scheduling construction outside of sensitive periods for marine mammals and birds, or for Mary River, commencing icebreaking prior to the period of lair and breathing hole creation for ringed seals. Another common measure was applying setbacks or buffer zones away from sensitive habitat areas such as migratory bird sanctuaries or walrus *uglit* (haulouts). Typically, in the projects reviewed, these setbacks were a minimum of 2 km from known habitat sites, with variation up to 30 km depending on the local study area and shipping route.

However, some measures were less precise. One common set of mitigation measures identified to minimize the effects of multiple impacts were reducing ship speed and maintaining a constant speed and ship track. Slowing vessels down is used to minimize the adverse effects of activities such as: icebreaking on landfast ice; anthropogenic noise disturbance effects to marine mammals; reducing the risk of ship strikes for mammals; and to minimize effects to water and sediment quality and nearshore habitat from propeller wash and ship wake. However, intervenors expressed uncertainty about the effectiveness of such measures. For example, baseline data gaps in acoustic data for a suitable arctic species, such as ringed seals, as well as limited data on the effectiveness of reducing ship speed made impact predictions and impact significance determinations uncertain about the effects of underwater noise in Arctic environments.

Compensation: Compensation was not widely identified in the sample of IA documents as a routine impact mitigation measure for shipping activities. The main compensation measure identified was the creation of new fish habitat in the event of the harmful alteration, disruption, or destruction (HADD) of fish habitat under the *Fisheries Act* prior to 2012, but this would be part of DFO's authorization and permitting process after a project is approved by the NIRB. Compensation was used in Mary River to ameliorate the impacts of the footprint of the port on Inuit harvesting activities, travel and land use. The port caused a detour and icebreaking activities at Steensby Port, meaning that direct travel on landfast ice to access harvesting areas would not be possible. Compensation measures included the installation of emergency shelters along the tote road, making hot meals available in camp for travellers, and providing a fuel offset for the additional cost of the detour. Other assessments mentioned that the specifics of compensation measures would be established through separate Inuit Impact Benefit Agreements.

4.2 Information needs of rights holders and stakeholders

Comments submitted to the IA process specifically related to shipping operations and associated infrastructure were used to explore the information needs of rights holders and stakeholders within NIRBs processes. A total of 783 comments were identified from the sample of IA reviews and 74 comments from IA screenings, referencing 196 different topics (Appendix B). Results show that comments submitted addressed a variety of issues and that while some topics received more attention than others, their frequency was relatively low compared to the volume of comments submitted. Information needs are therefore complex and context-specific to the details of the project, the local and regional ecosystems, and community dynamics and histories. Separating comments by stakeholders and rights holders as well as looking at regional differences provides more insight to information needs in NIRB's process.

4.2.1 Comments from NIRB IA reviews

A total of 783 comments related to shipping were identified from the 6 mining projects that underwent a full IA review by the NIRB. Comments from both the original Mary River project and the addendum for the Early Revenue Phase comprised 412 of all the comments collected (52.6%). Mary River has the most extensive shipping requirements of the projects, involving seasonal shipping of cargo, fuel, and ore at Milne Inlet during the Early Revenue Phase and eventually the year-round shipping of ore from Steensby Inlet along with increased tonnage. Given the unprecedented scale of operations for Mary River, there were far more comments related to shipping in the sample of IA documents. Comparatively, 108 comments were from Meliadine, 93 from Back River, 85 from Kiggavik, 51 from Hope Bay, and 34 from Meadowbank. These five projects only use the seasonal resupply of fuel and cargo.

Comments were mostly contained in public hearing reports and technical comments on the draft EIS. Each comment addressed multiple topics related to different aspects of the IA and the project. Within these 783 comments, nearly 3,000 topics were identified across 10 broad categories, namely: IA process elements, valued components, project design, project activities, project effects, technical topics, impact management, regulatory-based issues, community-based issues, and other. Comments that referred to a specific aspect of the IA process were examined separately; a total of 352 comments (45%) were in relation to monitoring, cumulative effects,

mitigation, management plans, baseline data, impact predictions, and impact significance. These components of the IA process were raised 538 times in the suite of comments, as a single comment often referred to multiple process points. For example, comments expressing disagreement with an impact prediction sometimes also referred to deficiencies in baseline data, or a concern over mitigation may have included a request for monitoring. Alongside these IA process elements, 1,010 other topics were mentioned. The most frequent commentators on IA process were: Designated Inuit Organizations (23%), DFO (19.3%), community members and HTOs (17.9%), Environment Canada (17.6%), and Government of Nunavut (7.7%). The remaining 14.5% of comments were from the NIRB, CIRNAC, Transport Canada, unspecified intervenors, and NRCan.

The other 431 comments (55%) did not explicitly refer to a specific component of the IA process but were general comments related to the project. These comments collectively addressed 1,445 topics. More than half of these comments were from community members and HTOs (53.4%). The remaining were from DFO (10.2%), Environment Canada (7.7%), Designated Inuit Organizations (6.5%), CIRNAC (5.6%), the NIRB (5.3%), Government of Nunavut, unspecified intervenors, Transport Canada (3.2%), Makivik Corporation, NRCan (0.7%), and Parks Canada (0.2%). The results below present a breakdown of the comments that focused on the different aspects of the IA process, followed by general project comments.

4.2.1.1 Comments related to different steps of the IA process

Figure 4.5 presents a summary of the most frequent topics raised in review comments for each step in the IA process. Marine mammals was coded when mammals were mentioned, but without reference to a specific species. Similarly, marine VECs were coded when a comment referred generally to marine valued components (i.e., a comment seeking an explanation of the effects of ship wake on VECs) instead of a specific component (such as sediment quality). Each IA process element is discussed below.

Figure 4.5 Most frequent topics raised in IA comments by stage of the IA process.

Monitoring: Comments related to various aspects of monitoring were the most frequent, identified 146 times across the sample of IAs. Related to monitoring, there were 424 topics raised in the suite of 146 comments. Valued components received the most attention (22.6%), followed by management actions or approaches (14.2%), project effects (13.7%), project design (13.2%), EIS technical issues (12%), regulatory-based issues (9.4%), project activities (8%), community-based issues (5.7%), and other (1.2%). Comments that referred to monitoring were often mentioned alongside another IA element, like cumulative effects, impact predictions or impact management. No one topic dominated the comments. Overall, the most frequent topics raised in the context of monitoring were adaptive management (6.4%), marine mammals (4.7%), ballast water (3.3%), communication (3.3%), noise (3.1%), and marine birds (2.8%), which comprised only 100 (23.6%) of the total 424 topics addressed in relation to monitoring. Communication was raised *only* in relation to monitoring; the comments submitted asked proponents to demonstrate how results from project monitoring studies would be shared with communities on an on-going basis.

Cumulative effects: A total of 86 comments referred to cumulative effects. Within those comments, 234 related topics were identified. The most common topics were about total shipping traffic (7.3%), marine mammals (6.4%), uncertainty (4.7%), shipping volume (4.3%), noise (3.8%), ballast water (3.4%), marine birds (3.4%), and fuel spills (3%). These topics comprised 85 (36.3%) of the 234 topics raised in relation to cumulative effects. In the context of cumulative effects, uncertainty often was related to the limitations in understanding of the ecosystem or VC overall, as well as limitations in accurately foreseeing future events or conditions. Again, no single topic dominated the comments submitted to the IA process. Comments related to cumulative effects were found in all projects; however, due to the extent of operations in Mary River, concerns were raised by rights holders and stakeholders over what was termed 'within-project cumulative effects.' The concern here was how multiple 'non-significant' effects combine over time to produce cumulative effects. Environment Canada used the example of ballast water in their technical review, stating

> "[the draft EIS] does not account for the temporal scale and frequency of activities. For example, the discharge of ballast water from one vessel may not have a significant impact on the receiving environment, but the cumulative impact of millions of cubic meters of ballast water discharged every year for 20 years might be significant" (Environment Canada, Mary River technical comments, October 5 2011, p. 5).

The general scale and pace of resource development in Nunavut was also highlighted when discussing cumulative effects, especially from community members. For projects like Mary River, the scale of shipping and icebreaking is unprecedented and there were comments suggesting that the project also be considered in the context of receding ice making the Northwest Passage more likely to be used for international transit. This concern was also evident in other projects, although project shipping involved open-water resupply. For example, vessels accessing Meadowbank and Kiggavik (although not approved) transit through the entrance to Chesterfield Inlet from Hudson Bay, through Chesterfield Narrows to the shores of Baker Lake. The density of ship traffic from multiple projects and community resupply coupled with the physical restrictions of Chesterfield Narrows was an issues raised by both rights holders and stakeholders in relation to navigational safety and cumulative effects.

Mitigation: Mitigation was the focus of 79 comments and addressed 217 topics. The most frequent included reference to marine mammals (6.5%), adaptive management (5.1%), ballast water (4.6%), noise (3.7%), marine VECs (3.2%), management plans (3.2%), uncertainty (3.2%), and construction (2.8%). These comprised 70 (32.3%) of the 217 topics raised in comments about mitigation. Many of the comments on mitigation were related to the comments on monitoring, with a theme of ensuring monitoring and adaptive management are in place to test whether mitigation measures and BMPs are sufficient and effective for Arctic environments. Effectiveness here implies that changes resulting from project activities on ecosystemic and socioeconomic components are similar to those anticipated in the impact predictions made in the IA. In a case where project monitoring discovers management actions are not as effective as anticipated, adaptive management can be implemented to modify mitigation measures in response to new information. This approach to impact management was expressed by DFO and echoed by board members and EC in the public hearing for Mary River:

> … given the scope and scale of the Mary River project, the current pristine nature of the area where the development is proposed, and the lack of data available for use as baseline information, a precautionary approach must be taken. At times this may mean going above and beyond the routine application of existing environmental regulations when establishing appropriate mitigation for this project proposal (DFO quoted in Mary River FHR, 2012, p. 142).

This underscores several of the comments submitted about the need for a rigorous and comprehensive suite of monitoring programs, informed by both western science and IQ, that can address gaps in baseline knowledge, detect project-related impacts in the face of substantial

natural variation, and inform adaptive management to minimize further impacts as the project proceeds.

Management plans: A total of 76 comments referred to management plans, discussing 233 topics. Adaptive management was the most frequent topic (13.3%), followed by spill response (6.4%), polar bears (4.7%), ballast water (3.9%), marine birds (3.9%), fuel spills (3%), reporting (3%), and invasive species (2.6%) - collectively comprising 40.8% of topics regarding management plans. The remaining topics focused on a wide variety of management actions that are dependent on the specifics of the project. Adaptive management was a dominant focus in comments about monitoring, likely because it provides the imperative for monitoring in many cases; where uncertainty exists in baseline data or impact predictions, the NIRB relies on monitoring to assess the accuracy of impact predictions made within the final EIS and the effectiveness of mitigation to create an adaptive management cycle.

Baseline data: A total of 75 comments focused on various aspects of baseline data and often focused on the nature of the data provided or requests for additional data. Comments focused on marine mammals (6.5%), polar bears (5.1%), noise/acoustic data (5.1%), uncertainty (4.2%), sea ice (3.7%), marine birds (3.3%), fuel spills (2.8%), sensitive habitat (2.8%), assessment methodologies (2.8%), and variability over time (often referring to ice regimes) (2.8%). These topics comprised 84 (39.3%) of the 214 topics identified in comments referring to baseline data.

Impact predictions: A total of 53 comments referred to impact predictions. Within these comments, the most common topics raised were uncertainty (8.7%), sea ice (6.7%), marine mammals (5.4%), disturbance effects (4%), marine VECs (4%), modelling (4%), sensitive habitat (4%), variability over time (4%), methodology (3.4%), and ship tracks (3.4%). These represent 71 (47.7%) of the 149 topics raised in comments referring to impact predictions.

Impact significance: Concern over significance determinations was raised in only 23 comments, and addressing only 59 related topics. Disagreement over methodology (10.2%) and thresholds (6.8%) were the most frequent technical topics, while marine mammals (5.1%), polar bears (5.1%), and sea ice were the most frequent valued components mentioned. Together, these topics comprised 32.2% of all issues raised about impact significance. Where there is uncertainty in baseline knowledge, thresholds are discussed and determined during technical meetings with regulators and through community roundtables on the draft EIS. Ultimately, the NIRB makes an

assessment regarding which effects are significant by taking into account the factors for determining significance set out by Sections 90 and 103 of *NuPPAA*.

4.2.1.2 Generic comments related to the project

The above comments were in relation to the various steps in the IA process and comprised 45% of all comments identified. The remaining 55% of comments were more general inquiries or comments on the projects being assessed. A total of 1,445 topics were raised in the suite of 431 comments. **Figure 4.6** presents the most frequent topics raised in general comments about the projects being assessed. Valued components, including marine mammals (4.6%) Inuit harvesting activities (3.8%), sea ice including sea, pack, and landfast ice (3%), sensitive habitat areas (2.4%), and Inuit travel (1.3%) were among the most frequent topics raised. Marine mammals was coded when a general reference was made to mammals without reference to a specific species. Polar bear was the species that received the most attention, referred to 14 times in general project comments. Other mammals included: seals (11), walrus (7), bowhead whale (6), narwhals (5), ringed seals, and whales (3).

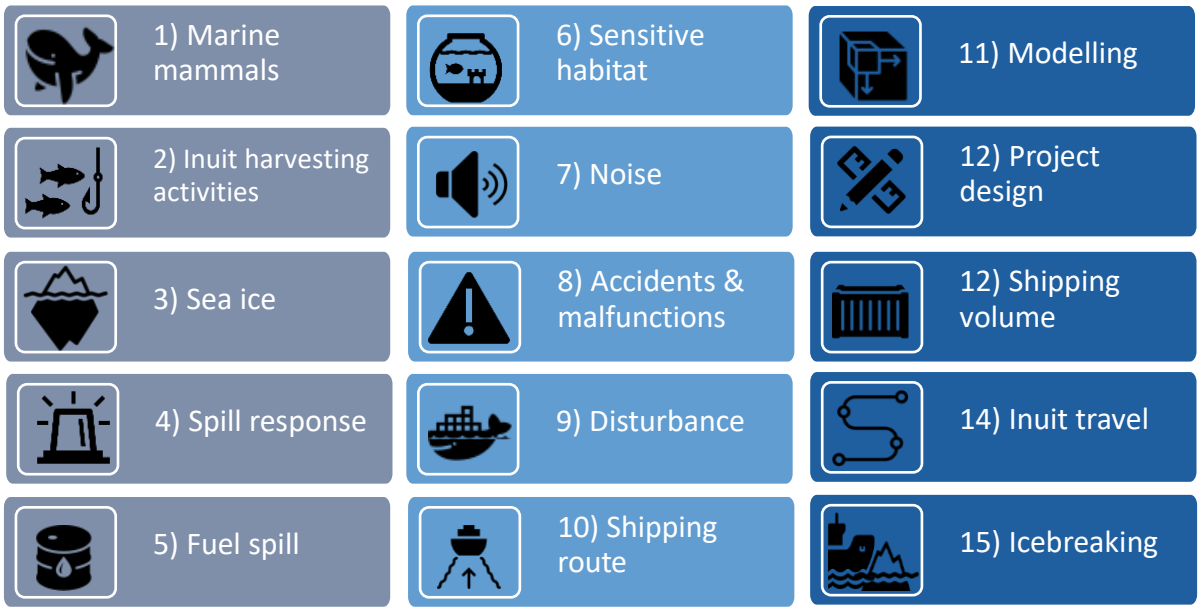

Figure 4.6 Most frequent topics raised in the general project comments submitted that were not related to a specific stage or component of the IA process.

The potential impacts on valued components that were most frequently identified were fuel spills (2.4%), noise effects (2%), and disturbance effects (1.9%). Spill response was the most frequent management plan or action discussed (2.8%). Accidents and malfunctions (1.9%), the shipping route (1.7%), project design, shipping volume (1.4%), and icebreaking (1.3%) were the project details or activities that received the most attention. Modelling was the technical topic that received the most attention (1.5%). However, collectively these topics only represent 33.2% of all topics raised in project comments. There were 965 other topics raised in this suite of comments, indicating great diversity in project comments. It may be more useful to examine comments by rights holder and stakeholder groups to understand the routine information needs.

4.2.2 Comments by rights holder/stakeholders

Results indicate that, based on rights holder/stakeholder comments, responsible authorities are unsurprisingly concerned about the issues that fall under their jurisdiction. The Government of Nunavut provided comments at the territorial level, accounting for 41 or 5.2% of all comments. While other IPGs play a role in regulating projects, the projects that were reviewed for this research were those conducted before *NuPPAA* entered into force in 2015. Under *NuPPAA,* project authorizations occur under a 'one-window approach' with better integration of all IPGs that play a licensing role. Therefore, comments from the IPG's parallel processes were outside of the scope of this research. The Nunavut Minister of the Environment and the Nunavut Wildlife Management Board are responsible for the co-management of wildlife including land and marine mammals, birds, fish, and plants in Nunavut (Government of Nunavut Co-management Working Group, 2016). While the Government of Nunavut is responsible for the management of many marine species, polar bears were almost exclusively recognized in comments from the Government of Nunavut related to shipping. Polar bears appeared in 58.5% of Government of Nunavut comments. The focus on polar bears could perhaps be due to their position at the top of pelagic food chains, therefore an indicator of ecosystem health. There was also a focus on management plans, baseline data, fuel spills, and spill response.

Federal responsible authorities submitted 273 (34.9%) of all comments identified. Among federal regulators, monitoring, mitigation and cumulative effects were aspects of the IA process that received the most attention in comments. Baseline data were frequently mentioned by both DFO and EC. For DFO, marine mammals, impact predictions, noise and ballast water were the

most frequent topics. Additionally, DFO often raised issues about proponents including benthic communities as valued components and selecting indicators at lower trophic levels as part of an ecosystem-based approach. This is in order to monitor for changes that may cause direct or indirect effects at higher trophic levels, therefore allowing opportunities for adaptive management. EC often echoed concern over proponents adopting an ecosystem-based approach in their final EIS. Where EC's concerns differed was over species that are under their jurisdiction, namely marine birds, Species at Risk, and sensitive habitat areas such as migratory bird sanctuaries. Another common issue raised by EC was that proponents include sensitivity mapping to identify particularly vulnerable, sensitive or valued sites alongside modelling for accidents and malfunctions such as fuel spills. This was both to inform response planning, but also to determine setbacks along the shipping route. Similarly, comments from Transport Canada focused on fuel spill response, capacity, and ensuring regulatory compliance such as reminding proponents that they must submit an Oil Pollution Emergency Plan before operations commence. Comments referring to capacity were often a reminder to proponents that emergency response should be self-sufficient given the reality of Arctic operations, and the availability and timeliness of outside assistance from the Canadian Coast Guard.

While DFO, EC, and Transport Canada all play a direct role regulating shipping activities, CIRNAC has responsibilities for water resource management on Crown land, and social and economic development. Subsequently, CIRNACs comments focused on Inuit harvesting activities, travel and land-use, as well as community engagement. Comments often focused on the extent and effectiveness of community engagement and participation undertaken by proponents. These included comments related to the inclusion of IQ, the collection of socioeconomic baseline data, and the extent to which proponents document how community engagement informed project design. On the technical side, CIRNAC most frequently commented on ensuring the appropriateness of measures for managing site contact water, such as using silt curtains during construction to minimize effects to water and sediment quality. Lastly, NRCan, a regular intervenor in NIRB's process, albeit more so on the mining side, provided limited comments related to shipping. Those comments identified focused on four related topics: ship wake effects, modelling of wave energy, shoreline erosion, and monitoring.

From the NIRB's perspective, these responsible authorities are in place to demonstrate their confidence in the licensing and permitting phase that follows an IA, especially given the focus on

compliance-based impact management. Through their participation in NIRB's process, these stakeholders are also trying to ensure they have the data they need if a project goes ahead. These results indicate that a challenge for the NIRB is striking a balance between ensuring data needs are met but also not having regulators monopolize the IA process with their own permitting concerns.

Comments from rights holders – from individual community members, representatives from Hamlets, HTOs, and Designated Inuit Organizations (DIO) – comprised 402 (53.9%) of all comments identified across the sample of IAs. These comments were most frequently about the impacts of projects on valued components that affect their daily harvesting, travel, and culture. However, many of the shipping activities associated with mining developments are identical to the activities that communities rely on for their own cargo and energy needs, even relying on the same sealift contractors. According to one NIRB staff member:

> People have concerns about sealift to a project which is functionally not different than sealift to a community but if you show a video of a sealift coming into Clyde River [community], and here's a sealift coming into Mary River [mine], well they're pretty much exactly the same. You can get your head around it. *There is a conceptual gap where people focus on who is doing something rather than what they're actually doing* [emphasis added].

In this sense, rights holders want assurance that regulations and enforcement will be in place to manage and monitor the impacts of project shipping. However, there were differences in the types of issues raised in the comments submitted when looking at individual community members versus Inuit organizations. Comments from DIOs were most often joint submissions between the regional designated organization (Kitikmeot, Kivalliq, and Qikiqtani) and Nunavut Tunngavik Incorporated (NTI), the legal representative of the Inuit of Nunavut in the *Nunavut Agreement*. DIO's are rights holders while also performing a regulatory role in managing Inuit owned land and consulting with beneficiaries on land use. The DIO submissions tended to focus on the IA process through technical comments on impact statements: of the 109 comments submitted by DIOs, 74.3% were in relation to a specific stage of the IA process, whereas of the 293 comments submitted by community members and HTOs, the majority (78.5%) were not in relation to any particular stage of the IA but more broadly focused on the project. Comments from communities, HTO, and DIOs collectively represent views of communities and rights holders.

Of the six projects selected for review, three projects are in Kivalliq (Meliadine, Meadowbank, and Kiggavik), two projects are in Kitikmeot (Back River and Hope Bay), and finally Mary River, the project with the most extensive shipping operations, is in Qikiqtani (Inuinnaqtun) or Qikiqtaaluk (Inuktitut). Of the 402 comments from communities and rights holders, half were from Qikiqtani, 134 from Kivalliq (33.3%), and 67 from Kitikmeot (16.7%). When asked about differences between regions, one NIRB staff member stated: "If you go to Kivalliq, [information needs] tend to be practical. In [Qikiqtani], there is concern about everything almost from the start. In Kitikmeot, they [do not] care; it's when do the jobs come." Across all three regions, monitoring was the IA process element that received the most attention in comments. For Kivalliq, cumulative effects and baseline data were the second and third most frequent IA processes discussed; while comments from communities in Qikiqtani more frequently referred to mitigation, cumulative effects, and management plans. In Kitikmeot, the majority of comments referred to the project rather than the process.

Figure 4.7 highlights the most frequent topics raised in community comments for each region. Differences between regions can be partly explained by their resource-base as well as the communities' previous experiences with development. For example, Kitikmeot relies more on terrestrial resources, such as *tuktu* (caribou) or *umingmak* (muskox), and there is less of a sense of marine culture outside of winter (NIRB Focus Group). There has also been a longer history of community interaction with development, or proximity to shipping routes. Comments tended to focus on operational details such as accidents and malfunctions, like groundings or fuel spills, and associated emergency response such as the details of spill response equipment, who has access to it, and so on. Communities, across all regions, also want to see capacity-building in local response measures, both in terms of equipment and training. The processes of refuelling received less attention generally due to the fact that communities rely on the same processes for their own energy needs. Communication was also a prominent topic with reference to ensuring management actions or plans are communicated to the shipping contractors carrying out mine sealift. In Kitikmeot, there is more of a focus on who is doing what and ensuring there are mechanisms to regulate and enforce compliance. Even in terms of the volume of comments, there were fewer comments in Kitikmeot region that referred to shipping: 67 across 2 projects, compared to 201 from communities in Qikiqtani for one project.

Qikiqtani does not have the same history of interaction with development, has a greater sense of marine culture, and relies more heavily on the marine environment and its resources (NIRB Focus Group). Mary River is distinct from the projects examined in other regions due to its scale; it is also the only mining development that has undergone an IA in the region. Two previous projects, the Nanisivik and Polaris mines, shipped ore concentrate through Davis Strait from the late 1970s to 2002 but neither underwent an Environmental Assessment and Review Process as they were 'strategic projects' for the federal government to test Arctic resource development and shipping technologies (Gibson, 1978; Green, 2015). However, a communities' interaction with shipping is dependent on its proximity to shipping routes, and although most communities in Nunavut are coastal, many do not directly oversee shipping passages. Communities, like Chesterfield Inlet near the three Kivalliq projects or Pond Inlet near Mary River, see every transit that passes by. While both communities would see transits, the most frequent topics raised in comments are different for Kivalliq and Qikiqtani.

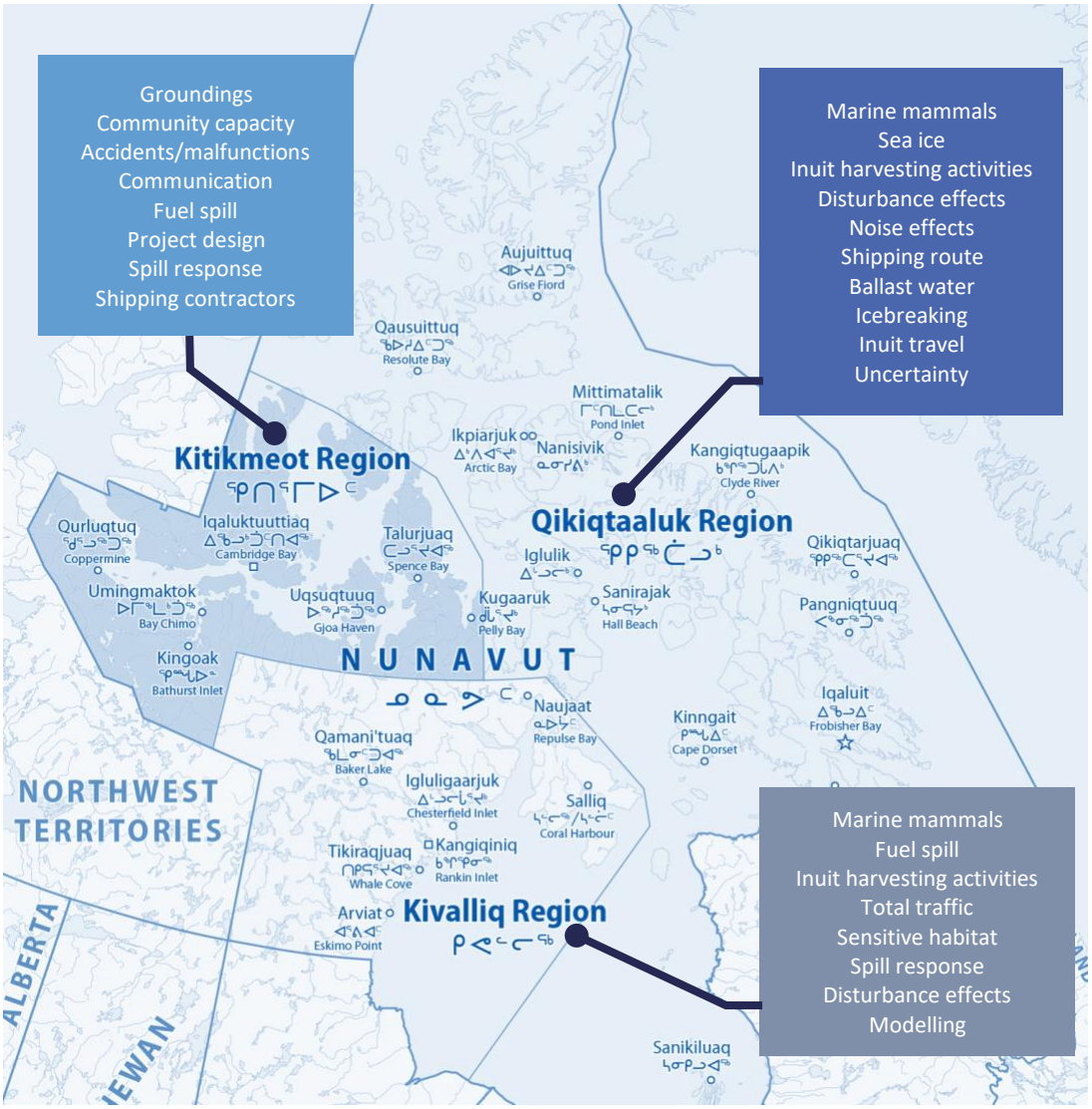

Figure 4.7 Focus of IA comments from community members for projects in different regions.[6]

In Kivalliq, project vessels accessing Meadowbank and those that would have accessed Kiggavik transit by Chesterfield Inlet through Chesterfield Narrows to Baker Lake. The density of ship traffic from multiple projects and community resupply coupled with navigational hazards in Chesterfield Narrows raises concerns over safety and cumulative effects; specifically, the cumulative effects of traffic to marine mammals and sensitive habitat. Relatedly, communication with shipping contractors was also highlighted. For example, ensuring that mitigation measures such as setbacks from important and sensitive habitat areas are communicated to the contractors carrying out the sealift. In Meliadine for example, the proponent agreed to a 30-kilometre buffer

[6] Base map source: Dorrbecker, *Wikipedia,* n.d..

from known sea bird habitat. These types of conditions are placed on proponents but would be met by shipping contractors. Both the Kivalliq Inuit Association and EC requested vessel location data should be included in annual monitoring reports in order to assess the level of compliance as well as contributing to an understanding of the cumulative effects along the shipping route.

In Qikiqtani, the Mary River assessment had the most comments collected and covered the greatest number of topics. Marine mammals, sea ice, Inuit harvesting activities, and Inuit travel were the most frequent valued components raised in comments. Disturbance and noise effects were the most frequent effects noted, while the shipping route, ballast water exchange, and icebreaking were the most common effects pathways. Generally, there were more comments focused on the interaction of project activities with valued components and potential effects, rather than on management plans or regulatory capacity to manage impacts. There were three unique topics discussed in both the original Mary River assessment and the Early Revenue Phase (ERP) addendum: operational flexibility, project change, and phase development. Collectively they refer to an emerging challenge facing the NIRB about project modifications.

In September 2012, the Board approved the original Mary River assessment, which involved seasonal resupply of cargo and fuel at Milne Inlet and year-round shipping of ore concentrate from Steensby Inlet with purpose-built ore carriers with icebreaking capabilities. Shortly after the project certificate was issued, the proponent Baffinland submitted the ERP asking to seasonally ship ore from Milne Inlet in order to secure the capital funding required to develop the larger Mary River project as originally proposed. During the Public Hearing, Baffinland asked the NIRB to grant "operational flexibility" to allow for variance of up to 20% in additional volume of ore that could be shipped out of Milne Port in any given year. The NIRB ultimately approved the ERP in March 2014 but limited operational flexibility to mining under the ERP with further limits placed on the total annual limit once mining commences under the terms of the original assessment (Mary River, Public Hearing Report, March 17 2014, p. xi). The decision in how the NIRB treats a modification is whether it requires a reasonable change to the project certified (i.e., adding fuel storage capabilities) or whether the modification is great enough that it changes the findings of the final EIS (i.e., changing the shipping route/season or turning a rail line into a trucking road). The challenge for the NIRB becomes finding the balance of how much operational flexibility to accommodate in the terms and conditions of licenses while ensuring the

Board is assessing what the project is likely to look like. Accordingly, the NIRB cannot assess what it cannot predict. This premise is also evident in the NIRB's decision not to approve the Kiggavik project, when the proponent failed to provide a definitive start date citing low uranium prices.

Since the Mary River ERP was approved in 2014, two more proposals have been submitted, although these were not included in the document review. In April 2018, Baffinland submitted another modification proposal seeking a production increase (from 4.2 Mt/a to 6 Mt/a) and an associated increase in shipping, additional fuel storage capacity, and new accommodations at the Milne Port. The NIRB only recommended the fuel storage and accommodations to proceed, without changes to the certificate. In rejecting the production increase, the NIRB made references to concerns expressed by regulators, community members and the results of the NIRB's monitoring in their decision, in terms of the "adequacy of impact predictions and uncertainty about the effectiveness of the mitigation measures proposed by Baffinland to address the potential for adverse effects associated with the proposed increase in road traffic and marine vessel traffic" (Mary River Reconsideration Report and Recommendations, August 31 2018, p. 5). The NIRB specifically referred to disturbance effects to marine mammals, birds and fish populations, and adverse effects on harvesting in the areas adjacent to Pond Inlet, as well as managing dust generated from road traffic and potential effects to marine areas, freshwater, sea ice and the terrestrial environment. However, despite the NIRB's recommendation, in October 2018 the responsible ministers approved a time-limited increase of production and shipping until December 31 2019 (unless otherwise amended). As of April 2019, the NIRB is reviewing a fourth amendment to Mary River's project certificate as part of a Phase 2 Development Proposal with Public Hearings expected in September 2019. This application seeks an increase in the quantity of ore shipped from Milne Port to 12 Mt/a and the construction of a new railway. If approved, the total mine production will eventually transport 30 Mt/a via railway, with 12 Mt/a shipped through Milne Port and 18 Mt/a transported through Steensby Port. Given this extensive cycle of modifications for one project, it is most certainly changing the level of interaction between communities in Qikiqtani and shipping development. Additionally, this cycle of modifications in an important consideration for both rights holders and stakeholders.

4.2.3 Comments from NIRB screenings

Screening applications that were reviewed included one deep sea port, one mine development, and four cruise tourism operations. Only 74 comments related to shipping were identified in screening decision reports drafted by the NIRB in response to these six applications. Instead of aggregating the screening comments, it is more useful to break them down by project type.

The mining development, the IZOK Corridor Project, was included to assess whether shipping issues are raised at the screening level for mine developments. However, only 7 comments were identified that referred to shipping, addressing 15 topics. Under the terms of the *Nunavut Agreement*, the NIRB recommends a project for review when the project may: have significant adverse ecological and socioeconomic impacts or significant adverse impacts on wildlife habitat or Inuit harvesting activities; the project will cause significant public concern; or the project involves technological innovations for which the effects are unknown (*Nunavut Agreement*, 1993). During the screening process, the NIRB received comments from agencies, organizations and individuals routinely involved in NIRB's processes, but due to the transboundary nature of IZOK project the NIRB also received comments from the Government of the Northwest Territories, seven transboundary Indigenous groups, five NGOs, and hundreds of public comments related to the mine as a result of a petition. Following NIRB's technical review and public concern expressed in the commenting period, the NIRB recommended IZOK for review in 2012.

In making their decision, the NIRB noted the shipping component and port infrastructure may result in adverse and transboundary impacts to marine ecosystems, and to community and Inuit harvesting of marine species. However, only 7 comments from the sample of documents from IZOK referred to shipping. While shipping did not evidently play a leading role in the NIRB's decision, shipping infrastructure has played a role in the project proceeding. The Proponent cited a lack of infrastructure in the region (or specifically Gray's Bay) as an obstacle to an economically viable plan in annual updates on the file (IZOK Corridor, general correspondence, 2016). There has been repeated attempts to partner to build a port at Gray's Bay, most recently by the Kitikmeot Inuit Association and the Government of Nunavut. However, the territorial Government withdrew support in 2018 putting the assessment of the port on hold (Grays Bay Road and Port, general correspondence, 2018).

Marine infrastructure is incredibly important for Nunavut, where all but one of the 25 communities are coastal. The comments from the screening of the Iqaluit deep port were not all that different from comments about port construction in NIRB IA reviews. A total of 21 comments addressing 73 topics were identified for the Iqaluit port application. There was focus on mitigation (12.3%), construction activities (11%), management plans (8.2%), fuel spills, and Inuit land use (6.8%). Comments referring to management plans or mitigation were often concerned with ensuring appropriate measures were in place to deal with common operational issues, such as erosion control, site water management, or accidents and malfunctions planning. They often reiterated compliance with appropriate federal and territorial regulations. Comments regarding Inuit harvesting activities and travel were concerned mostly with safety around the construction site due to proximity to land use areas.

Cruise tourism presents a different land-based activity to be considered when screening projects: land-based tourism excursions. A total of 46 comments were identified in screening documents for cruise ship applications, discussing 128 different topics. Of the four operations reviewed, Crystal Serenity was the largest, with a passenger capacity of over 1,600 which effectively doubled the population of Cambridge Bay, one of their community stops. **Figure 4.8** shows the topics that were most frequently raised in comments on tourism applications; these topics represent 43.8% of the total. Shore landings and community visits (6.3%) as well as the cumulative effects of activities (5.5%) were the most frequent. Although tourism applications did not identify valued components, comments referred to project interactions with marine birds (4.7%), marine mammals, polar bears, archeological sites, and community land-use activities (3.9%). Other topics included community engagement, reporting, and waste management (3.9%).

Figure 4.8 Most frequent topics raised in comments for tourism screenings.

Comments from the NIRB on shore landings focused on the potential for public concern over the cumulative impacts of cruise ship interaction with wildlife, historical and archeological sites, and potential adverse impacts to public and traditional land use along the shipping route. While many of these potential impacts can be mitigated through standard operating procedures, compliance with regulations as well as through federal, territorial, and regional permitting, in several of the screenings the issue of reporting and compliance was raised by HTOs, members of the public, and wildlife boards. For example, in response to the application for LE SOLEAL 2017, the Qikiqtaaluk Wildlife Board stated:

> In the past, several vessels, their landing vessels, passengers, staff and crew allegedly have been involved in wildlife harassment, tampering with archaeological sites, and suspected violation of NIRB and other restrictions… Identification of the few potential violators is critical, instead of allowing the negative reputation of the entire Arctic cruise industry that is growing among the communities (screening comments, 2017).

A related issue noted in screening reports and comments was ensuring that cruise tourism can positively contribute to community development through economic benefits. Several concerns were highlighted in the comments. CIRNAC, for example, noted that except for Crystal Serenity there was a lack of documentation of community engagement undertaken by cruise operators

prior to submitting an application. Another issue, although reinforced through terms and conditions but still noted as an issue for visitor centre operators like the Kitikmeot Heritage Society, was the lack of sufficient notice of the arrival of ships. Sufficient notice was raised as important for communities to be able to prepare in order to accommodate a large influx of visitors to fully realize the economic benefits of these visits.

4.2.4 Key challenges raised in comments for decision-making

The diversity of issues raised in IA review and screening comments indicates that the information needs of rights holders and stakeholders in the IA process are complex and often context-specific. However, there were some common themes that emerged across IA reviews and screenings, and also highlighted by the NIRB during focus groups as representing routine challenges in assessing shipping activities: how to address uncertainty; concern over the scale and pace of development in the territory; and assessing the appropriateness of mitigation measures for Arctic environments. These themes and the challenges they present provide important context before looking at how concerns from rights holders, stakeholders, and the NIRB are addressed in the decision-making process.

Uncertainty: Gaps in baseline data present practical challenges for decision-makers in assessing impact predictions, significance determinations, and mitigation. For example, gaps in available data on arctic species can create uncertainty in impact predictions. For the Mary River project, there was a gap identified in baseline data on the hearing sensitivity of ringed seals to airborne, anthropogenic noise; therefore, the proponent used data from harbour seal, harp seal, Hawaiian monk seal, grey seal, northern fur seal, California sea lion and walrus in their impact predictions (Mary River Final EIS, February 13 2012, p. 145). While these species may be close relatives of ringed seals, the ecological context of a Californian sea lion is very different from a ringed seal in Baffin Bay, and can fail to address concerns around how sea ice can change hearing thresholds. Another important example is bathymetric data. Gaps in bathymetry and the availability of updated navigational charts can pose a serious risk for operators. Between 2002 and 2018, the MARSIS dataset of the Transportation Safety Board of Canada reports 24 shipping incidents and accidents in the Nunavut Settlement Area involving groundings, bottom contact, damage due to ice, and collisions with other vessels (Transportation Safety Board of Canada,

n.d.). The risks posed by gaps in navigational data, along with the hazards posed by sea ice and the remoteness of operations, can be compounded when considering the increase in vessel traffic in the Arctic.

Cumulative effects of development: The scale and pace of development in Nunavut is another underlying theme as it relates to cumulative effects both within projects and the general increase in shipping traffic in the Canadian Arctic. The previous example of the phased development timeline of the Mary River mine is a good example of this concern within projects. The general increase in traffic also leads to concern over the cumulative effects of shipping in the NSA. In the Hope Bay assessment, the NIRB noted that data deficiencies (not specific to the project) limit the ability of regulators to have confidence in the assessment of cumulative effects. DFO noted general gaps in data, but especially in terms of the cumulative impacts of shipping on Arctic marine mammals (Hope Bay FHR, 2018, p.287). However, many of the contributors to the substantial increase in marine traffic in the NSA, such as community resupply, cruise ships, and fishing vessels, are not assessed by the NIRB's project-specific assessments. The NIRB is "keenly aware" of these concerns but the Board generally accepts that "the potential for cumulative effects arising from the Project can be effectively managed by implementing the mitigation, monitoring and adaptive management measures proposed by the Proponent" (Hope Bay FHR, 2018, p.282). Given the confines of project-based assessments, NIRB reviews do not provide the appropriate venue for addressing these more general concerns and data deficiencies.

Mitigation: Results from this research demonstrate that many of the mitigation measures used to manage the routine impacts of shipping are heavily focused on compliance-based measures and BMPs. For community members and rights holders, issues of compliance, enforcement and reporting were raised for both mining projects and tourism applications, seeking assurances that the appropriate mechanisms are in place to manage impacts. In making decisions on project approvals, the NIRB must ask whether compliance-based measures, which were largely developed to regulate shipping outside of the Arctic (e.g. *Ballast Water Control and Management Regulations* (SOR/2017-286)), are suitable for Arctic waters.

This focus on compliance-based mitigation coupled with questions over the cumulative effects of ship traffic led to an interesting question in the most recent assessment that was reviewed, Hope Bay. The proponent of the Hope Bay project argued over the necessity of requiring shipping management plans given the focus on regulatory compliance, further

prompting questions about how the potential cumulative effects of shipping on marine mammals should be dealt with. It was the NIRB's view that it would be "most appropriate for the Government of Canada to establish and implement standardized requirements that would pertain to all certified vessels transiting through Arctic waters, rather than placing the onus on proponents" (Hope Bay FHR, 2018, p. 282).

This discussion arose around the application of onboard ship observers (SBO) as a mitigation measure (NIRB Focus Group). DFO wanted to implement SBOs for Hope Bay vessels based on their prediction of whale strikes and concern for cumulative effects in the study area. There were two problems that arose in the public hearings. First, there was contention over the underlying assumptions of the model DFO was using. Their model to predict whale strikes predicted a high amount of strikes, around 20 per year, due to Hope Bay alone. However, in the hearing it was discovered that the model assumed that whales did not move. This prompted one board member to remark, "It'd be a lot easier to hunt if they didn't move!" The reason they were using this model was due to a lack of data on an arctic species. This was not only the case in Hope Bay but in all assessments. Regulators, like DFO, encourage adaptive management approaches to meet their own data needs, and the onus is put on proponents to fill data gaps on species under their jurisdiction. The challenge for the NIRB, and for Proponents, is avoiding regulators front-loading the IA process with their own needs. The NIRB is put in the position of "finding a balance between creating opportunities through monitoring programs to fill data gaps and having to accept and deal with high levels of uncertainty" (NIRB Focus Group).

The second issue in the SBO case was that the sealift activities associated with Hope Bay are not functionally different from community sealift, often using the same contractors. As noted above, the NIRB took the position that the responsibility for such measures does not lie with one proponent and their shipping contractor; instead, it lies with the industry that the federal government regulates. In the NIRB's view, SBOs can be appropriate for projects like Mary River, where there is not just seasonal resupply and the proponent has direct control over vessels. There is a need for a more strategic approach to regulate Arctic shipping; requiring SBOs for individual project proponents does nothing to monitor or mitigate the effects of other types of marine traffic, like tourism.

4.3 Knowledge brokerage

Previous sections have identified the complex nature of information needs of rights holder and stakeholders regarding shipping impacts and mitigation. Central challenges to making decisions related to shipping include dealing with uncertainty, managing cumulative effects, and whether mitigation measures are cautious enough for a rapidly changing Arctic environment. The NIRB's approach to addressing these concerns has been through adaptive management and by creating new knowledge through project monitoring. Just like in the SBO case mentioned above, the NIRB cannot hold off making decisions in the absence of scientific information. But this does not constitute a gap in available knowledge. The NIRB relies more heavily or solely on IQ in their decision-making; the many ways the NIRB both exchanges IQ and facilitates the exchange of information across different knowledge bases provides an example of how knowledge brokerage takes place to support the decision-making process and ultimately promote learning. The results below draw from the focus groups and identify where opportunities exist for knowledge exchange, and some of the challenges in communication between rights holders, stakeholders, and decision-makers.

The NIRB relies on the exchange of information from different knowledge bases in order to make decisions: from community members and Elders who share IQ, and from regulatory, legal and technical bases. The way the NIRB exchanges knowledge between the board members and its technical staff parallels the role IQ plays alongside western science in all phases of an IA. The board has predominately been made up of Nunavummiut, many of which have been Inuit. On the staff side, while the NIRB gives preference to Nunavummiut, many of its technical staff come from outside of the territory (at the time of focus groups). As one board member stated:

> We have our board of directors who are from the land and that have a strong belief in our people, at the same time we have 17 of the best, brilliant, educated staff that have PhDs, legal knowledge; … they have that other knowledge that we don't have. And they also say the same thing to us. That they need our knowledge to make an informed decision that is not only going to complement what is in front of us but what will affect us in the long run.

The NIRB requires proponents to not only use IQ in baseline methodologies and data collection but to also outline where project design, management plans, mitigation and monitoring employ the values and principles of IQ.

The exchange of IQ across regions is also crucial for decision-making. As discussed above (Section 4.2.2), there are regional differences in knowledge relating to the resource base of each region. The NIRB relies on the exchange of knowledge across different regions to supplement their own knowledge in decision-making. For example, when one board member originally from Kivalliq had to make a decision on the prospect of year-round shipping in Qikiqtani, they relied on the knowledge from local board and community members:

> And for me, I'm not from the sea, I never grew up by the sea so these concepts of living off the ice that way people do on the coast, I knew very, very little about them, very superficial. But it took… other board members to share what they know about the ice for me to be able to make a decision. I could not make a decision without their baseline knowledge about what the ice is actually like before you can decide if it's acceptable or not.

The role that IQ plays in NIRB's process cannot be overstated. While a detailed examination of its role is beyond the scope of this research, the ways in which NIRB's process creates opportunity for knowledge brokerage to occur is addressed below.

4.3.1 Process opportunities and challenges

The NIRB's process, enabled through the *Nunavut Agreement* and the *NuPPAA*, creates opportunities for multi-way knowledge exchange, and provides early opportunities to address concerns, especially by rights holders and community members. One example is the facilitation of community roundtables at different stages. First, after scoping and the development of EIS guidelines, the proponent prepares a draft EIS, which is followed by information sessions and technical review. The pre-hearing conference following the technical review gives stakeholders an opportunity to present resolved and outstanding issues based on their technical comments on the draft EIS. The point that makes NIRB's pre-hearing conferences unique are the community roundtable sessions. In other jurisdictions, the pre-hearing conference is typically a technical matter, sometimes closed to the public. The roundtables bring an opportunity for proponents to 'listen and learn' from communities at an earlier phase, before the final EIS has been prepared. Based on the NIRB's experience, its novel to proponents going through the process for the first time but the roundtables can provide some degree of assurance for proponents that the final EIS will address major gaps. And this has led to a noticeable change for board members in the types of concerns raised later on in the process and final public hearings (for example, relating to the

inclusion, or lack thereof, of IQ); when proponents miss this opportunity, its glaringly obvious: "the expectations are well beyond just giving lip service to traditional knowledge."

When it comes to decision-making, the final public hearing "gives significant weight to the opinions of Elders and community members, and to the tradition of Inuit oral communication and decision-making" (NIRB, 2018d). What this looks like in action is structuring the hearings in two sections similar to the pre-conference hearing: one deals with proponents, Inuit organizations, and responsible authorities on technical matters (3-5 days), and the last two days are spent holding community roundtables. After hearing from the perspectives of proponents, responsible authorities and other intervenors, the NIRB hears from community members at the roundtables: "you hear from the people what they think of the project from their harvesting perspective, or from their elder perspective, and that's how we continuously try to bridge those two areas [IQ and western science]."

While these process points are important for the NIRB in facilitating the exchange of knowledge at multiple stages, nevertheless there are challenges in how information is communicated between proponents, regulators, rights holders and community members. These challenges are related to who is communicating, the quality and format of the information, and maintaining organizational and social learning.

Getting the right people to the table: The NIRB relies on the participation of responsible authorities, like DFO or Transport Canada, to provide information about their jurisdiction over project activities as well technical expertise and their roles in follow-up phases. Limits on the full participation by these regulators can "jeopardize the NIRB's ability to provide thorough, credible and timely assessments" (Meliadine FHR, 2014, p. 294). For example, in the Meliadine assessment, the NIRB noted the significant challenges it faced in understanding substantive changes to the *Fisheries Act* that overhauled HADD provisions. The absence of clear guidance from DFO on how these and other changes to the *Metal Mining Effluent Regulations* and the *Navigation Protection Act* would affect licensing and permitting meant that the NIRB, proponent and the public were "left uncertain over which aspects of the assessment, can, should, and most importantly *should not* be deferred" to later stages [emphasis original] (Meliadine FHR, 2014, p. 294).

Many federal regulators are underrepresented in the territory and operate from departments in the south. Therefore, some of the challenge of bringing people to the table is related to capacity:

when rights holders and stakeholders are not properly resourced, the NIRB's process suffers and the "Board's decision-making becomes harder." The high cost of travel can mean that NIRB has had to remind federal regulators that they have the power to compel: "it was like pulling teeth in getting experts that could speak competently on behalf of their department about things like ballast water exchange." This becomes very important when making decisions about development projects at an unprecedented scale and with great uncertainty over the cumulative effects of ballast water exchange in a rapidly changing Arctic ocean. However, there have been positive developments for federal regulators establishing a greater presence in the Arctic that could be promising. In October 2018, DFO and the Canadian Coast Guard announced the creation of a stand-alone Arctic region inclusive of the four regions of Inuit Nunangat, a first for any federal department (CBC News, 2018).

After a review is finished, having a physical presence in an affected community would be beneficial for sharing information throughout the follow-up phase. For both communities and the NIRB, an issue identified through the document review and the focus group was better communication of the results from monitoring studies from both proponents and regulators. According to one NIRB staff member: "There is no substitute for in-person communication, especially in a culture which is born out of oral traditions and communication, where the importance of it can't be overstated." Having a physical presence in communities, for proponents and regulators, is important. For example, ship tracking data is freely available to access over the internet but there are issues with accessibility for some community members, especially for those most marginalized. According to staff, proponents seem to think it is a complicated fix, but it could be as simple as installing a monitor in a Hamlet or HTO office. Being able to walk into an office and see ship tracking data on a monitor would be an effective way to provide real-time ship tracking data to land users.

Quality/format of the information being exchanged: Communication challenges persist in the quality of the information presented in community meetings or information sessions. One challenge is proponents or regulators providing meaningful translations into regional dialects. Language and dialect can be vastly different among regions and the language authority, Inuit Uqausinginnik Taiguusiliuqtiit, has not always been able to keep up with project-specific terminology. One example surrounds uranium mining. Inuit languages do not have terms associated with uranium and its development. The term that was used translated to the 'yellow

rock that kills'; this translation is not one many proponents would be eager to use in public meetings. In the Kiggavik assessment for a uranium mine approximately 80 kilometres west of Baker Lake, the NIRB noted that the lack of terminology in Inuktitut of basic components and activities compromises "the foundation for the Kivalliq community members to understand the Project… and does not reflect the values and priorities of the Kivalliq community members, or Nunavut as a whole" (Kiggavik FHR, 2015, p. 240). In addition to the gap in language, uranium was "the mineral that must not be named" due to public fears surrounding uranium mining (NIRB Focus Group). Therefore, the challenge of expanding the existing IQ knowledge system to include an understanding of uranium through education is nearly impossible without terminology across Inuit dialects. However, the onus of developing or updating a lexicon for projects is not up to an individual proponent but the Government of Nunavut and the Language Authority.

Meaningful translation is not always the issue, but communication challenges still exist in how regulators present information to communities. The IA process is one of the only points of contact for many community members regarding issues like shipping. The NIRB becomes a "repository for a lot of comments because people aren't sure of who to talk to." There are two issues here. First, often agencies are poor at communicating what it is that they regulate. It can be hard for people to distinguish if their concern is related to shipping or impacts to fish, and to wrap their heads around why they would go to Transport Canada over DFO, respectively. In previous hearings when some of these agencies are in front of communities, a large portion of time is devoted to the 'nitty gritty' details of specific pieces of legislation in order to cover liability. According to one NIRB staff member, community members simply do not care: "They want to know if they are responsible for my concern or not, who do I direct my question to." A second issue is that if IA is often the only venue for interaction between these agencies and communities, there is a tendency for issues to come up that are well beyond the scope of the project under review.

Maintaining learning: Turnover and the retention of organizational learning can be a challenge for responsible authorities, while NIRB has generally seen long term retention of board members and staff (NIRB, 2018). But when the NIRB has seen individuals from government departments return who have been through the process before, their effectiveness in communicating increases as well as their ability to 'hear' and understand what communities are

saying by having experience from past assessments in Nunavut's cultural context. According to one staff member, "You need someone who can translate English to English before we translate it into something else." For regulators, especially for those without a permanent presence in the territory, a willingness to use different knowledge and engage with communities is critical in informing their own submissions but also in ensuring that learning from one assessment can be translated into organizational learning to be used in the follow-up phase and future assessments.

As stakeholders and right holders gain more experience in NIRB's process, the more learning can take place. For example, the NIRB noted learning among communities in terms of their understandings of shipping impacts the more they engage in the IA process. For example, prior to the Mary River assessment, ballast water exchange was not really an issue on the radar in assessments as most operations involved seasonal resupply. However, the Mary River review "really lit up community members' concern about ships coming in from other places and bringing in larger amounts of water." The NIRB itself had to do a lot of work to understand the models, regulations, and enforcement mechanisms in order to assess if they were suitable for Arctic waters. In subsequent reviews, like Meliadine, ballast water became an issue for communities in so far as confirming whether or not is was going to be used as part of the mine's sealift. This is related to the results presented earlier whereby the types of issues raised by communities correspond with previous experiences with development.

Proponents are learning through the NIRB's process, too. Under the terms of references of a review, proponents are required to demonstrate how IQ was used, what knowledge was gained and how, and how IQ was applied to project design and to identify potential impacts, cumulative effects, and mitigation measures. Meeting the requirements of using IQ is not to be achieved through routine public consultation but through IQ studies and data collection with affected communities. When the NIRB was asked about their perception of how receptive proponents, who are new to doing business in Nunavut, are to the inclusion of IQ, both the board members and staff reiterated that the expectations are well beyond giving lip service to traditional knowledge. The proponents that do not get it, very clearly stand out: "the bar [for acquiring a social license from Indigenous communities] is pretty high in Canada but even higher in the Arctic." When an application is rejected due to insufficient community engagement, proponents and consultants are learning what is considered 'business as usual' in Nunavut and often go back to communities to do their due diligence in order to submit a stronger application.

Chapter 5 Discussion

The purpose of this research was to examine how knowledge about Arctic shipping impacts and mitigation are brokered through IA processes. The objectives were to identify the routine information needs of rights holders and stakeholders about shipping impacts and mitigation; assess how these information needs are addressed through an IA where knowledge is brokered; and identify opportunities for enhanced knowledge exchange and capacity building to support decision-making. In the literature on knowledge brokerage and assessment, the question is often raised whether knowledge brokerage and learning are explicitly designed into the IA process as a desired outcome or whether they are incidental (Partidario & Sheate, 2013; Saarela et al., 2015; Sánchez & Mitchell, 2017). The results of this research show that while knowledge brokerage and learning are not explicitly designed into Nunavut's assessment process, they inevitably take place to support decision-making in IA about marine shipping.

5.1 Information needs of rights holders and stakeholders

The routine impacts and mitigation measures of Arctic shipping are not all that different from shipping operations in southern Canada. Impacts from port or dock construction activities, ballast water exchange, and the effects of traffic on marine wildlife are routine, although their significance and extent vary across projects and ecosystems. Mitigation measures tend to focus on compliance-based measures with shipping management plans using BMPs to minimize risk and meet regulatory compliance. The comments submitted to the sample of IAs that were reviewed covered a wide variety of topics. Results from this research show that information needs about shipping impacts and mitigation are complex and dependent on the project, the local and regional ecosystems, and the dynamics and histories of communities affected by the project.

Regulators tended to focus more on the steps of the IA process, with monitoring receiving the most attention. Marine mammals, noise effects, ballast water, uncertainty, and adaptive management were topics frequently discussed across comments that referred to the IA process. In performing their regulatory function, responsible authorities like DFO, CIRNAC or EC provide their expertise on matters under their respective jurisdictions while also positioning information requests to support and inform their own authorization processes.

Comments from community members and organizations were more general and often related to understanding project design, project interaction with valued components, and the management plans to address these impacts as well as potential accidents and malfunctions, especially fuel spills. Because communities in Nunavut rely on some of the same shipping operations and infrastructure for community resupply, these operations are familiar. From the comments reviewed, communities seek assurance that if a project proceeds, there are mechanisms in place to manage and monitor impacts and enforce the terms of a project certificate. However, regional differences were found in the types of issues raised by communities. Comments from Kitikmeot and Kivalliq tended to be more practical, indicative of communities that have been through the process before, whereas less experience with development and a greater sense of marine culture meant that comments in Qikiqtani covered many different topics related to both the process and the project. Experiences with past development can inform the way new developments are viewed. For three communities in Nunavut, Stewart et al. (2015) found that temporal factors, like past exposure to cruise ships, informs future actions and adaptive strategies in how communities perceive the risks and opportunities of marine-based tourism. In tourism IA screenings, there were similar concerns expressed over shipping, such as the potential for cumulative effects and a project's interaction with valued components. The importance of community engagement by tourism operators was raised in comments as well as reinforced by the NIRB in Screening Decision Reports by encouraging proponents to give sufficient advanced notice of planned community visits. This communication gap, between operators and communities, was identified by Stewart et al. (2015) as a barrier to experiencing the full economic benefits of tourism.

There is a tendency, however, for issues to arise in an IA that are beyond the scope of what can be addressed within the confines of project-based IA (Udofia, Noble, & Poelzer, 2015). These can be considered chronic information needs when considering Arctic shipping. However, not all issues are appropriately addressed or managed at the project level; regional and strategic assessments provide better opportunities to address concerns over the appropriateness of development for the region, or the most desirable development future (CCME, 2009; Fidler & Noble, 2013b; Noble & Hanna, 2015). Although information needs were diverse, the subtext of many of the comments, especially by rights holders and community members, involved more strategic-level topics when considering Arctic shipping impacts and mitigation, including

addressing uncertainty, the cumulative effects of increasing traffic, and the effectiveness of existing mitigation measures.

Uncertainty: Uncertainty is ubiquitous in Arctic environments, especially as it relates to shipping impacts on the marine environment. There is uncertainty in baseline and changing environmental conditions, in climate models, in marine transportation risk, in questions of governing the Northwest Passage, and so on (Arctic Council, 2016). Discussions of how to manage uncertainty are found within the broader IA literature (Tennøy et al., 2006; Bond et al., 2015; Leung et al., 2015; Leung et al., 2016). The current model of IA that is predominately practiced is baseline-led, meaning that the implications of changes induced by a proposed project and mitigation measures are evaluated against the existing situation (Bond et al., 2015). Therefore, gaps in scientific baseline data on Arctic species, where southern species are used in modelling, often leads to uncertainty in impact predictions. Concern over the impacts of shipping on marine wildlife, for example, are heightened by concern over the increase in Arctic shipping traffic generally and the considerable uncertainty related to cumulative effects. Additionally, uncertainty over the effectiveness of existing mechanisms to manage shipping impacts in an Arctic setting can further complicate significance determinations of residual impacts (e.g., Wood, 2008).

As gatekeepers for proponents seeking approvals and authorizations for new proposals, the IA process presents an opportunity for regulators to attempt to secure the data they need to fulfill their own jurisdictional responsibilities if the project goes ahead (Lawrence, 2013). From the NIRB's perspective, the challenge is striking a balance between ensuring data needs are met but also not having regulators front-load the process with their own data needs. The NIRB must balance creating opportunities through monitoring that are appropriate for individual projects and proponents, and having to accept a high level of uncertainty in their decision-making.

Cumulative effects of shipping: Concern over the cumulative effects of shipping was another theme that emerged in comments, both from rights holders and stakeholders. This included concern over cumulative effects within a single project, such as chronic noise from ships, as well as concern over the increase in Arctic vessel traffic generally. The magnitude of shipping and icebreaking activities for the Mary River project alone is unprecedented in Canadian Arctic waters and generated concerns over the cumulative residual effects across the twenty-year project lifespan. Additionally, concern was generated in individual IAs over the cumulative

effects of the general increase in total shipping traffic within the NSA, especially for communities where this increase is observable due to proximity to shipping routes. The challenges of assessing cumulative effects through project-based IAs are well noted (Duinker et al., 2013; Noble et al., 2017; Sinclair et al., 2017). Identifying cumulative effects can be a technically challenging process in IAs, even though they may seem 'obvious' to affected communities observing change over time (Arnold et al., 2019).

Shipping traffic in the NSA doubled between 1990 and 2015, and further increases in shipping activity are expected as sea ice regimes continue to influence accessibility (Dawson, Copland, et al., 2017). However, shipping associated with mining developments are currently the only form of shipping that undergoes a comprehensive IA review; cruise ships, research vessels and private yachts may undergo a screening, only if the NIRB receives a referral from Parks Canada or the Nunavut Planning Commission (after a conformity determination is made against a land use plan). Private pleasure crafts were the fastest growing vessel type in the region over the past 25 years. With discoveries such as the Franklin Expedition and the allure of 'last chance' tourism along the Northwest Passage, the demand for Arctic marine tourism will continue (Dawson et al., 2018). Regional demographics and a focus on further developing a fisheries economy suggest that general cargo, tug and barge, and fishing traffic will not decrease (Dawson, Copland, et al., 2017). Therefore, a regulatory gap exists in how different types of shipping activities are managed in the NSA.

Assessing mitigation: This research found that the approach to managing the impacts of project shipping in the NSA is largely compliance-based coupled with the use of BMPs in shipping management plans. Given this focus on compliance, assessing the effectiveness of existing legislation, regulations and BMPs to manage the impacts of shipping in Arctic waters, along with where a more precautionary approach is necessary, is a significant task for the NIRB in IA decision-making. Monitoring to confirm the effectiveness of mitigation, along with enforcement mechanisms to ensure their implementation, is important for creating adaptive capacity (Morrison-Saunders et al., 2003; Tinker et al., 2005), or the ability to cope with, prepare for, and adapt to uncertain or changing social-ecological conditions (Dale & Armitage, 2011)

As part of its annual monitoring reports, the NIRB may reconsider mitigation measures, monitoring programs, and existing terms and conditions. Annual monitoring reports are prepared by Proponents and are submitted to the NIRB, as well as to regulators in order to satisfy their

own permitting/licensing requirements. The NIRB issues recommendations to address unanticipated effects, unexpected monitoring results, or when a proponent is found to be non-compliant with a condition of their project certificate. The comprehensive monitoring function the NIRB performs is therefore critical for creating an adaptive management cycle. This is especially important given the uncertainty over the effectiveness of some mitigation measures, such as the efficacy of speed restrictions on reducing the noise effects of ships on marine mammals or the chronic exchange of ballast water into Arctic environments. In one example, project certificate conditions 106 and 107 of the Mary River project require the use of shipboard observers (SBO) to monitor for marine mammals and birds along the shipping route and to report any ship strikes. In the NIRB's 2017-2018 Monitoring Report, Baffinland was non-compliant with these conditions after the SBO program was discontinued in 2016 due to safety concerns over transferring observers from smaller vessels to vessels at sea as well as limited sightings of marine mammals by observers and through the use of unmanned aerial vehicles. The NIRB's subsequent recommendation requested the proponent work with the project's Marine Environment Working Group to develop alternative strategies for monitoring vessel interactions with marine mammals should the SBO program continue to be unfeasible due to safety concerns (Mary River Annual Monitoring Report, November 8 2018). The proponent agreed to reinstate the observer program during operations in 2018 and in Baffinland's 2018 Annual Report to the NIRB, the initial safety concerns were mitigated through the use of a dedicated survey platform and on-board accommodations for Inuit observers on MSV Botnica, an Ice Management Vessel. This allowed for consecutive days or weeks of wildlife surveys instead of occasionally onboarding observers at sea. It also resulted in a substantial increase in wildlife sightings in 2018, a total of 551 sightings totaling 2,766 individual marine mammals were observed compared to 65 marine mammals in 2013, 12 in 2014, and 16 in 2015, although no ship strikes were reported over the four years (Mary River Annual Report to the NIRB, March 8 2019). This is just one of many examples from NIRB's project monitoring where enforcement action is taken, and the effectiveness of a mitigation measure and monitoring program is improved.

5.2 Knowledge brokerage

Some of the ways the NIRB addresses their own information needs and those of rights holders and stakeholders in decision-making is through a process that enables knowledge brokerage and

the ability to create longer term benefits and learning in follow-up. IA is a process that collects, generates and stores knowledge. Knowledge – whether existing or new, western or Indigenous – is gathered or created through baseline studies, preparation of impact statements, and in follow-up, and is exchanged and communicated among stakeholders to support the decision-making of an assessment agency or board. However, the way knowledge is exchanged and by whom has implications for the effectiveness of the process (Chanchitpricha & Bond, 2013).

IA has enabled learning through the exchange of technical knowledge, albeit mostly between consultants, proponents, and administrators (Sánchez & Mitchell, 2017). However, this exchange alone is insufficient in contributing to the more substantive or normative goals of IA (Cashmore, 2004). Knowledge brokerage is one approach that seeks to move beyond the transfer of evidence and the exchange of technical knowledge and to additionally move beyond engagement as 'mining' of local knowledge to make for a smoother planning process; instead knowledge brokerage is an approach where various types of knowledge are engaged to contribute to a collective learning process (Partidario & Sheate, 2013). In a strategic assessment context, Sheate & Partidario (2010) identified a number of conditions that are likely to facilitate knowledge brokerage to take place: a range of stakeholders; opportunity space; time and space that is conducive to knowledge exchange; an environment where learning is encouraged; receptiveness of the proponent; and a willingness to use different knowledges. While knowledge brokerage and learning are not explicitly designed into NIRB's assessment techniques, they are incidental outcomes of their process, enabled through the terms of the *Nunavut Agreement* and *NuPPAA*. Each of the conditions are discussed below.

Range of stakeholders: One of the fundamental premises of knowledge brokerage is a willingness to share power and to recognize other partners in the decision-making process (Partidario & Sheate, 2013). Power sharing is the desired result of co-management when conceived as a continuous process of decision-making involving deliberation, negotiation, and joint learning (Carlsson & Berkes, 2005). Through the *Nunavut Agreement*, the mandates of the institutions of public governance are to spread decision-making among communities, federal and territorial governments, and local Inuit and NLCA organizations, therefore ensuring a wide range of stakeholders are included. Although the NIRB is not responsible for carrying out consultations, the NIRB has specific obligations to inform the public and facilitate participation in the decision-making process by providing opportunities and forums for the public and Inuit

organizations (NIRB, 2018d). The governance structures created under the *Nunavut Agreement* as well as the federal government's remaining jurisdiction ensure that a wide variety of territorial and federal regulatory stakeholders are involved. The general public, affected communities, and Inuit organizations engage in screenings and reviews at multiple stages and various capacities, and proponents are strongly advised to consult with potentially affected communities before developing project proposals.

Opportunity space & conducive space: Opportunity space for knowledge brokerage requires time, space, and resources to produce a conducive, open-dialogue environment where the exchange of knowledge can take place (Sheate & Partidario, 2010). Opportunity space is enabled at multiple points in the assessment process, from screening to scoping, technical meetings, and final hearings. Process points that make the NIRB unique are the inclusion of community roundtables at the pre-conference hearing phase. In many other jurisdictions, this step is predominantly a technical one, but the community roundtables provide an additional check to address outstanding issues prior to submitting a final EIS. In scheduling opportunity space, the NIRB and proponents have shown flexibility in timelines in order to enable the greatest opportunity to have community and HTO members involved. For example, the public hearing for Phase 2 of Mary River was scheduled for May 2019 but has since been moved to September 2019 due to the challenges of holding a hearing during the summer months when people are harvesting and camping in addition to calls from regulatory stakeholders for more time in the technical review (Nunatsiaq News, 2019).

As for conducive space, the intent of this research was not to evaluate participation in NIRB's process; however, from the NIRB's perspective there has been an overall positive trend over time in how proponents and responsible authorities engage with communities. This is the benefit of having long-term retention of several board members who have served multiple terms in maintaining organizational memory (Fitzpatrick, 2006). Delays in appointments and vacancies can compromise the ability of management boards to maintain internal capacity to reach timely and appropriate decisions about proposed developments (McCrank, 2008). The process gives significant weight to the opinions of Elders and community members and to the traditions of Inuit oral communication and decision-making which is instrumental in creating space that is open and fits within Nunavut's cultural context. However, this does not mean there are not real challenges in creating conducive space, as discussed in the final section of this Chapter.

Encouraging learning: Learning is important in building longer-term adaptive responses to minimize risk and uncertainty, and thus a greater ability to cope with variability (Armitage et al., 2011). In order to facilitate learning in IA, structures and practices that foster information sharing and interpretation are needed (Sinclair et al., 2008). As a co-managed IA process, the NIRB's assessments are part of an iterative process of learning where both individual, social and organizational learning can occur.

Learning is gained from individual project assessments through the exchange of IQ and technical knowledge and is also able to be applied beyond the immediate assessment. Weaver et al. (2008) highlight how project-based IA can contribute to creating knowledge in information-poor areas where baseline data is lacking. However, Greig and Duinker (2011) point out that especially in areas where there is impact uncertainty or when a specific type of impact is first recognized, it is unlikely that uncertainties would be substantially reduced over the course of a single project assessment. The potential severity of newly identified impacts, how it varies with changing environmental conditions, how it interacts with other system drivers, observability over time, and the effectiveness of proposed mitigation can be a major source of uncertainty. However, if subsequent developments can build on prior investigations, over time it becomes possible to significantly improve the understanding of the impacts and ecosystemic factors (Greig & Duinker, 2011). Additionally, this can contribute to an important learning outcome for IA, how to design and manage projects that mitigate adverse effects and enhance benefits (Cashmore et al., 2004; Chanchitpricha & Bond, 2013). Sharing knowledge across assessments can result in collaborative learning through IA, which can not only lead to changes at the project level but also in future decisions (Marshall et al., 2005; Sánchez & Mitchell, 2017).

The NIRB is in a unique position to due to the role it plays in the monitoring of approved projects. The NIRB's monitoring function is meant to coordinate monitoring activities among proponents and regulators and set the specifics of programs rather than duplicate efforts in order to monitor project effects, determine the effectiveness of mitigation, and revisit approvals when necessary. This comprehensive monitoring function allows for the data and information gained in the follow up phase to be used and transformed into knowledge to improve both the efficiency and effectiveness of the NIRBs work (Sánchez & André, 2013). Monitoring and the evaluation of management approaches is imperative for learning and enabling adaptive management (Plummer et al., 2017).

Generally, IA is recognized as a driver of advancing science (Cashmore, et al., 2004; Greig & Duinker, 2011; Sánchez & Mitchell, 2017). New studies are being published, for example, on the distribution of ringed seals and implications for icebreaking from the Mary River project (Yurkowski et al., 2018) or on assessing the risk of invasive species in ballast water exchange along Davis Strait (Goldsmit et al., 2019). In the western and central Arctic, studies are contributing to an understanding of shipping noise and its effects on marine mammals (Halliday et al., 2017; McWhinnie et al., 2018; Pine et al., 2018). For the NIRB, the knowledge and baseline data that is created through project monitoring will not only help in future project assessments or modification but also when the NIRB considers more strategic questions such as the ongoing strategic environmental assessment of offshore oil and gas development in Davis Strait.

Receptiveness of the proponent: For knowledge brokerage to occur, the receptiveness of proponents to receive external input and a willingness to use other forms of knowledge and expertise is critical (Partidario & Sheate, 2013). As noted previously, the NIRB has generally seen proponents 'getting it', and the ones that do not, more clearly stand out. The terms of reference for project reviews make the inclusion of IQ non-negotiable for project proposals, and final decision-making gives significant weight to the opinions of rights holders and community members and to Inuit traditions of oral communication.

Willingness to use different knowledges: Proponents are required by the NIRB to include any questions or concerns pertaining to the collection and use of IQ that have been raised in any public participation activities. Additionally, in preparing impact statements, proponents must include how IQ was used to identify potential project effects, cumulative effects, mitigation measures, and potential residual impacts (NIRB, 2018d). An important determinant of trust in the process is demonstrating to rights holders and communities how their input is valued, instead of rejected or ignored (Partidario & Sheate, 2013). Co-management provides a good example for a broader science of sustainability, a forum for dialogue and decision-making to bridge Indigenous knowledge and modern scientific principles (Gondor, 2016).

5.3 Opportunities

Some of the challenges identified by this research in the brokerage of knowledge in the NIRB's process included meaningful participation from regulators, the quality and format of

information that is exchanged, and maintaining learning among IA intervenors. These communication challenges are not unique to the NIRB or Arctic IA. Each are discussed below along with potential opportunities to enhance knowledge exchange.

The NIRB, established in 1996, is a relatively new IA process compared to other jurisdictions in Canada. Initial years were spent building institutional capacity, policy development, and human resources in order to fulfill its mandate under the *Nunavut Agreement* (NIRB, 2018a). Building capacity takes time for skills and institutions to develop and mature (Pope et al., 2013). Regulatory systems across the Arctic and Inuit Nunangat are often lumped together in 'the North' as experiencing ambiguous capacity constraints (Darling et al., 2018). But after over 20 years of implementation, the NIRB has demonstrated that it is a highly competent, reflexive, and adaptive agency and process. This research has shown how the NIRB exchanges knowledge in order to make decisions surrounding shipping, and how the NIRB and participants in their process are learning and storing knowledge. Despite its progress, there remains opportunities where additional support is needed.

Guides and resources: One way the NIRB has been able to store and incorporate learning from past assessments is by preparing and updating guidance documents such as technical guides for proponents, intervenors, and authorizing agencies. The NIRB has created efficiencies through standardized terms of references for assessments, which are currently in their draft form undergoing consultation (NIRB, 2018b). Creating consistency in standards of practice can facilitate the transfer of knowledge from one assessment to the next as well as maintain organizational memory (Fitzpatrick, 2006; Sánchez & André, 2013). Updates to the guides as well as illustrative process and terminology guides reflect changes made by *NuPPAA* and explain the 'one-window' approach through the Nunavut Planning Commission and the NIRB, as well as the coordinated process with the Nunavut Water Board. However, there are some areas identified by the NIRB where more resources are needed.

One community information need identified in this research was understanding the regulatory process, identifying who is responsible for what, and associated issues of reporting and enforcement. Resources exist on the integrated resource management structure of Nunavut, (NIRB, 2018c) and the NIRB offers IA process and terminology guides in English, Inuktitut, Inuinnaqtun, and French (NIRB, n.d.b), but a useful resource would be how federal responsible authorities fit into the structure. Another opportunity identified in the focus group was a guide to

identify for communities and transboundary groups about where in the process are the best opportunities to participate. Making interventions 'scalable' would be valuable to communities, given capacity restraints on their full participation in an IA.

Capacity-building: Financial capacity restraints can be a factor in bringing the right people to the table, which can have further implications for the quality of the information being exchanged. In addition to advocating for their own funding needs, the NIRB also advocates for the funding needs of their participants. For rights holders, participant funding is needed to be able to engage effectively in NIRB's review processes. Funding capacity can be an obstacle for communities and community organizations to fully participate in regulatory processes (Udofia et al., 2016), and the NIRB does not have a consistent participant funding programme. In follow-up, there is a need for funding for community-based monitoring (CBM) or for participation in working groups. Currently, many CBM programmes rely on third party funding through grants. For example, a desire has been expressed for HTOs to participate more in monitoring because of the knowledge they hold and their active use of the land. The NIRB has been conscious to not place additional responsibilities on HTOs due to a lack of a clear funding mechanism to support that work since funding for HTOs under the *Nunavut Agreement* is contingent on very specific roles that does not include monitoring.

Funding for the participation of responsible authorities is also important. Effective participation by regulatory stakeholders is critical for decision-makers by contributing and interpreting data (Arnold et al., 2019). For the NIRB, decision-making can become that much harder without adequate representation from government departments and quality submissions. NIRB staff spends a great deal of energy ensuring that the people that need to be there are there. This means reminding ministers or deputy ministers that they need to sign off on the high costs of travel to get people to the table. This includes resources to be able to engage with communities in order to inform their own submissions and to communicate results in the follow-up phase. Adequate resources in terms of human resources and financial capacity are critical for follow-up and in reporting back to stakeholders (Morrison-Saunders et al., 2003).

Having the resources to maintain a presence in communities is important for sustaining relationships. In NIRB's experience, even without the type of lexicon challenges that came with uranium mining, there are challenges in communication between communities, proponents and regulators in translating information both ways: of translating scientific and technical

information into Inuktut, and translating concepts that are unique to Inuit culture to an English-speaking (and thinking) audience (Barry et al., 2016). This is related to the broader underlying epistemological challenges of bridging Indigenous knowledge with scientific knowledge and western environmental resource management systems that are not unique to Nunavut (Usher, 2000; Ellis, 2005; Stevenson, 2006; White, 2006). Ultimately, relationship building, trust and understanding take place at the level of personal engagement with different forms of knowledge and cultural experiences (Natcher et al., 2005). Therefore, having an ongoing presence in affected communities is important. While internet-based reporting tools have their place, 'there is no substitute for in-person communication' for a culture that is born out of oral communication.

Lastly, greater regional integration of project monitoring could help to maximize effectiveness and create efficiencies. While individual project monitoring is a coordinated effort under terms and conditions, there is less integration of monitoring at the regional level in Nunavut. This is consistent with other jurisdictions such as the Beaufort Sea of Canada's western Arctic (Fidler & Noble, 2013b), but this is not a distinctly Arctic problem (CCME, 2009). On the socioeconomic side, there is more coordination through regional socioeconomic monitoring committees; proponents can align their monitoring programs with regional initiatives to be empowered to fulfill their individual obligations. On the biophysical side, there is less regional coordination but there is a desire to do so, especially among regulators like DFO. It was suggested in the Kiggavik assessment that the proponent work with the proponent of Mary River on their Marine Environment Working Group due to overlap of their respective shipping routes. However, the Kiggavik project was not approved after a review. But this approach, to encourage the participation of multiple project proponents on a regional working group, could alleviate some common issues of aligning monitoring methods and data collection in order to ensure monitoring and data are quality controlled, transferable and comparable (CCME, 2009; Fidler & Noble, 2013b).

Furthering the 'one-window approach': A regional or strategic approach to Arctic shipping and the management of the Nunavut Marine Area can contribute towards the 'one-window approach' envisioned under the *Nunavut Agreement* and *NuPPAA*. There is an "appetite for collaboration" among IPGs, NGOs, and government in Nunavut which could broadly allow for more efficiencies (NIRB, 2018). *NuPPAA* does advance the implementation of the 'one-window approach' envisioned in the *Nunavut Agreement*, with project applications coming first through

the Nunavut Planning Commission for compliance with land-use plans. There are two opportunities for collaboration specifically related to managing the marine environment in addition to regional-level monitoring: the Nunavut Marine Council and land-use planning.

In NIRB's most recent Five-Year Strategic Plan (2018-2022), the NIRB identified 6 primary goals for the organization; the first five were in previous plans and focused on objectives in organization and policy areas such as fulfilling its mandate under the *Nunavut Agreement*, how to reflect IQ through its work, and how to promote public confidence and participation in its processes. The new and sixth goal refers to collaboration to manage marine issues. Article 15 in the *Nunavut Agreement* established a role for the NIRB beyond project assessments to advise and make recommendations in marine management. Together, the NIRB, Nunavut Wildlife Management Board, the Nunavut Planning Commission and the Nunavut Water Board form the Nunavut Marine Council to provide such advice. While the mechanism exists, limited financial capacity has been an issue in fully realizing and embracing its mandate. Funding for the Marine Council is provided by the Government of Canada through the implementation of the *Nunavut Agreement*, but is dispersed through annual contribution agreements to each of the IPGs. Objectives identified by the NIRB in this area include developing a collaboration strategy, clearly defining marine issues and management mechanisms, and improving understandings on these topics. One of the specific objectives refers to utilizing the results of the Strategic Environmental Assessment of oil and gas development in Baffin Bay and Davis Strait in order to identify and manage marine issues, representing an example of using knowledge beyond the immediate assessment.

The second opportunity is land use planning. In the *Nunavut Agreement,* 'land' refers to the marine environment as an extension of the land and is therefore covered under land use planning. Currently, there are only two approved land use plans implemented in the territory, both of which have not been substantially updated since their approval in 2000 (NPC, n.d.). An updated and territory-wide land use plan could address concerns over the cumulative contributions of future developments, especially for those associated with projects that do not typically trigger an IA review. A Draft Nunavut Land Use Plan was released in 2016 but consultation processes have stalled (NPC, 2016). Having updated plans for each region would benefit the regulatory process in two ways: enabling a 'one-window approach' for all regions and providing opportunities to address larger issues beyond project assessments. When the NPC receives a

proposal for an area with no approved plan in place, the proposal goes directly to NIRB. Even in regions with plans, when these plans are not kept current to reflect the values of communities, the IA process struggles with larger regional issues at the project level (Barry et al., 2016). The NIRB's assessment process is often one of the only avenues for community members to interact with responsible authorities and as this research has demonstrated, there is a tendency for some regional issues beyond the scope of a project to be raised at the screening or review level. The planning process would allow for lessons learned through IA to be fed into land-use planning.

Chapter 6 Conclusion

The purpose of this research was to build an understanding of how information about shipping impacts and mitigation is exchanged throughout the IA process. Results showed a wide variety of topics and concerns raised by rights holders and stakeholders in comments submitted to the IA process about shipping. Key themes included the presence of uncertainty, concern over the cumulative effects of increasing Arctic shipping traffic, and questions surrounding the appropriateness of management strategies for an Arctic environment. Mitigation measures employed by project proponents to manage the potential impacts of shipping centre on compliance-based measures and best management practices to meet regulatory compliance. The NIRB uses project monitoring, the precautionary principle, and adaptive management to monitor the terms of projects certificates while also creating longer term benefits. As the NIRB's process has developed over the last 23 years, communities, regulators, proponents, and the NIRB have matured and learned as they engage in IA, however challenges remain. Similar to experiences in other co-management arrangements, it is about managing relationships and communication, not solely managing resources (Carlsson & Berkes, 2005; Dale & Armitage, 2011; Natcher et al., 2005). Additionally, co-management decision-making is a continuous process, not a definitive state. Opportunities exist in areas such as: regional assessments of shipping, financial capacity, better communication in the follow-up phase, language development and translation capacity, land use planning, and further collaboration among IPGs.

Ultimately, this research aimed to develop a meaningful partnership with the NIRB to conduct research in a way that is respectful and beneficial for Nunavut in line with the National Inuit Strategy on Research (2018). On the practical side, results from this research will help to address needs identified by the NIRB for advancing engagement and information exchange to support local decision making. Results from the larger project will be made available through a research report and a community toolkit to facilitate better communication, understanding and identification of routine marine impacts and topics often considered in IA. The toolkit will be made available online through the NIRB and the Nunavut Research Institute with select communication products translated into Inuktitut. Given the traditional and active use of marine areas by the Inuit and Nunavummiut and the realities of arctic transportation infrastructure in Nunavut, it is critical that local marine users are empowered to participate directly in the

decision-making processes that affect their daily harvesting, travel and culture. Additionally, this research can help to address some of the uncertainty when it comes to managing marine resources. The larger project identified gaps in baseline data related to marine impacts and how IQ has been used alongside western science in IA. Collectively, results from both projects can be used to identify priority areas where gaps are most critical to fill ultimately contributing to an important learning outcome of IA: how to better design and manage projects that minimize adverse impacts while enhancing benefits (Sánchez & Mitchell, 2017).

This research has contributed to filling three main research gaps. First, while studies exist on the temporal and spatial trends of shipping in the Canadian Arctic (Dawson et al., 2018; Pizzolato et al., 2014), regulatory perspectives on shipping outside of IA (Guy & Lasserre, 2016; Dawson, Johnston, et al., 2017), and cruise tourism from community and operator perspectives (Stewart et al., 2015; Johnston et al., 2017), very little research exists on Arctic shipping from an IA perspective. However, this perspective is valuable. Importantly, this research has built an understanding of how shipping impacts and the concerns around them are managed in decision-making through mitigation and monitoring, as well as the strategies the NIRB uses to address uncertainty both in the immediate project but also in the long term.

Secondly, this research addresses a gap in examining knowledge brokerage at project level IA and from a Canadian perspectives (Sheate & Partidario, 2010; Partidario & Sheate, 2013; Saarela et al., 2015). As project-based assessment remains the dominate form of IA practice in Canada, a knowledge brokerage perspective can contribute to advancing an understanding of more substantive forms of effectiveness beyond the transfer of evidence and the exchange of technical knowledge. IA processes created under land claims in the Canadian Arctic provide a well-suited example to demonstrate how a process can enable a knowledge brokerage approach as identified by Partidario and Sheate (2013) where "stakeholders are seen as part of the solution and where long-term benefits may accrue through knowledge creation and co-production" (p. 35).

Lastly, this research has contributed to a gap in the IA literature on Nunavut's unique assessment process. While some studies have looked to Nunavut for examples from specific assessments, for example, Meadowbank was used by both Gondor (2016) to examine the role of IQ in EIS preparation and Kennedy Dalseg et al. (2018) to explore how gender was scoped in IA in three projects across Nunavut, Nunatsiavut, and the Mackenzie Valley, none have looked at a sample of IA's conducted by the NIRB to document their decision-making process. This research

has contributed to an understanding of how Arctic shipping is assessed and managed by the NIRB, but also some unique features that facilitate the exchange of knowledge to build adaptive capacity.

6.1 Future Research

Changing demographics, market trends, tourism demand and climate change are expected to continue to drive interest in Arctic shipping (Council of Canadian Academies, 2017; Dawson et al., 2018). The challenge for decision makers is balancing an interest in economic development with the integrity of the Arctic's biophysical and human environments. This research built an understanding of the impacts and concerns around shipping that are often considered in IA. It also discussed how the NIRB is able to address uncertainty, create benefits beyond individual projects, and exhibit learning and exchange knowledge by creating new knowledge through coordinated monitoring programmes. Future research could involve a longer-term study on the outcomes of how knowledge from monitoring is used to inform project design and impact management of future projects to reduce risk and maximize benefits.

Additionally, Nunavut's IA process is a relatively new regime and the NIRB's process is not well-explored in the literature compared to its territorial counterparts, let alone IA processes in southern Canada. Indigenous-led impact assessment is an emerging form of IA in Canada, driven in part by court cases, international laws and norms like the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP), modern land claims, and a strong discontent with status quo assessments among many Indigenous groups (Gibson et al., 2018). Gondor (2016) argues that the institutional framework of IA in Nunavut may provide a good example for the management of other landscapes due to the level of decision-making power given to resource users, as well as the opportunities for communication and information exchange among proponents, rights holders and stakeholders. Future research could explore the lessons learned through the process developed under the *Nunavut Agreement* and how these could be applied to Indigenous-led IA in other jurisdictions.

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Appendix A: Focus group question sets

Introduction to the project and overview of the project's objectives

This is a collaborative research project developed with the Nunavut Impact Review Board (NIRB).

The work has two parts. The **communication part** will examine the best ways to communicate marine related impacts to communities and environmental assessment (EA) stakeholders to improve participation, including identifying the information routinely needed. The **information part** will identify key baseline information needs related to marine activities and assess options for meeting these.

The project has two key outcomes of value to Northern communities, agencies and industry. **First**, the research will work to produce a community tool kit that can help provide information about the routine and expected impacts of marine related operations that can occur from development. This will support better community engagement in EA. **Second**, it will create an understanding of gaps in baseline information that affects the assessment of marine-related project applications and consider longer-term options and feasibility for addressing them. The role of traditional and local knowledge, and adaptive management approaches in addressing baseline information needs is also reviewed.

The approach employs a review of EAs conducted in Nunavut; a review of global EA research to identify options and approaches to communication and information development; and engagement with EA stakeholders, through the NIRB, to identify community, government and industry needs and best approaches to providing information and advancing capacity in EA and other planning processes. Engagement is facilitated through 1) the focus group today, 2) NIRB requests to partner organizations and stakeholders to identify needed information and specific knowledge to be included in communication and information materials, and 3) the eventual sharing of draft materials with stakeholder organizations for comment, review and enhancing. Parts 2 and 3 are done through the NIRB.

This provides a research-based approach to addressing needs identified by the NIRB for helping to advance consultation, information communication and information collection to support an enhanced understanding of the marine related impacts considered in Nunavut's EA process.

The discussions and questions focus on agency perspectives and information that you can provide as an agency representative, either as a Board member or NIRB staff.

The questions cover areas of your agency's practice and can be provided as part of your role with the agency. They do not address areas of confidential deliberation or decision-making. What we seek is information from the focus group as expert and authorized personnel (to release information or data in the ordinary course of your employment about the organization, and its policies, procedures, professional practices and statistical notes on information needs).

We have reviewed a selection of environmental assessments to see what information about marine related activities seem to be most often requested through consultation, or provided by the agency, or included by proponents in the project application.

The focus group today allows use to elaborate on the document review and learn about the agency experience in managing information provision and requests and help guide the development of standard information products for communicating the impacts of marine activities.

*Introduction of focus group facilitators (a faculty member and a graduate student will ask the questions). *Please note that, notes are taken by laptop. A record of the focus group will be circulated back to the group for review and clarification. *The resulting information will be used to help develop eventual communication products and to understand EA information needs.

All questions relate specifically to marine related activities. This includes shipping, shoreline modification and use, onshore activities to support marine (shipping) activities. The terms and phrases are standard to the field of environmental assessment.

The questions are about information needs emerging during public meetings and hearings, or by registry or written requests that become part of the public record or would be otherwise publicly accessible.

Note: focus groups are conducted in English. The NIRB may choose to provide a translation of the questions into the appropriate dialect of Inuktut.

Board Focus Group Questions

1. Has the Board noticed any regional differences in the types of concerns or questions communities ask during public meetings or hearings held in the Kitikmeot Region or the Kivalliq Region or the Qikiqtani Region?
2. How do gaps or uncertainty surrounding marine baseline data and marine impacts affect decision-making? *Follow up: How are marine information gaps addressed by the Board?*
3. How does the Board determine if Inuit Qaujimaningit values have been well incorporated into the proposed project?
4. Are there challenges with the incorporation and compatibility of Inuit Qaujimaningit in the EA process, and are there examples from specific EA reviews that help illustrate this? *Follow up: How does the board overcome identified challenges?*
5. How has Inuit Qaujimaningit, and its application to the EA review, changed over time?
6. In the Whale Tail Pit Expansion Final Hearing Report, the Board noted that communities expressed concern that they are not informed how the Meadowbank project has been regulated and compliance monitored over the past 10 years. What can be done to make communication between regulators, proponents and

communities better? *Follow up: where do they need more support for their participation in the process?*

7. Where does the board need more support in decision making regarding the marine environment?

NIRB Staff Focus Group Questions

1. In the review process, are there concerns about shipping and related onshore activities that are frequently presented by regulators (like DFO or Transport Canada)? Are there specific marine activities and impacts that are routine regardless of the project or location? (ex. refuelling operations, icebreaking, search and rescue or ballast management). *Follow up: what changes have been made by NIRB to anticipate marine related information requests?*
2. Are there marine activities that communities routinely raise in public meetings and hearings? Which concerns are of most interest to communities? (e.g. refuelling, fuel storage, ice breaking, equipment location, response times, navigational equipment placement, others). *Follow-up: have these changed over the last 5 years?*
3. Building on the previous question, over the last 5 years how has the way marine related information is communicated by NIRB in meetings or hearings changed? (Here we are interested in modifications to the formats rather than content; e.g. text, graphics, other media arrangements). *Follow-up: Have the changes been effective? Are there clear opportunities for improvement?*
4. Do some project stages result in more public information needs than others? For example, more information is sought from the agency about the construction period than for operation, maintenance, or closure/decommission?
5. What areas of marine related baseline conditions has the agency identified as needing further research or development? *Follow-up: Have any of these been identified as priority areas? How are these being addressed?*
6. What challenges has NIRB faced with the incorporation and compatibility of Inuit Qaujimaningit in the EA process? *Follow-up: Are there examples from specific EA reviews that help illustrate this? How does the agency overcome identified challenges?*
7. In NWT, the Mackenzie Valley Environmental Impact Review Board identifies three components of traditional knowledge for use in their process; 1) knowledge from direct observations, 2) experiences/practices, and 3) TK values. Is there a similar approach used here? *Follow up: In EIS guidelines, proponents are asked to include "Types of TK collected", how is this often presented in the review and what does the agency look for regarding types of TK?*
8. The Board relies on the contributions of regulatory stakeholders to provide expertise and an understanding of their jurisdictional basis. In the Final Hearing Report of the Meliadine project, it was noted that limits on the full participation of any regulatory stakeholders can jeopardize the Board's ability to provide a thorough, credible and timely assessments. The Report gives an example of changes to the Federal Fisheries Act. What are some ways regulators can better support the Board's decision-making?

Appendix B: Topics raised in comments submitted to NIRB reviews and screenings

IA Process

baseline data
cumulative effects
impact predictions
impact significance
management plans
mitigation
monitoring

Valued Components

air quality
arctic char
archeological sites
beluga whale
benthic communities
bowhead whale
caribou
food security
importance of marine environment
Inuit harvesting
Inuit travel
land use activities
marine birds
marine fish
marine fisheries
marine habitat
marine mammals
marine VECs
marine VECs selection
narwhal
permafrost
polar bear
polynyas
ringed seals
sea ice (landfast, pack)
seals
sediment quality
sensitive habitat
sensitive periods
soil quality
Species at Risk
terrestrial wildlife
VSECs
walrus
water quality
whales

Project Design

closure and reclamation
construction
duration
frequency
operation
operational flexibility
phase development
post-closure
production increase
project change
project design
project location
project scale
sealift source
ship design
shipping contractors
shipping season
shipping volume
suspend shipping
total traffic
vessel presence
vessel tracking
year-round shipping

Project Activities

accidents/malfunctions
anchoring
ballast water
blasting
discharge
dock
dredging
explosives
fuelling (transfer, storage)
icebreaking
infrastructure
lighting
mooring arrangements
navigation
overwintering
pile driving
port
roads
ship speed
ship tracks
ship wake
shipping route
shore landings
tourism

Effects

abundance
avoidance
benefits
contamination
displacement
distribution
disturbance
dust
emissions
erosion
fouling
fuel spills
grounding
habituation
HADD (harmful alteration, disruption or destruction)
human-polar bear interaction
invasive species
masking
mortality
noise
predation
productivity
sedimentation
ship strikes
ships attracting wildlife
social impacts
transboundary effects

EIS Technical

acoustic data
alternatives
baseline data gaps
bathymetry
cause-effect
climate change
climate data
data mgmt
food chain indicators
hydrological regime
IQ
Knowledge transfer
lower trophic levels
methodology
modelling
risk assessment
sea levels
sensitivity mapping
study area

EIS Technical cont.
tagging
thresholds
transferability to the arctic
uncertainty
variability
wave energy
worst-case scenario

Specific management plans/actions

spill response
adaptive mgmt
best management practices (BMP)
bubble curtain
conflict avoidance agreement
ecosystem-based approach
emergency response
energy efficiency
inspection
lack of shipping mgmt plan
Marine Environment Working Group
mgmt plans
offsetting
precautionary principle
safety
search and rescue
secondary containment
setbacks
shipboard observers (SBO)
silt curtains
site water mgmt
socio-economic monitoring committee
Spill Contingency Plan
waste mgmt

Regulatory

Canadian Coast Guard
compensation
decision-making
enforcement
insurance
land use planning
licensing/permitting
Oceans Protection Plan
Oil Pollution Emergency Plan (OPEP)
priorities
regulatory capacity
regulatory compliance
regulatory gap
regulatory process
reporting
responsible authority
terms and conditions

Community-based

collaboration
communication
community capacity
community concerns
community development
community engagement
community resupply
community-based monitoring
sharing data

Other

capacity
resource extraction/exploration
trends
shipping trend