



## HUMAN DIMENSIONS

**H**uman dimensions refer to the interrelationships of people and the environment, particularly with respect to environmental change. Often, human dimensions concern broad issues such as government policies or institutional responses to change. In the Arctic, human dimensions research has typically looked at local or regional cases. For marine shipping in the Arctic, both the broad and the local approaches are important to consider. Shipping will occur across the entire region, requiring national and international policies to provide effective management and regulation. Because trans-Arctic shipping will be driven largely by global economic factors, as will more local shipping for resource development, the role of institutions such as shipping companies, regulatory agencies and local or regional organizations who may be affected will all be pertinent.

This chapter addresses primarily the local aspects of human dimensions of Arctic marine shipping, with a particular focus on indigenous communities and traditional activities in the marine environment. Arctic marine shipping will occur in the context of many other changes affecting Arctic residents. Climate change,

which will make the Arctic more accessible to marine shipping, will affect most aspects of the lives of Arctic residents, from traditional livelihoods to infrastructure to the spread of disease. Social and economic change will come from national and global trends in trade and communication. Impacts to the environment and society are most likely to stem from the interactions of human and environmental change, particularly as human choices influence the trajectories of change. In this context, shipping may play a significant role not only on its own, but also, and perhaps even more likely, through combining with other drivers of change.

Arctic marine shipping involves several distinct activities, each with different interactions with local residents and thus different implications and likely impacts. Trans-Arctic shipping of cargo, using the Arctic merely as a corridor between distant ports, has some potential for environmental impact, depending on cargo carried and volume, and thus for affecting local societies that depend on a healthy marine environment. The infrastructure required to support such shipping may include port facilities, search and rescue or emergency response capability, and mechanisms of governance



Map 7.1 Circumpolar coastal human population distribution. Source: AMSA

Economically, more shipping may increase trade or lower costs for Arctic communities, while increased resource development can provide employment and income for Arctic residents and regions.

or enforcement, which may include military presence to preserve sovereign claims over certain waters. Such facilities may provide employment and other economic opportunity for local communities, but could also lead to social disruption if many people move to small communities to take new jobs. Local shipping, to and from Arctic ports, is likely to have more direct influence on communities. Indeed, local shipping today provides for substantial shipments of cargo and fuel to remote communities, allowing for a higher standard of living and lower prices than would be possible by air or land shipment alone. Longer shipping seasons could reduce prices further, or allow greater access by visitors.

Another form of local shipping is that in support of resource development in the Arctic. Supplying mines, oil and gas installations, and other development sites, and transporting the materials that are produced there, is the dominant form of marine shipping in the region today. While it is not clear whether reduced sea ice will

have a major influence on development trends, increased shipping is unlikely to constrain development. If indeed development increases, it will have far-reaching economic consequences for the regions in which it occurs, and will likely have environmental impacts as well.

In addition to mineral and petroleum extraction, fishing in Arctic waters is likely to increase as a result of greater access to ice-free waters. In Greenland in particular, the development of a shrimp fishery has had major impacts on coastal communities and indeed on the national economy, as shrimp constitute a major export from Greenland. In Alaska, participation in commercial fisheries has substantial social and economic impacts on communities, implying that increased involvement in fisheries by more northern communities could have major impacts both positive and negative.

One non-extractive industry likely to benefit from increased shipping access is tourism. For local communities, tourism can be a source of revenue but also a disruption, both from direct (though

## A Container of Hazardous Materials Washes Ashore in the Commander Islands, Russian Federation

Bering Island, one of the Commander Islands, lies east of the coast of Kamchatka and west of the U.S. territories in the Aleutians. The only Aleut community on Russian soil and the only inhabited village on the Commander Islands is the village of Nikolskoye with about 750 residents, 300 of them Aleuts. The following is an account of an accident that should serve as a warning sign and an opportunity to examine the Achilles heel in shipping regulation and disaster preparedness, pointing the way toward policy changes to prevent worse disasters.

In July 2003, a 20-ton container filled with a hazardous chemical used in cement (tetraethylene glycol diheptanoate) washed up off the western coast of Bering Island, near the northwestern fur seal rookery and 15 kilometers from the local fishing grounds. The container, owned by the DuPont Corporation, was being shipped from South Africa to Korea and was lost at sea in March 2003.

When the container was discovered on the beach, there was no disaster response plan in place. Individuals who got close to the

container to examine it did not have any training in the handling of hazardous materials or the necessary equipment and clothes. They were poisoned and needed medical assistance.

The first attempt to move the container away from the area where tidal waves could throw it on the rocks and break it was unsuccessful. The container cracked and approximately 15 tonnes of the chemical leaked, creating a 400 square-meter oily spill. A later survey counted 46 dead birds and one dead seal.

The Anchorage office of the Aleut International Association, after receiving first news of the accident, made a round of calls to maritime attorneys in an attempt to find legal counsel for the village of Nikolskoye. Finally a firm with appropriate expertise was located in Juneau, Alaska. A telephone conversation, however, was abruptly interrupted by the news that the firm had been hired to represent DuPont.

DuPont provided funds for clean up, environmental assessment and some emergency response equipment. The nature and size of this work was mostly determined by DuPont itself.

This particular accident was small, but it exposed potential problems. Governments may want to identify measures that can help prevent accidents and address response, especially in light of expected increases in shipping.



© Aleut International Association, from the Nikolskoye Administration

■ The container of tetraethylene glycol diheptanoate that washed ashore on Bering Island.

## Reflections from the Kola Coast

Shipping is but one of the many aspects of the history of northwestern Russia, one of the many factors shaping today and tomorrow. Murmansk was a bustling seaport during the Soviet era, when at the height of the Cold War it was the fishing capital of Northern Russia. The Murmansk Region is home to about 2,000 Saami, who continue their traditional culture in the inland parts of the Peninsula.

In the Murmansk Region, history has been witnessed, lived, forgotten, suppressed, remembered and altered. Kola Bay, with its nuclear fleets, is poised to be the jumping off point for Arctic opportunities of shipping and mineral development. The Kola coast is a smaller version of the multi-faceted, complex and layered coastal landscape and seascape that is the Russian Arctic coast today.

As a part of the time of transformation, the Kola Saami are witnessing a painful rebirth of their culture and nation. Since the formation of the Russian Federation, they can collaborate with the Saami in neighboring countries. They can participate in the Arctic Council and influence, for example, the development of marine and ocean policies. Even though the seasonal salmon harvest along the fjords of Kola is over and seals are no longer harvested by the Kola Saami, many elders still remember the sites, places and songs of the Kola coast. They remember the yearly cycle of the ocean, birds, fish and other beings.

The Kola Saami are afraid that the increased shipping and construction of new pipelines will ruin the remaining wilderness areas of the Kola. Atlantic salmon spawning rivers, such as the Ponoï, are vital traditional fishing areas for the Saami and their productivity is directly related to the ecological status of the Russian sector of the Arctic Ocean. The Kola Saami are engaging in planning and decision-making to make sure that the people of the Sun Deer will be here now and forever.



© Arctic Council

likely inadvertent) interference with traditional and other activities, and also from greater attention to some local practices that may not conform with the values or expectations of non-Arctic societies. The presence of large cruise ships and their visits to communities that may have a fraction of the population of the ship itself cannot be ignored. An emergency involving such a ship could easily overwhelm local response capacity. Tourism, like fishing but unlike other forms of shipping, is likely to be focused on some of the same living resources (seabird colonies, marine mammals) that sustain local communities, thus increasing the potential for disruption and conflict.

The local human dimensions of Arctic marine shipping appear to be extensive, but there have been relatively few studies that have considered the implications either of current shipping activities or projections of what is likely to occur in the next few decades. The

AMSA's description of human dimensions of Arctic marine shipping is neither comprehensive nor exhaustive, but is intended to demonstrate how and why marine shipping matters to Arctic communities and to consider what additional work is needed to be able to prevent, mitigate, or otherwise manage shipping to reduce negative impacts and maximize potential positive benefits.

In recent decades and today, Arctic coastal people travel far on sea ice and water, both along coastlines and also out to sea. A comprehensive, up-to-date catalog of indigenous use of the Arctic marine environment does not exist. Compilations of data from Canada and Alaska are two to three decades old. Some more recent studies have examined use patterns near individual communities, but even these are few and dispersed. It is thus impossible to present an overall map or description for the entire Arctic. This section provides instead a few examples of various uses of the Arctic marine environment and

## “The Sea Ice Is Our Highway”

### *Canadian Inuit Perspective on Transportation in the Arctic*

Within Canada, Inuit view the Arctic as the places where Inuit have traditionally lived: Nunatsiavut along the coast of Labrador, Nunavik in Northern Quebec, the entire territory of Nunavut, and the Inuvialuit settlement region along the northern coast and around the northern islands of the Northwest Territories.

Life in the Arctic is dependent on movement, and sea ice is integral to this movement. The Inuit have been a nomadic people living in the Arctic since ancient times. As such, our entire culture and identity is based on free movement on the land and sea. Much of the traditional knowledge passed down from generation to generation is meant to hone the skills necessary for hunting and fishing. In order to hunt and fish safely and effectively in the Arctic, we train our young people to recognize different types of ice and to know the dangers associated with different seasons. Inuit hunters spend much of their time out on the ice, mostly in small groups or even alone; therefore, reliable knowledge of the ice can be a matter of life and death.

Interviews conducted by ICC Canada in March 2008 indicate that despite the increased difficulty in finding and harvesting big game and sea mammals due to thinning and less predictable sea ice, Inuit communities are persistent in maintaining their traditional diets. When asked whether changes in ice conditions were affecting their traditional diets, respondents spoke of having to travel further or in a different month than usual; they spoke of dietary substitutions such as hunting more musk-oxen when the caribou migration shifted away from their area; or they explained how melting permafrost has made the natural ice cellars used to age and store meat less effective. Not one of them said anything to suggest they were giving up on hunting despite the considerable challenges some were facing in getting out on the ice and land.

When asked how his life might change because of poorer ice conditions in the future, Tommy Qaqqasiq from Pangnirtung, Nunavut said: “Then we’ll use other equipment. People will still hunt. It’s part of our life. When things change, you just have to go with it.”

After describing in detail how climate change is forcing his community to deal with new challenges, John Keogak of Sachs Harbour shared this idea on how he can continue his harvesting practices:

“A buddy of mine is into making little sleds out of aluminum, which you can use as a little kayak or boat. If you’re out on the ice and you have to cross an open lead or something you can use that. It’s one of the things that can help. I’m going to get one of those. It’s combined as a little sleigh and, if you have to, you can use it as a boat. That’s one way I can adapt.”

With few exceptions, Inuit settlements are located on sea coasts or on major waterways with easy access to the sea. This clearly reflects the importance of the sea to our Inuit way of life. Whether thickly frozen or open for the summer, the sea is our primary means of transportation. The usually ice-covered sea is our highway, the only physical connection between many of our communities and the only way we can access many of the animals we depend on for food (Table 7.1).

As climate change and reductions in sea ice affect the migration routes of the land and sea animals we rely upon, it may be necessary for us to travel even further than before in order to reach them. Inuit hunters are reporting many changes in the locations and times that our traditional animals can be found. In some communities this is reducing the territory that hunters need to cover, while in others they have to travel much further than before in order to harvest enough food for the communities. This is why we are very concerned that sea ice routes remain passable for hunters, as well as the migratory game they follow, and that the entire Arctic environment be kept free from contamination – both in the areas we are now using regularly and in those areas where we may need to hunt in the future.

The primary resource for Inuit is the animals. Our people have always known how to care for this resource. We live in harmony with the land. When we hunt, we only take what we need and make sure to leave enough of the herd so that it can replenish itself. When we talk about the future, we are not talking about a five-year plan or even a 10-year plan. We are talking about our children and our children’s children. We are talking about living in the same communities where we can see the evidence of our ancestors. We are talking about preserving our way of life and the natural environment it depends upon for hundreds and thousands of years.

Ships coming through our seas are a cause for concern. On the one hand, they can be used to supply our communities with building materials and goods for our stores, which might bring a welcome reduction in the high cost of living in the Arctic. However, ships have also caused a lot of damage, as hunter Tommy Qaqqasiq of Pangnirtung explains:

“In recent years, all kinds of cruise ships are coming in to our area. Last year alone, there were maybe five or six cruise ships that came into town. More are coming every year. There’s a national park here in Pangnirtung, further inside the fjord, that’s what they are coming to see. The tourists come into town and buy all kinds of

art, like carvings, craft work, soapstone, whatever they can afford to buy. They help the artists. But hunters have been complaining about those ships because they go all over Cumberland Sound, even to the campsites. People are saying they are scaring away the animals, the mammals and whales. We are really noticing this because in the past couple of summers we hardly saw any narwhals around. Usually we catch our quota, but not in these past years.”

Another example of the difficulties related to shipping comes from the community of Tuktoyaktuk on the Beaufort Sea coast. Tuktoyaktuk has long been a key hub for supply ships servicing many of the Inuit communities in Canada. Because the harbor is also teeming with various species of fish, Tuktoyaktuk is an instructive example of colliding interests between economic activities and Inuit use of the sea. Inuit hunter, trapper and fisherman Chucky Gruben describes the issues:

“We have a hunters and trappers committee here, we take care of the wildlife. We deal with the people, we deal with the shipping companies. We have done some things where, after freeze-up, the ships are not allowed to come into the harbor. But this past year, because of late shipping to other communities, we had to keep our harbor open longer than usual because the supplies hadn’t gone out to the other communities.

“The community of Tuktoyaktuk is right in a harbor where a lot of fishing takes place. ... The east entrance is a place where a lot of people here that do their fishing set their nets right in the channel. Because the ships had made a ship track through the east entrance, they kept it open up right until November sometime, and the people couldn’t set their nets there because of the ships going back and forth. That is one of the impacts of shipping on our harvest.

“Usually with that kind of thing, we do have a say on whether the ships can use the area, but times are changing and every year we get applications to come into the harbor later and later. They wanted to do that the year before last, too, but we had to say no. Last fall we didn’t really have a choice because there was still fuel and a lot of supplies that needed to go out to the other communities, so we had no choice.”

The point to emphasize through these accounts from various Inuit communities is that the environment is vital to our entire way of life as Inuit. If something were to happen to our fragile Arctic ecosystem, our way of life would be lost and we as a people would be lost. Therefore, any activity in the Arctic, whether it is resource extraction, tourism or military-related, must be undertaken according to the Inuit definition of sustainability – it must support the continuation of the Inuit way of life for thousands of years to come.



**Table 7.1** Socio-economic projections for the Canadian North from the 2007 Canadian Arctic Shipping Assessment. *Source: Transport Canada*

Region	Demographics	Transportation	Economy
<b>Nunavut</b>	<ul style="list-style-type: none"> <li>• 2006 population: 29,500</li> <li>• Growth rate 1.8% in 2005 to 2020</li> </ul>	<ul style="list-style-type: none"> <li>• No all-weather roads or rail links between communities</li> <li>• Most communities receive 2 re-supply calls per year</li> </ul>	<ul style="list-style-type: none"> <li>• Dominance of public sector for economic output and jobs</li> <li>• Significant non-wage and subsistence activity</li> <li>• &gt;100 active resource exploration sites</li> <li>• Limited tourism</li> <li>• Growth at 4.7% to 2010, slowing thereafter</li> </ul>
<b>Northwest Territories (NWT)</b>	<ul style="list-style-type: none"> <li>• 2006 population: 41,861</li> <li>• Most communities not expected to grow by 2020</li> </ul>	<ul style="list-style-type: none"> <li>• Mackenzie River communities served by all-weather or winter roads</li> </ul>	<ul style="list-style-type: none"> <li>• High unemployment in coastal communities</li> <li>• Presently no resource projects for river communities</li> <li>• Any shipping impact centred on Mackenzie Gas Project</li> <li>• High Arctic oil and gas potential, but not before 2020</li> <li>• Some diamond mine development opportunities</li> </ul>
<b>Nunavik</b>	<ul style="list-style-type: none"> <li>• 2006 population: 10,783</li> <li>• Population younger than Canadian average</li> <li>• Growth rate of 2.4% to 2010, to slow thereafter</li> </ul>	<ul style="list-style-type: none"> <li>• Community port programme receives fed/prov support</li> <li>• No all-weather road links to the 14 communities</li> </ul>	<ul style="list-style-type: none"> <li>• Significant non-wage and subsistence activity</li> <li>• Like Nunavut, wage economy is growing through govt., fishing and sealing, tourism, construction and resources</li> <li>• Resource development slow due to lack of road infrastructure</li> </ul>
<b>Coastal Cree Communities</b> (in Quebec, Ontario, and Manitoba)	<ul style="list-style-type: none"> <li>• 2006 population: 18,654</li> <li>• Young population</li> <li>• Declining or levelling growth rates expected post-2010</li> </ul>	<ul style="list-style-type: none"> <li>• Port of Churchill</li> <li>• Limited all-year road access</li> </ul>	<ul style="list-style-type: none"> <li>• Largely subsistence economies</li> <li>• Some benefiting from hydro-electric developments</li> <li>• Resources on the horizon (diamond, gold, uranium)</li> <li>• Churchill – a viable link to Russia?</li> </ul>

resulting interactions with marine shipping activities in different forms. These examples are intended to illustrate some of the range of potential interactions and effects.

Arctic marine shipping is one of many factors affecting, or with the potential to affect, the lives of Arctic residents. Predicting exactly how various developments in shipping will affect Arctic communities is difficult at best. For example, there is insufficient information to describe current local human uses of the Arctic marine environment adequately enough to assess the range of likely effects of marine shipping, and researchers cannot anticipate all potential information needs when conducting studies in advance. Rather, findings of the

kind presented in this section can be used to identify areas of potential conflict or interaction between local uses and marine shipping, but further studies should be done of specific areas where shipping activities are planned, in which the details of shipping and current local uses can be compared and evaluated for potential impacts and mitigation strategies.

In the face of uncertainty about what activities will take place, what effects those activities will have and what other factors will be involved, a collaborative management approach and careful planning are required to identify and respond to negative impacts and to identify and harness positive benefits. One hallmark of the collaborative


## Extent of Use of the Marine Environment by Aleut Communities

The marine environment is vital for coastal Arctic communities. This is especially true in the Aleut region, where communities are on islands or along the Alaska Peninsula, providing excellent access to the sea but relatively few options on land. As with other data on the extent of marine use by Arctic indigenous communities, the information from the Aleut region is not consistent, comprehensive, and up to date for all communities. Instead, some reports are over a quarter century old, and more recent information does not cover all communities or all species. Nonetheless, tribal representatives confirm that the general pattern of marine use continues today.

Table 7.2 shows the results of surveys concerning traditional harvests in three predominantly Aleut communities in Alaska. Other studies have found that the overwhelming majority of households in Aleut communities use birds and eggs. In Nelson Lagoon, 92.3 percent of households used at least one bird or egg during the study period. In Akutan, the figure was 92.9 percent, compared with 88.9 percent in Nikolski and 73 percent in False Pass. Sharing of harvested birds and eggs was considered to have great cultural importance in all four communities.

Zenia Borenin, president of the Tribal Council for the Native Village of Akutan, described local use of the marine environment:

“The northeast near coastal waters of Akutan Island are important for black bass, chitons, halibut, salmon, razor clams, and sea lions. The southeastern-most near coastal waters is a vital cod and salmon fishing area. There is a sea lion haul out area on the eastern coast of Cape Morgan. A cod and halibut fishing area is located in the near coastal waters northeast of Talus Point.

“Akutan utilizes the coastal waters around Akun Island as well. Seagull eggs are harvested on the northwest shore of the island (Akun Head), and on the small islands southeast of Akun. Salmon and halibut are taken in the area of Lost Harbor. Halibut is harvested in the near coastal waters southwest of the island, and in several areas east of the island. Salmon are taken in Surf Bay, Trident Bay, and in Akun Bay in the area of Helianthus Cove. Akun Bay is an important area for halibut, crab, cod, octopus, and sea bass.” 

**Table 7.2** Per capita harvests of wild resources from three Aleut communities, with percent contribution from various classes of marine resources.

Source: Fall et al. 1993a, b, 1996

Community	Per capita harvest (kg)	% from salmon	% from other fishes	% from marine invertebrates	% from birds and eggs	% from marine mammals
Sand Point	115.9	54	21	7	2	2
King Cove	116.0	53	17	7	4	1
False Pass	186.9	47	15	6	4	6

approach is that it is adaptive in the sense that it allows for adjustments and alterations based on experience and evaluation as changes take place, rather than creating a fixed system for addressing anticipated issues that may turn out to be ineffective when unanticipated events occur.

An advantage of substantive local involvement is that local residents are often best positioned to weigh the many factors affecting them. The example of the container that washed ashore in the Commander Islands describes the consequences when local capacity for addressing a problem is lacking, a situation exacerbated in that case by the lack of any larger precedent or system for response or accountability. In cases where local involvement in planning or carrying out shipping-related activities was higher, communities generally experienced better results.

One component of local involvement is communication. Many of the participants in the AMSA town hall meetings asked for better information about cruise visits and trans-Arctic shipping plans. Effective communication and continued interaction has been found to be important in oil and gas activities and in tourism in the Arctic. Communication can help reduce the number of surprises for all involved, and early identification of problems can allow more time for resolution.

As noted earlier, projection of shipping activities and their impacts is difficult due to the interactions of numerous factors in the environment and in human society. To some extent, researchers need to develop better methods for studying combined effects of these kinds, just as regulators need to develop better methods for balancing multiple management objectives. Just as importantly, those involved in marine shipping in any capacity need to recognize that flexibility and adaptiveness will be required to recognize and address challenges, problems and opportunities that arise.

Marine shipping encompasses a wide range of activities, taking place in different locations and seasons and with differing degrees of local involvement and effects. The quantity of shipping, likewise, may determine whether effects are largely beneficial or otherwise, and also who is most affected. For example, limited tourist traffic may provide a modest economic opportunity for local artists and handicraft makers, whereas higher levels of traffic may have environmental or other impacts that offset any benefits. As noted earlier, the details of effects will depend greatly on the details of shipping and the characteristics of specific times and places. Nonetheless, the case studies in this section and studies of other types of activities, such as mineral and petroleum development, suggest some observations about what can be expected from increases in Arctic marine shipping.



## Beaufort Sea Beluga Whales

### *Local and Distant Effects of Shipping*

The Beaufort Sea population of beluga whales, numbering in the tens of thousands, migrates from the Bering Sea through the Bering Strait into the Chukchi Sea and then eastwards into the Beaufort Sea. The animals pass through the Mackenzie Delta region and into the waters among the western islands of the Canadian Arctic Archipelago. This migratory path takes them through the waters of Russia, Alaska and Canada. The belugas are hunted in all three regions.

During their migration, Beaufort Sea belugas traverse several areas where shipping may be a major presence. The Bering Strait is a crucial chokepoint for any trans-Arctic shipping. The Mackenzie Delta area already sees extensive tug and barge traffic. Shipping through the Northwest Passage will pass through narrow waterways where belugas gather in summer. Offshore oil and gas activities, including shipping, may affect belugas throughout much of their range.

Shipping may also interfere with hunting activities and opportunity, compounding any effects at the level of the beluga population. Further work is needed to examine exactly where and when shipping will overlap with hunting and with key stages of the beluga migration. This information can be used to develop specific management and mitigation plans, perhaps including limitations on shipping to protect belugas and those who hunt them.

In addition to local initiatives, a broader management plan is required to address impacts in one region that may affect other regions. For example, a disaster in the Bering Strait could affect hunters in the Mackenzie Delta region, 2,000 kilometers away, undermining any conservation efforts they have made in their area.



## Town Hall Meetings

Town hall meetings were held in various locations in the Arctic as part of the outreach effort of the Arctic Marine Shipping Assessment. The intent of these meetings was two-fold. First, the organizers presented the plans for the assessment and the expectation of increased marine shipping that was driving the study. Second, the organizers sought input from participants regarding their observations, concerns and questions related to marine shipping. This section presents a summary of the main themes that emerged from these meetings.

Arctic residents think about shipping, not by itself, but in a broader context of economic, environmental, political and social change. In the town hall meetings, shipping did not appear to be a cause of great hope or fear, but rather as an additional factor that would influence the future of Arctic communities in various ways. In addition, discussing the future of Arctic marine shipping raised concerns about the ability of small indigenous communities to influence large-scale economic activities.

Environmentally, shipping is seen as a potential source of disruption to marine species. Marine mammals, in particular, are seen as vulnerable to disturbance. In Resolute, Nunavut, a period of increased shipping in the 1990s pushed walrus away from the community, too far for hunters to reach them. Saami fishermen in northern Norway are concerned about impacts to fisheries and fish stocks, particularly from pollution or oil spills. Oil spills are, in fact, one of the largest concerns, especially with the lack of response capability in nearly all areas of the Arctic. Ship traffic also raises the possibility of introductions of invasive species.

Hunters are concerned about impacts to the animals and to their practices. Too much ship traffic could be dangerous for hunters in small boats. In many cases, hunters traveling over sea ice have been cut off by icebreakers, an impact that remains a big concern, especially when travelers' lives could be at risk from unexpected open water. In some areas of the Canadian Arctic Archipelago, caribou migrate over sea ice and could be affected by icebreaker traffic. On the other hand, hunters in Resolute and Iqaluit noted that some marine mammals follow ships. In Iqaluit, the arrival of a ship was often a signal to beluga hunters to look for whales that may have come into the bay. As one hunter in Cambridge Bay, Nunavut, said, hunters are going to adapt, but they cannot survive without healthy animals to hunt.

Economically, shipping offers many benefits. Participants in many communities spoke of the prospect of lower shipping costs if cargo ships can come more frequently or if larger ships can be used. Increased shipping and port activity can also provide jobs. In

Canada, ports for mines have often been located away from communities at the communities' request, to avoid social impacts from the influx of workers. Communities may reconsider that approach or seek other ways to gain economic benefits from port activities. On a smaller scale, cruise ships provide an opportunity for carvers to sell their artwork, making their visits welcome to at least some Arctic residents.

The relative costs and benefits of shipping depend greatly on volume. Modest amounts of traffic, or a few visits by cruise ships, may be seen as largely positive. Increasing numbers of ships and visits, however, pose the threat of greater disruption and little time in between to recover. Culturally and socially, shipping can be a catalyst for disturbance if many newcomers arrive in the Arctic, as has been seen with other forms of development. The Arctic is already experiencing rapid social and cultural change, and additional pressures will only make adjustment harder.

In this context, many participants expressed concern over having little voice in shipping, development and other activities that have so much effect on their lives. In Norway, development of onshore mineral resources and offshore oil and gas are seen as major threats to the Saami way of life. With the extent of global environment, economic and social change, many Arctic people feel they have little ability to influence major developments like Arctic marine shipping. When shipping companies ignore local residents, the feeling of powerlessness is compounded. By contrast, when shipping companies or cruise lines communicate with local residents, the effort is well received and makes people better informed and thus better able to make any adjustments they need to in order to minimize the impacts of ship traffic.

An additional insight from the town hall meetings is that few Arctic residents are aware of the scope of activities that may be coming to their region soon. The meetings were able to provide some information, but many additional questions were raised about the scale of environmental change, the prospects of mineral development and other changes that can be expected in the near future. For Arctic residents, these influences are not separate things that can be treated one by one. Instead, each new factor merely joins the others in shaping people's lives. The degree to which Arctic people retain the ability to determine their own futures remains to be seen. Communication and the ability to exercise at least local influence are seen as key components of sustaining traditional ways and practices.





First, the impacts of shipping depend greatly on the type of shipping, the season(s) in which it occurs and the locations. Trans-Arctic shipping done in ice-free conditions and largely offshore may have few or no local effects, barring an accident. Nonetheless, as the Aleutian region has experienced, accidents can and should be expected, prepared for and responded to promptly and effectively. This is especially true in narrow waterways of the Arctic. In these places, ships must travel close to land and may well encounter local hunters or travelers out in boats. In addition, proximity to communities means proximity to hunting areas and the animals that people depend upon, so the potential for environmental impacts is correspondingly higher in these areas. Tourism, too, is likely to take place largely or exclusively in the ice-free season (with the exception of icebreaker voyages to the North Pole), though cruise ships are likely to visit communities or areas of high biological activity such as bird colonies or marine mammal haul-outs.

Shipping to and from destinations within the Arctic is also largely done during the ice-free season, with important exceptions in the Russian Arctic as well as occasional icebreaker transits throughout the region. Ice-breaking can interfere with over-ice travel by hunters and others and so is potentially a more significant impact than are open-water transits. Icebreaker activity may increase as mineral and petroleum resources are developed in the region, which might make interactions with local travelers more common. Here, too, the potential for environmental impacts is high, both from accidents and from destruction to key habitats such as areas where seals or polar bears make ice dens for bearing young. As with trans-Arctic shipping, the

potential for local impacts is greatest near shore, particularly in narrow passages and straits.

Effects, too, come in several forms. Economically, more shipping may increase trade or lower costs for Arctic communities, while increased resource development can provide employment and income for Arctic residents and regions. As has been noted with regard to oil and gas activities in the Arctic, economic benefits may be considerable and can have a number of secondary effects, such as increased local capacity to provide social, cultural and health services as well as construct and maintain infrastructure.

Socially, increased economic activity and resource development can, but does not necessarily, lead to population growth through immigration, which can create social tension between newcomers and indigenous or other long-time residents. Often, those moving to the Arctic for employment are young men, creating a gender imbalance in the local population, which can exacerbate tensions and social problems. Changes in income, too, are often associated with increases in drug and alcohol abuse, as well as domestic violence and other crime. Many of these negative impacts can be addressed largely or in part, by establishing rotational work schedules, with workers traveling to the region for work shifts of one to several weeks and returning to their home communities during the periods they are off or by physical separation between a community and a development site.

Environmental effects are often the greatest concern from increased industrial activity of any kind, whether resource development or shipping. The environmental effects of Arctic marine



shipping are addressed in other sections of this assessment, but it is important to note that loss of hunting opportunities and degradation of the environment can have substantial impacts on local communities. Concern about these types of impacts can by itself cause stress, especially when hunting and other traditional activities are seen as pillars of cultural continuity but also under threat from other social and environmental changes.

The cultural effects of shipping and development may, therefore, be generally anticipated to be negative, but this is not necessarily the case. Environmental impacts and greater assimilation from exposure to outside influences can cause cultural loss, but tourism can boost local cultural awareness and pride and greater economic well-being can allow investments in cultural programs.

As noted earlier, the difference between negative impacts and positive or neutral ones is often a question of planning and preparation. A large influx of cash into a community can create a boom-and-bust atmosphere, with minimal investment for the long-term and a host of social problems in the short-term. The same economic boom can also be harnessed to produce lasting benefits. Doing so successfully requires extensive local involvement in the planning process, so that local concerns and ideas can be fully incorporated. Not all marine shipping activities will be beneficial for Arctic residents, and some are likely to have negative impacts. Nonetheless, careful attention to good communication and collaborative approaches to management can help keep increases in shipping activity from causing undue stress and harm to Arctic people and may result in benefits to many areas. ☀

## Research Opportunities

- ❑ Regional analyses of traditional marine use patterns (spatial and seasonal) for application in the development of strategies and measures to reduce potential conflicts and impacts of multiple users of Arctic waterways.
- ❑ Research on the impacts of noise/sound on marine mammals in regions where current and future marine operations overlap with indigenous hunting (examples: bowhead whale hunting off Alaska's northern coast and beluga hunting in the Canadian Arctic).
- ❑ Detailed, interdisciplinary analyses of the interactions and impacts of marine shipping with Arctic communities. Further assessment of the social, cultural, economic and environmental impacts from shipping to provide insights for planning future Arctic marine systems and operations.
- ❑ Mapping and study of changing indigenous use of Arctic sea ice as a transport medium in the face of climate change and sea ice retreat.
- ❑ Comprehensive review of changes in Arctic marine technology during the past six decades, specifically for Arctic commercial ships, and how these changes may influence the future of Arctic marine transport systems.

**While it is not clear whether reduced sea ice will have a major influence on development trends, increased shipping is unlikely to constrain development.**

## Findings

- 1] Marine shipping is one of many factors affecting Arctic communities, directly and indirectly. The variety of shipping activities and the range of social, cultural and economic conditions in Arctic communities mean that shipping can have many effects, both positive and negative.
- 2] While economic effects of marine shipping may be positive, there are many concerns expressed by Arctic coastal communities about social, cultural and environmental effects.
- 3] There is insufficient information to identify with any precision the likely effects of marine shipping for most Arctic coastal communities. No current database exists for indigenous use in local Arctic waterways that could be used to develop multiple use management measures and potential mitigation strategies.
- 4] The costs and benefits from marine shipping will be unevenly distributed among and within communities and regions.
- 5] Constructive engagement of local residents at the earliest time in a planned Arctic marine development project can help reduce negative impacts, assist in a smooth interaction and increase positive benefits from marine shipping.
- 6] The marine environment and marine resources have long sustained Arctic communities. Thus, Arctic settlement patterns demonstrate a strong marine influence. Local Arctic residents today depend heavily on marine resources for subsistence and the local economy. A combination of over-the-ice travel (i.e., using ice as a platform and means of travel for hunting and fishing) and boat transport (i.e., for fishing, hunting and travel) allows the use of large Arctic marine areas during much of the year. Life in the Arctic is dependent on movement and sea ice is integral to this movement in the high Arctic. Remote indigenous coastal communities are especially vulnerable to marine accidents as they risk losing not only their vital marine resources, but the natural foundation of their cultures and way of life.
- 7] AMSA town hall meetings revealed that Arctic residents think about shipping, not by itself, but in a broader context of economic, environmental, political and social change. Shipping did not appear to be a cause of great hope or fear; rather, as an additional factor that would influence the future of Arctic communities in various ways.
- 8] AMSA town hall meetings indicated that from an environmental perspective, shipping is viewed as a potential disruption to marine species. Oil spills are one of the largest concerns. Hunters are also concerned about the impacts of ships on the animals and on their hunting practices.

