ArcticNet

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FROM SCIENCE TO POLICY IN THE GREATER HUDSON BAY MARINE REGION

AN INTEGRATED REGIONAL IMPACT STUDY (IRIS) OF CLIMATE CHANGE AND MODERNIZATION

Synthesis and Recommendations

FROM SCIENCE TO POLICY

IN THE GREATER HUDSON BAY MARINE REGION

HUDSON BAY, JAMES BAY, FOXE BASIN, HUDSON STRAIT AND UNGAVA BAY

AN INTEGRATED REGIONAL IMPACT STUDY (IRIS)
OF CLIMATE CHANGE AND MODERNIZATION

SYNTHESIS AND RECOMENDATIONS

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SCIENCE-TO-POLICY SYNTHESIS: KEY MESSAGES AND RECOMMENDATIONS FOR POLICY MAKERS

The Greater Hudson Bay Marine Region—that is, Hudson Bay, James Bay, Foxe Basin, Hudson Strait and extending into Ungava Bay—is an integral part of both Inuit and Cree homelands. These expansive waters have supported Inuit and Cree health, livelihoods, mobility, and culture for millennia. In the present day, there are more than 30 largely Inuit and Cree communities distributed along the coasts of this large marine region. Residents continue in a close relationship with many aspects of the marine system, relying on fish and wildlife for traditional food security, travelling by small boat on the coastal waters and by snowmobile on the sea ice, and developing a variety of economic opportunities ranging from char fisheries to ecotourism to commercial shipping.

INTRODUCTION

Coastal communities surrounding the Greater Hudson Bay Marine Region have been observing and adapting to environmental changes for some time. Scientific studies looking at these changes and their underlying causes are more recent. The ArcticNet research programme has helped invigorate efforts to observe the Greater Hudson Bay system since 2004. The Integrated Regional Impact Study (IRIS) of the Greater Hudson Bay Marine Region marks the culmination of this programme. As the pace of climate change continues to accelerate, the IRIS aims to provide decision makers at all levels with credible, accessible, context-appropriate information that can be integrated into decision-making processes.

To contribute to evidence-based decision making for this important marine region, this science-to-policy synthesis contains: **1)** **key scientific findings related to current and anticipated future changes in the Greater Hudson Bay Marine Region**, and **2)** **recommendations for action directed at policymakers and decision makers.** As one of four IRIS reports produced by ArcticNet, this IRIS is focused on the marine and coastal environment of the Greater Hudson Bay Marine Region. To develop the key messages and recommendations presented here, the IRIS Steering Committee considered the scientific findings detailed in the topical chapters of the full report together with regional and community priorities. While James Bay was not included in the initial ArcticNet research program, resulting in a scarcity of recent data, it is nonetheless included in the IRIS due to its strong physical and biological linkages with Hudson Bay. It is essential to consider the James Bay and Hudson Bay systems in relation to each other in future research stewardship efforts.

There are numerous jurisdictions with authority over parts of the Greater Hudson Bay Marine Region or its surrounding lands. This complexity is a legacy of inherited federal and provincial boundaries, and the results of initiatives of the Cree and Inuit to assert self-determination through land claim processes. As with all decision making processes, in the management of this Marine Region there are knowledge choke points, where important information is not shared, poorly understood, or culturally divergent. Nonetheless, there is widespread agreement about the need for broadening knowledge bases to support communities as they adapt to ongoing environmental change. Where there is disagreement, climate change adaptation processes must focus on local to global approaches.

Regional approaches to resource management are essential to long-term success, and cooperation at high levels is critical for ensuring that regional programs succeed.

The primary audience for this synthesis and recommendations are coastal communities surrounding the Greater Hudson Bay Marine Region in Nunavut, Manitoba, Nunavik and Eeyou Istchee in Québec, and Mushkegowuk region of Ontario and their respective governments and land claim organizations. The audience includes Nunavut Tunngavik, Makivik Corporation, Kativik Regional Government, Cree Nation Government (Québec), Mushkegowuk Council, and the Governments of Nunavut, Manitoba, Ontario, and Québec. It also includes the Institutions of Public Government (regional commissions and boards) created by the major land claim agreements, which are charged with responsibilities for implementing wildlife management, land use planning and environmental impact assessment throughout much of the region. The synthesis and recommendations are also directed at the relevant departments of the federal government and stakeholders ranging from non-governmental organizations, to marine transportation companies, hydroelectric utilities, and resource development groups, and to organizations such as the Arctic Council, Inuit Circumpolar Council (ICC) and Inuit Tapiriit Kanatami (ITK) —all of which may make decisions that have consequences for the region. These decision makers can and should respond to current and projected future changes in the Greater Hudson

Bay Marine Region in a way that supports the ecological integrity of the marine area and bolsters the sustainability, wellbeing, and adaptive capacity of communities that depend on it. The document also seeks to inform those involved in ongoing and future research and monitoring enterprises. With all the complexities caused by interjurisdictional challenges, differences in land claim implementation and community capacity for engagement across this vast region, it is particularly important that researchers and practitioners seek to find common ground and bridge differences both in the arena of knowledge acquisition and policy development.

KEY MESSAGES AND RECOMMENDATIONS

Knowledge of the physical environment

Scientific observations confirm that the climate has changed in the Greater Hudson Bay Marine Region during the last 30–40 years. Winter air temperatures monitored at coastal stations have become warmer and/or more variable and the open-water season has increased by 3–5 weeks. People living in the region have observed these changes first hand as longer open water season along the coast, less predictable weather and coastal sea ice conditions. There have also been increases in the frequency and severity of extreme events including entrapments of wildlife in sea ice and winter rain.

During the same period, river flows and properties of wetlands/peatlands have changed due to climate warming, hydroelectric development, and other human activities. Hydroelectric development, including the cumulative effect of river diversions, along the Nelson and La Grande systems has significantly increased river flows in winter, while decreasing flows in spring and summer. These rivers also experience short-term fluctuations in flow. Regulation also affects the flows of the Churchill River in Manitoba, the Moose River in Ontario and the Eastmain, Rupert, La Grande, Caniapiscau, and Koksoak rivers in Quebec. Inuit and Cree encounter unpredictable water levels in the lower reaches of some river systems. The changes in the watershed also affect the salinity of coastal waters, ice conditions, and transport of sediment, nutrients and carbon. However, these complicated land-ocean interactions are the most difficult to assess, and an assessment of the combined effects of modified river flows, together with climate change, has yet to be accomplished.

Although climate models and appreciation of their uncertainties are still evolving, several climate scenarios (representations of future climate) have been produced for the watershed of the Greater Hudson Bay Marine Region during the last decade. With fairly high confidence, model projections for 2050 show a general warming of winter air temperatures (5–7°C) in the watershed. Increasing precipitation during winter is likely both in Nunavik and the Kivalliq region. Summer precipitation is projected to increase slightly only in these northern regions of the watershed. The predicted overall effect of these changes is an increase in annual (and winter) runoff in Nunavik, eastern James Bay and the Kivalliq region. Changes in precipitation and evapotranspiration are more uncertain than changes in temperature and the two factors together will determine future runoff.

Regional sea ice–ocean models projecting future ocean conditions are still at an early stage for the Greater Hudson Bay Marine Region. In this region, models have been applied to predict impacts of atmospheric warming without taking into account changes in river runoff. In a scenario with regional air temperatures increasing by 4°C, models indicate that the sea-ice season would be reduced by 7–9 weeks and summer sea-surface temperatures would increase by 3°C in central Hudson Bay and as much as 5°C in southeastern Hudson Bay, along the Nunavik coast and in James Bay. If these changes come to pass, they may lead to altered ocean circulation, changes in seawater pH, changes in nutrient and oxygen distribution and impacts on the food web.

The ability to monitor climate change at a regional level is strongly dependent on the availability, distribution and effectiveness of climatological stations. Along the coastlines of Hudson Bay, James Bay, Foxe Basin, Hudson Strait and Ungava Bay, relevant stations are too few in number and unevenly distributed. There are also major hydrographic regions for which reliable runoff data are scarce or non-existent, which limits analysis of changing precipitation and runoff relationships. The lack of long term climate, precipitation, and runoff monitoring stations reduces the ability to evaluate regional climate change models and determine regional climate trends. Similarly, ocean moorings (observatories) are needed to monitor and track changes in the properties of offshore and basin waters.

Inuit and Cree who hunt, fish and travel on the coastal waters and sea ice have observed significant changes in recent decades, such as unprecedented rapid freezing of the biologically-important flaw leads and polynyas in the Belcher Islands area of southeast Hudson Bay. However, there have been few scientific studies of coastal ice and ocean processes and the influence of hydrologic change.

- **Gaps in our understanding of the coastal ice-ocean system and impact of enhanced winter runoff should be addressed through scientific studies, application of Cree and Inuit knowledge, and studies in which there is opportunity for co-development of knowledge such as collaborative community-based monitoring programs. A forum for sharing information across jurisdictions on a regular basis would be beneficial.**
- **Existing networks for gathering long term meteorological and hydrological data should be critically reviewed and augmented as required to improve spatial distribution.**
- **Climate information and expertise needs to be made available to regional policy makers to support adaptation to climate change.**

Ecosystems, fish and wildlife monitoring and management

Marine plant life, including microscopic algae, kelp, and coastal eelgrass, support the diverse food webs that occur throughout the Greater Hudson Bay Marine Region. In coastal areas, the plants receive some of the nutrients they need from rivers. However, further away from the river mouths, the fresh river water forms a cap over the system that prevents deep ocean nutrients from mixing up into the upper sunlit layer of the water column, where algae can grow. For these reasons, the productivity of the ecosystem (abundance of marine life) varies throughout the region, from high in Hudson Strait and southern Foxe Basin to moderate in coastal Hudson Bay and very low in the offshore waters of Hudson Bay.

Although very little is known about the oceanography of James Bay, the productivity in offshore waters appears to be low. Coastal eelgrass ecosystems that were once highly productive declined during the 1990s and have not fully recovered. In relation to future climate change, it is expected that changes in the physical environment (ice, salinity and temperature and other properties of the water) will lead to changes in plant ecology and organisms at the base of the food web, which will then influence higher levels of the food web including fish, birds and marine mammals that are harvested.

Coastal and marine fish species vary greatly throughout the region and this variation is reflected in the subsistence fisheries as well as the commercial fisheries in the Kivalliq region and Hudson Strait. There has been a shift in the presence and abundance of some fish species and locally there are observations of new species not normally found in those areas. However, relatively little is known about the biodiversity, distribution and abundance of coastal fish and invertebrate species, nor the life histories of the key anadromous species in the region.

- **Baselines need to be established for both fish and aquatic invertebrates and more monitoring is required, particularly in what are predicted to be the most affected areas.**
- **More ecological studies including fish and invertebrates should be conducted in coastal areas because of their particular sensitivity to climate change.**

The coasts of the Greater Hudson Bay Region are critical to several bird species. Populations of these species are changing due to a combination of factors, some of which are not specific to this region. In some areas, populations have grown and are negatively impacting shoreline habitat. In other areas, populations have decreased and/or migratory routes have changed, which has impacted subsistence harvesting.

- **Data collection at long-term seabird monitoring stations should be continued and expanded to other sites to improve the spatial distribution of information.**
- **Additional bird surveys should be conducted to better understand bird movements and population dynamics. Additional studies should also be conducted to improve knowledge of habitat use.**
- **Community capacity building should be supported to allow increased collaboration among communities and regional, national and international institutions in relation to bird monitoring efforts, particularly in relation to larger scale efforts to understand shorebird and songbird ecology and impacts of climate change.**

Decreases in summer sea ice concentration and changes in winter ice distribution and thickness are expected to affect all of the marine mammal populations in the Greater Hudson Bay Marine Region including the ice adapted whales, beluga, narwhal, and bowhead whales, the ice adapted seals (ringed and bearded seals), and the walrus. Marine mammal migration behaviour is affected by changing water temperature, diets are expected to shift with changing food availability, and expansion of the range of the killer whale into the region's waters could affect beluga, narwhal, and bowhead numbers. Decreases in the health and abundance of whale, walrus, and seal populations will affect people's ability to find and use these resources, impacting traditional subsistence harvesting.

- **Regional studies are required to understand the importance of specific habitats to marine mammal use (e.g., estuaries, sea ice, migration corridors).**
- **Relevant scientific studies and maintaining long-term monitoring programs are important and should be continued to help predict how changes in climate will impact the region's marine mammal populations.**
- **Management strategies should be reviewed with the inclusion of communities and Cree and Inuit knowledge to address issues as they arise.**

Because of the fundamental relationship between the welfare of polar bears and sea-ice availability, scientific consensus is that continued warming and declines in the seasonal extent and thickness of sea ice may negatively affect polar bears over the long term. However, negative effects of warming have not been documented on some polar-bear subpopulations and other subpopulations are apparently still faring well. Local Inuit knowledge from Inuit in Nunavik and the Kivalliq region of Nunavut have been documenting greater numbers of polar bears over the last half century and report that overall the observed polar bears seem healthy. Polar bears continue to be important to Inuit in regards to culture and mental health, safety, sustenance, and economy.

- **Polar bears and other wildlife made vulnerable in the long term by anthropogenic climate warming are a reminder about the local impacts of global actions/inactions.**
- **Wildlife boards and other agencies mandated with polar bear management need access to the best available scientific information and Inuit and Cree knowledge to inform their decision-making processes.**

Parks and Protected Areas:

Although several land-based parks in the greater Hudson Bay region include coastal areas, there are as yet no marine protected areas. Concerted efforts are required by planning partners to identify and move forward with proposals for marine protected areas that protect ecological integrity and reflect areas that are considered important by Inuit and Cree for food security and cultural identity. Parks and marine protected areas, when created, will have a positive impact on biodiversity, education, and conservation.

- **In the creation of parks and marine protected areas, local educational benefits should be maximized, together with biodiversity and conservation.**
- **Inter-jurisdictional coordination for the development and management of parks and protected areas needs to be improved.**
- **Indigenous protected areas should be explored as a new conservation tool to include Cree and Inuit knowledge in shaping conservation objectives and share decision-making among all key parties.**

Transportation and Safety

Due in part to the lengthening open-water season, there has been an increase in the number of vessels coming into the Greater Hudson Bay Marine Region each year. Increased ship traffic means there is increased risk of accidents and spills. For communities, changing ice conditions, weather events, lack of infrastructure and shortage of baseline and real-time information about conditions make travel on the ice and coastal waters less safe. Most communities in the region have very limited marine transportation infrastructure. Search and rescue capability and emergency response capacity within the region is also very limited.

- **Ice is critical travel infrastructure for communities. Remote sensing and other real-time observation tools (weather cameras) can complement community observations to help communities adapt to the changing ice and weather conditions. To improve the safety of travel, there is a need to further develop both these tools and the capacity to use them.**
- **The deterioration and thinning of ice cover particularly near river mouths is a significant factor in local and coastal travel. Plumes of relatively warm water released in winter from reservoirs used for hydroelectric energy production can impact the safety of travel. The La Grande Complex in northwest Québec could be used as a case study to understand the practical challenges faced by communities downstream from such developments and to identify adaptation strategies.**
- **For safety and marine access, priority should be given to maintaining community infrastructure in Nunavik, and assessing needs and constructing infrastructure as required in Nunavut and James Bay communities.**
- **Regulations and protocols related to major transportation corridors and cruise ships should be regularly reviewed with community and regional input.**
- **Regional and local search-and-rescue capabilities and coordination must be improved. Risk reduction and emergency preparedness plans must be a priority.**
- **The regional importance of the rail line to Churchill and associated deep-water port must be recognized and its future security ensured.**

Contaminants

Contaminants are present in the Greater Hudson Bay Marine Region as they are throughout the North due to both local and distant sources (i.e., air pollution). Through existing programs, several species are being monitored at a few sites. Regulations are helping to reduce sources of mercury and the concentrations in some wildlife tissues have begun to decrease. There are no public health advisories associated with fish consumption in either Nunavik or Nunavut. However, in northern Ontario and Québec along the western James Bay and Hudson Bay border, where there is a long history of industrial activities in the watershed, mercury concentrations remain elevated in some inland fish and wildlife and numerous consumption advisories are in effect. There are also new and emerging contaminants that have been found throughout the region and further research is needed to understand the impact of these contaminants on the environment, wildlife and people.

- **Current efforts to monitor contaminants in this region through programs such as the Northern Contaminants Program and other initiatives should be continued.**
- **Regional action plans that will communicate about the risks associated with contaminants should be developed with appropriate communities and health professionals.**
- **Canada's implementation of the United Nations' Minamata Convention on Mercury should include continued support for research and monitoring to address remaining uncertainties, in particular those related to mercury cycling in subarctic ecosystems and methylmercury toxicology.**
- **Efforts to reduce and eliminate the use of lead shot should be continued and supported as lead has negative effects on the environment and human health.**

Tourism

Tourism is of emerging economic importance within most communities in the Greater Hudson Bay Region and the ecotourism industry is growing and diversifying. However, an increase in tourism in the region may have adverse impacts on small communities and wildlife and most communities need better infrastructure to receive tourists.

- **There should be investment in tourism infrastructure, including parks, to encourage tourism and increase local benefits and opportunities.**
- **Regional protocols to manage tourism in relation to respect for culture, capacity, and wildlife should be developed.**
- **Steps should be taken to encourage the integration of western and Indigenous knowledge as part of ecotourism activities when and wherever practical.**

Research and Monitoring Processes

There is tremendous value in communication and collaboration between researchers and communities and among communities within the region. There is also much to be gained by the co-production of knowledge. Given the rapid rate of change in the Greater Hudson Bay Marine region and in all Arctic regions, relevant knowledge informing Arctic adaptation actions and policies is required in accessible formats as soon as it is produced.

- **Cree and Inuit knowledge and knowledge holders should be included early in research processes, and specifically in the identification of knowledge gaps and research priorities. Processes for appropriate inclusion of Indigenous knowledge must be determined in partnership with communities and knowledge holders.**
- **Sponsors of research and monitoring programs should provide better support to community-researcher partnerships to improve capacity for community involvement in research and help sustain community-driven programs.**
- **Indigenous peoples ownership' of their traditional and living Indigenous knowledge should be recognized. Through a living data management plan, data ownership and data licenses should be discussed and clearly laid out during research partnerships.**
- **Plans for communication of research results should be developed with local and regional guidance.**
- **Knowledge mobilization efforts such as those undertaken by ArcticNet need to be maintained over the long term and adapted to respond quickly and efficiently to the evolving needs of decision makers and end-users of the research.**

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