

Climate Change Adaptive Capacity

within the Government of Nunavut

"Building adaptive capacity requires a strong, unifying vision; scientific understanding of the problems; an openness to face challenges; pragmatism in developing solutions; community involvement; and commitment at the highest political level!"

Holmes, 1996 in CIER, 2009

This report was prepared by Mr. Emery Paquin for the Nunavut Department of Environment. The views and conclusions expressed in this report are solely those of the author and do not necessarily represent those of the Government of Nunavut, the Department of Environment or other affiliated departments, agencies and organizations.

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Introduction

There is overwhelming evidence that our climate is changing and will continue to change for the foreseeable future. Scientific studies suggest that the Arctic region is experiencing some of the most rapid and severe climate changes on Earth. Over the past decade, the Governments of Nunavut and Canada have been bringing together the best scientific and community knowledge in order to better understand the impacts of climate change and focus the world's attention on this emerging issue. *Inuit Qaujimajatuqangit*, the system of Inuit traditional and societal values, has supplemented and enhanced this research by providing further insight into climate change which has significantly contributed to our overall understanding of climate change in Nunavut.

"There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

Although Nunavut contributes only a very small amount of greenhouse gases compared to the rest of Canada and the world, the Government of Nunavut recognizes the serious consequences of climate change and its responsibility to contribute to global actions that address the causes and impacts. By approving the *Nunavut Climate Change Strategy* in 2003, the Government established broad direction for the future including increasing the understanding of climate change among Nunavummiut and developing a locally-based community-driven approach to adapt to the changes being brought on by climate change.

Intergovernmental Panel on Climate Change¹

Climate change is highly complex and dynamic and as such requires a multi-faceted management approach. An example of such an approach is the *Atuliqtuq Project*, which means 'coming into force'. Initiated in 2006 by the Government of Nunavut, Natural Resources Canada, Indian and Northern Affairs Canada and the Canadian Institute of Planners, *Atuliqtuq* focuses on building local knowledge and community capacity, which in turn enables communities to better adapt to climate change. Over the past five years, the partners have contributed their own unique experience, insights and resources to advance climate change adaptation planning within the three regions of Nunavut.

Although the Government of Nunavut has been involved in climate change adaptation planning for several years, little is known about the level of knowledge and capacity held within its departments and agencies to enable implementation of adaptation measures. In order to progress on adaptation planning it is critical that departments and agencies recognize and embrace their roles and functions within the various climate change planning and implementation processes. Further, through work already conducted by the Government of Nunavut including regional workshops, the Elder and youth workshop, *Inuit Qaujimajatuqangit* studies, community adaptation plans and community research projects, it has been recognized that many different departments and agencies will need to be involved in climate change adaptation planning and measures.

Departments and agencies have begun to assess and build upon their individual levels of knowledge and identify internal capacity gaps that may need to be bridged. The objective of this assessment is to consider and synthesize the level of knowledge on climate change adaptation held collectively within Nunavut departments and agencies and identify possible gaps in this knowledge.

This assessment has been completed for the Nunavut Department of Environment and forms one part of a greater analysis being conducted in Nunavut. McGill University, in cooperation with the Nunavut

Research Institute, is undertaking a systematic literature review and gap analysis of climate change research being conducted in Nunavut. Inuit Tapiriit Kanatami is also completing an assessment of community capacity to address climate change vulnerability and adaptation. Together the outcomes of these projects will form a gap analysis and state-of-knowledge report on climate change vulnerability and adaptation planning across community, government and research organizations in Nunavut.

Potential Impacts of a Changing Northern Climate

The Earth's climate is constantly changing because of natural processes. However, scientific studies now indicate the recent accumulation of greenhouse gases in the atmosphere from human activities is contributing to rises in atmospheric temperatures at a rate greater than at any time in the recorded past. Widespread melting of glaciers and sea ice, rising permafrost temperatures, coastal erosion and changes in the distribution and abundance of wildlife and fish are further evidence of strong Arctic warming. Whether these changes are perceived to be positive or negative is dependent upon one's interests. The following section provides a summary of the potential impacts and benefits of a changing northern climate and their implications on northern lifestyle, culture and the economy.

Air, Water and Land

Increasing temperatures are being recorded in Canada's Arctic region. Although there are regional variations due to atmospheric winds and ocean currents, average air temperatures in the Arctic have increased over the past few decades at almost twice the global rate. Projections are for this trend to continue with average temperatures in the entire Arctic region being as much as 5 degrees Celsius warmer by the end of the 21st century.⁹

These rising air temperatures have led to a number of changes in Canada's Arctic Ocean. Over the past 30 years, the area of summer sea ice has decreased by nearly one million square kilometers⁹, or an area larger than all of Norway, Sweden and Denmark. The continued decrease in Arctic sea ice is expected to result in a longer northern marine navigation season, reaching 100 days by the year 2080.⁹

The rise in air temperature has also contributed to an increase in the average ocean temperature and to changes in sea level. However, because much of the land in Nunavut continues to rebound, or rise in elevation, following the retreat of large arctic ice sheets at the end of the last Ice Age, sea level rise in Nunavut is expected to be less than in other regions of the world, and variable across the region.⁶ A number of other changes have been observed including large portions of glaciers breaking away or calving, and ice cover on lakes, rivers and oceans forming later and melting earlier.

Permafrost coverage, strength and depth can also be affected by warmer temperatures. The foundations of many existing buildings, roads, airport runways and pipelines are expected to become unstable as ground ice and the frozen ground upon which they are built begin to melt. This melting can also result in erosion and the instability of shorelines, drainage of lakes and wetlands leading to the loss of fish and wildlife habitat, deterioration of archaeological sites and artifacts and the release of methane¹⁴, a powerful greenhouse gas that is currently captured within the frozen soil.

Wildlife and their Habitats

Hunting and fishing continues to be an important part of the traditions, culture, diet and economy of many Nunavummiut. However, the diversity and distribution of many important Arctic wildlife species and their habitats are expected to change as the climate continues to warm. Marine mammal populations and ranges will likely change as the extent and seasonal duration of sea ice changes.⁹ Caribou and muskoxen depend upon the availability of abundant tundra vegetation and good foraging conditions. Climate-induced changes to vegetation, freeze-thaw cycles and freezing rain could have implications on the ability of these species to forage.⁹ Birds that migrate to Nunavut each summer may

also be affected as the treeline advances northward and because the timing of bird arrival may no longer coincide with the availability of insect and other food sources.⁹

Traditional Culture and Heritage

The land and oceans continue to be the basis for Inuit cultural and social values.⁹ For centuries Elders passed on essential knowledge through stories, songs, behaviors and legends that speak of the wisdom of generations and which enabled younger Inuit to carry on traditional activities. Today, many Nunavummiut continue to depend on hunting, fishing and gathering as a source of food, recreation and to support the local economy, but without the benefit of *Inuit Qaujimajatuqangit*. Changes in wildlife and fish populations and distribution, treacherous and unsafe travel in changing ice and weather conditions, the inaccessibility of traditional travel routes and the unpredictability of weather are making it increasingly difficult to safely carry on these traditional activities.¹⁴ Traditional hunting and travel activities could be further affected by melting sea ice and the passage of large ships as sea routes further open to shipping.

Archaeological sites and artifacts beneath the ground have been preserved for centuries by the presence of permafrost. The melting of this frozen ground will increasingly expose these sites and artifacts to degradation, and likely lead to the loss of many significant historical and cultural resources.

Communities and Infrastructure

Permafrost, while presenting an engineering challenge, could in the past always be relied upon to provide a strong, frozen support for infrastructure such as buildings, roads, airport runways, bulk storage tanks and supply pipelines. Thawing permafrost and ground ice weakens this support and makes the infrastructure vulnerable to shifting foundations and damage. Given the anticipated time period these structures are expected to last and the significant cost associated with their repair and replacement, the continued melting of permafrost and ground ice could pose a considerable burden on already inadequate infrastructure budgets.

Coastal erosion is expected to be an increasing threat as rising sea levels and a reduction in sea ice allow higher waves and storm surges to reach shorelines.⁹ The thawing of coastal permafrost and ground ice will also add to the vulnerability of shorelines, docks and other marine facilities. Governments have already, and will need to continue to, invest significant expertise and resources to ensure low-lying coastal areas are protected. Landscape hazard mapping and community planning would assist communities in minimizing the risks associated with climate change.

Extreme weather events caused by a changing climate may also require changes to the way buildings and other infrastructure is designed, built and maintained.

Food Security, Health and Contaminants

The Department of Health and Social Services delivers programs that are designed to recognize and promote the health benefits of eating locally harvested traditional foods. Changes in wildlife, fish and vegetation abundance and distribution brought on by a changing climate may make access to these traditional foods more difficult. Changes in ice and snow conditions are also making access to the land

and resources more difficult. Ultimately, substituting imported foods for traditional sources of food would not only be less healthy, but would be more costly.

The health and safety of Nunavummiut is also being affected by climate change through increases in unusual and extreme weather events, which is believed to be resulting in an increase in accidents and emergency searches. Many scientists also predict new diseases will be introduced into Canada's Arctic as wildlife, fish and insects expand their traditional ranges.

Winds presently carry contaminants over long distances to the Arctic, and precipitation deposits them into water and on to land. Changes in wind patterns and precipitation could change the locations and amounts of contaminants deposited in the Arctic.¹⁴ Changes in animal movements and the introduction of new species because of a warming climate could also increase contaminant transport. Over the long term, Nunavummiut who depend upon subsistence hunting, fishing and gathering could be affected by greater personal consumption of these contaminants.

Climate-related changes to the quantity, quality and accessibility of drinking water are also expected to affect northern communities, some of which already face challenges in maintaining and operating municipal water treatment and supply systems. Changes in water quality may lead to changes in the way community drinking water is treated and a greater reliance on bottled water.¹⁴

Resource Development and the Economy

Observations and measurements confirm that the area of summer sea ice in the Arctic has decreased by nearly one million square kilometers. Scientists predict that summer sea ice will continue to retreat away from most Arctic landmasses because of warming temperatures, thereby opening new shipping routes and extending the period during which shipping is possible. Along with greater access to shipping routes comes greater access to the significant fishery, oil, gas and mineral resources that can be found in Nunavut. While this greater access to natural resources will likely result in new and increased wage employment opportunities¹⁴ and a better and cheaper supply of consumer goods for communities, it could also increase the risk of environmental impacts (i.e. oil spills and other industrial accidents, greater access to and disturbance of wildlife).

Tourism is expected to benefit from a longer tourist season and greater access to marine travel routes by cruise ships. Greater numbers of tourists will bring in new business opportunities and increased sales of carvings, prints and other arts and crafts. While benefits will be realized through the continued transition to a wage economy, this will likely further reduce the opportunity for young Nunavummiut to learn the skills required to safely carry on traditional lifestyles and activities.

Emergency Measures Planning

Rapidly changing ice conditions, storm surges, high winds and other extreme weather events are predicted to increase in frequency and intensity in a warming climate. While emergency measures planning can help to ensure the safety and welfare of people in the event of such occurrences, many Nunavummiut are becoming more risk averse by reducing their hunting and travelling activities.¹⁴ Others are relying upon the use of Global Positioning Systems (GPS), satellite phones and more powerful boats, ATVs and snowmobiles to compensate for the ever increasing unpredictable and challenging conditions.¹⁴ These adaptations can however, also increase the overall risk by raising the sense of

security and reliance upon modern communications and technology.¹⁴ The continued teaching of traditional land-based skills to youth by Elders may help to ensure safe travel and reduce the need for costly search and rescue operations.

Emergency measures planning can also help to assess vulnerabilities and protect buildings and shoreline property from climate change-related storm events.

Arctic Security and Sovereignty

As the area covered by summer sea ice decreases and the northern marine navigation season lengthens, international commercial shipping will become more viable in the Arctic. While community resupply and resource extraction will bring economic opportunities and benefits, with this comes the challenge of maintaining Canadian sovereignty over the Northwest Passage and Arctic Archipelago. The pace and extent of shipping development because of reduced sea ice will likely determine, in part, the extent of international pressures on Canada's Arctic sovereignty. The economic cost to Canada for surveillance and enforcement, and the need for new and revised national and international laws focusing on Arctic marine safety and environmental protection, will likely increase.⁹

Understanding Adaptation and Vulnerability

Inuit have demonstrated a significant ability in the past to adjust to gradual or even rapid environmental change. In other words, they were able to *adapt* and had a high *adaptive capacity* in the face of climatic stresses. Historically, this capacity was facilitated by the use of *Inuit Qaujimajatuqangit*, resource use flexibility and diversity, strong social and cultural networks and group mobility. There is now a growing concern that climatic changes are beginning to exceed these conventional adaptation capacities and increase northerners' vulnerability to climatic change.

"Adaptation" is any action that reduces the negative impacts of climate change or takes advantage of potential new opportunities.¹¹

Today, climate change impacts and adaptation responses are largely based on observed climatic changes and modeled future climate scenario predictions. Predicting future climate scenarios and the impacts these will have on society is difficult however, because of our incomplete understanding of climate processes, the interacting environmental and socio-economic variables that influence climate change and the unknown societal responses to climate change. These uncertainties have led to a high degree of indecision and, to some degree, a reluctance to put in place the strategies, plans and actions necessary to address the impacts of climate change.

"Adaptive capacity" is the ability of a region or community to adjust to climate, moderate potential damages and take advantage of any opportunities.¹²

Unlike the impact assessment approach where impacts are predicted based upon a specific action (construction of a mine), the starting point for the *vulnerability* approach is the system itself (i.e. community, region, sector). This approach builds a foundation of knowledge regarding an area and its vulnerabilities over which future change scenarios, or actions, are applied. In other words, the vulnerability approach reduces uncertainty by not only taking into consideration the predicted climate and socio-economic scenarios, but also the system's ability to adjust to the real and predicted changes. It enables decision-makers to better establish priorities and manage risks despite the uncertainties associated with climate change. It also enables climate change adaptation to be undertaken on a much smaller scale (i.e. community, region) than does the impact assessment approach.¹³

"Vulnerability" is the degree to which a natural or man-made system is susceptible to, or unable to deal with, the impacts of climate change.¹²

Given the risks and consequences of climate change, incorporating *adaptation* and a *vulnerability* approach into decision-making is prudent.

The Role of Government

There are two major components to the challenge of climate change: (1) reducing the emission of greenhouse gases and other actions (i.e. deforestation and changes in land use) that have resulted in enhanced climate change – *mitigation*, and (2) preparing for the consequences – *adaptation*. In general, people are more willing and likely to take actions when the benefits are known and outweigh the costs, and when it is in their best interest and power to do so. There are however, a number of barriers that can also make it difficult for people to choose the right action. These include the lack of awareness and knowledge of climate change, misaligned incentives and policies, costs, the complexity of the necessary decisions and the lack of adaptive capacity.⁴ Each of these barriers can lead to delays and inappropriate or incorrect actions being taken.

Government can support the overcoming of these barriers by establishing the appropriate policy framework and program incentives which enable individuals, communities and organizations to make sound adaptation decisions⁴, and by ‘mainstreaming’ climate concerns into their own policies and programs. This requires institutional awareness and vision. The *Nunavut Climate Change Strategy 2003* remains a cornerstone for the Government of Nunavut’s efforts to establish a clear direction and course for a sustainable future. The setting of design standards, building codes and land use plans, ensuring flexibility in resource management regimes and supporting the pursuit of traditional and subsistence ways of life can each support aspects of climate change resilience among northern communities and industry. The development of partnerships which build adaptive capacity, marshal resources from across disciplines, carry on research, transfer knowledge and support the development of decision-making tools is also important in developing adaptive capacity.^{8,10} The Nunavut Climate Change Partnership (NCCP) and *Atuliqtuq Project* are two examples of successful climate change partnerships. Adaptation decisions are not however, made by individuals in a vacuum. By ensuring the appropriate institutional framework exists to support climate change adaptation, governments can help others to manage their exposure to climate risk.

Community governments and the Government of Nunavut also directly own and control buildings, major infrastructure and other physical assets that are susceptible to climate-related risks. The design, operation and maintenance of these assets, public procurement and governments’ direct participation in important public projects (i.e. shoreline protection, flood defense) can affect Nunavut’s resilience to climate impacts. Building the necessary internal awareness and knowledge, incorporating adaptation considerations into all government decision-making and facilitating the transfer of knowledge to community decision-makers can be not only effective but can result in wider benefits, such as expanding the market and awareness of climate resilient goods and services.⁴

Information Collection and Methodology

The main method used to collect information for this assessment was a written survey designed and distributed by the Department of Environment. The survey was intended to collect information on current levels of climate change knowledge and adaptive capacity within territorial departments and agencies. Representatives of eleven departments and agencies, or 85 percent of those canvassed, responded to the survey. A copy of the survey is provided in Appendix A.⁵

Following an initial analysis of the information collected through the survey, a follow-up survey was distributed to all territorial departments and agencies. This survey focused on the question of information and support. Representatives of twelve departments and agencies, or 93 percent of those canvassed, responded to the follow-up survey. A copy of the survey is provided in Appendix B.¹⁷

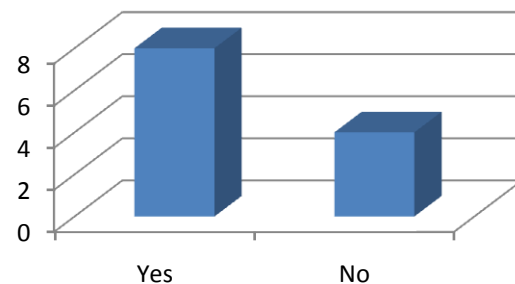
This report represents a preliminary assessment of the climate change adaptive capacity within the Government of Nunavut. The limited number of surveys distributed places significant limitations in the confidence one can place in the data collected. The results and conclusions of this assessment should be considered to be indicative of general trends only, and should not be used for detailed qualitative or quantitative analysis.

Survey Results

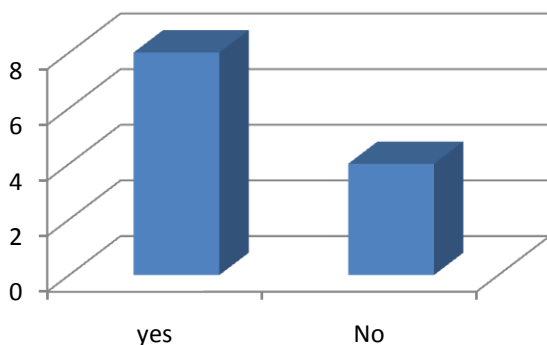
Are the impacts of a changing climate being observed?

The majority of respondents indicated they have observed impacts that are consistent with those predicted from a warming climate, although a direct causal affect could not be confirmed because monitoring is not undertaken. Some of the changes identified include unusual flooding, shoreline erosion, unstable building and tank farm foundations, power poles leaning over, reduced sea ice thickness, later freeze-up and earlier breakup, and unusual weather events.

Health and Social Services also indicated an observed change in the types and frequency of access to health care, although these changes could not be directly attributed to climate change.



Are department and agency operations vulnerable to impacts or effects of a changing climate?



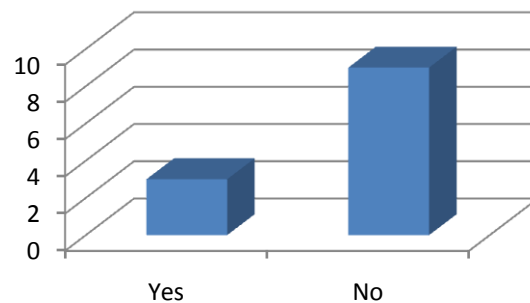
In general, the same respondents who indicated they have observed the impacts of a changing climate also indicated their operations are vulnerable to further changes. This observation confirms the importance and influences first-hand observations and experience can have in the design of programs and policies.

Several respondents expressed concern that the true extent of impacts and vulnerabilities is not yet known. This is further reinforced by several respondents stating that data collected in the past, such as heating and snow loading, hydroelectric potential, permafrost conditions, may be becoming obsolete or less useful. This will result in greater need for updated data, implementation of new research and monitoring programs and greater reliance on outside expertise.

When asked whether climate change would alter their specific job responsibilities, half of the respondents indicated their responsibilities would be impacted, while half were either undecided or did not think their jobs would be impacted.

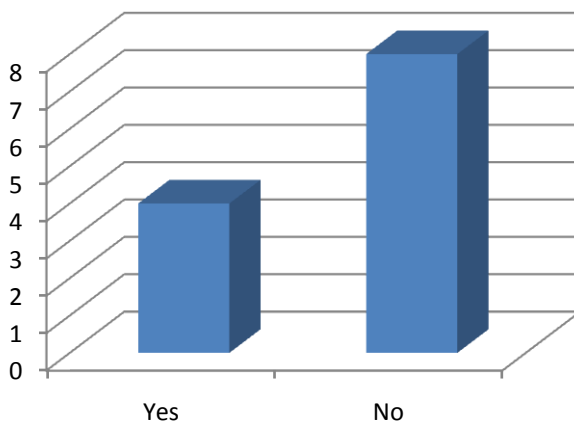
Have departments and agencies planned any future changes to operations or services to adapt to impacts or effects of a changing climate?

Although the majority of respondents reported observing the impacts of climate change and acknowledged their operations are vulnerable to these changes, the majority indicated they have yet to implement changes in their operational or service provisions to respond to these observations and vulnerabilities. Similarly, the majority of respondents indicated that future changes to operations and services are not yet planned, although internal discussions have been initiated by several departments and agencies. Those respondents who indicated changes to operations and services are underway can generally be described as being responsible for delivering technical and engineering services. These departments and agencies have increasingly been utilizing the services of engineers and planners to assess and provide guidance on how best to adapt to observed and future changes.



Do departments and agencies have the internal information and support that are required to effectively plan and implement climate change adaptation actions?

When asked whether there is enough information available on climate change impacts and adaptation for them to do their jobs, the majority of respondents disagreed or were undecided. When asked



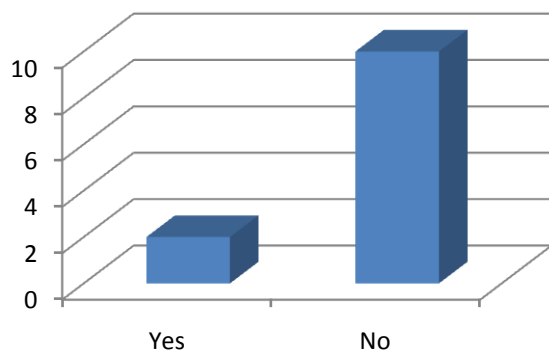
whether easier access to information on climate change would benefit them in their job, a large majority of respondents agreed. However, when responding to the major question of whether their department or agency has the internal information and support that is required to effectively plan and implement climate change adaptation actions, 66 percent of respondents indicated insufficient internal information and support was available (refer to graph).

Further analysis suggests there are differences between ‘internal’ information and support and information and support that can be obtained through external sources. Several respondents indicated that external expertise (i.e. geotechnical engineers, planners) is being contracted where a specific need is identified. It is likely this will have financial implications as departments and agencies increasingly contract outside expertise to plan, design and implement climate change adaptation actions.

The majority of respondents indicated that better sharing of information between departments and agencies and better access to comprehensive online databases would assist in ensuring existing staff have access to the necessary information. The lack of strong corporate policies was identified as hindering internal knowledge retention and transfer. Other respondents indicated that while sufficient general information is available on climate change and its impacts, more information is needed in specialized subject areas (i.e. landscape hazard mapping) and on a local community basis.

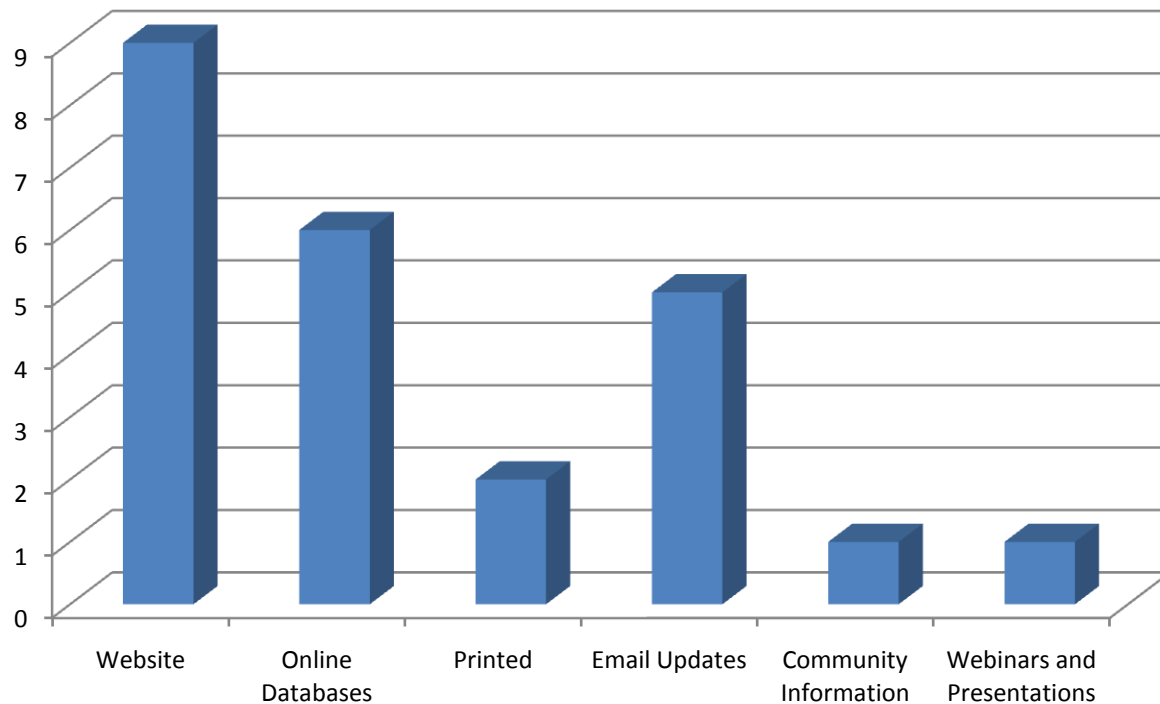
Are there adequate opportunities for climate change impacts and adaptation information transfer and capacity building within departments, agencies or the government?

The large majority of respondents indicated there is inadequate opportunity for climate change impacts and adaptation information transfer and capacity building within the Government of Nunavut. More complete climate change-related baseline information and better interdepartmental communication, planning and coordination were identified as being required. The inclusion of climate change science, impacts and adaptation opportunities in school curriculum was also identified as an ongoing opportunity to build future capacity within the government and territory as a whole.



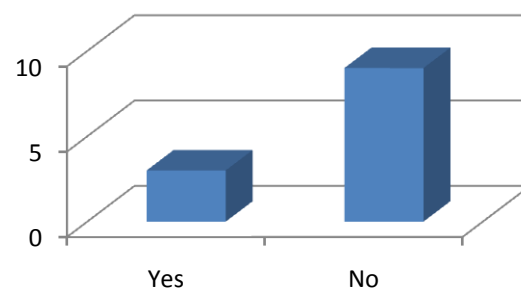
While overall the opportunities for information transfer and capacity building are few, several respondents did identify Natural Resources Canada’s Northern Regional Adaptation Collaborative (RAC) and the Nunavut Climate Change Partnership (NCCP) as emerging initiatives that are helping to transfer information and build capacity. Other respondents identified the continued documentation of *Inuit Qaujimagatuqangit* as being an opportunity to transfer the wisdom of Elders to tomorrow’s decision-makers.

When asked how they would like to see information on climate change made available, respondents indicated a strong preference for information in electronic format (i.e. websites, online database and email updates). Only a small number of respondents indicated a preference for information in hardcopy printed format.



Do departments and agencies currently undertake any type of climate change-related monitoring or generate data that can benefit the Government in climate change adaptation planning?

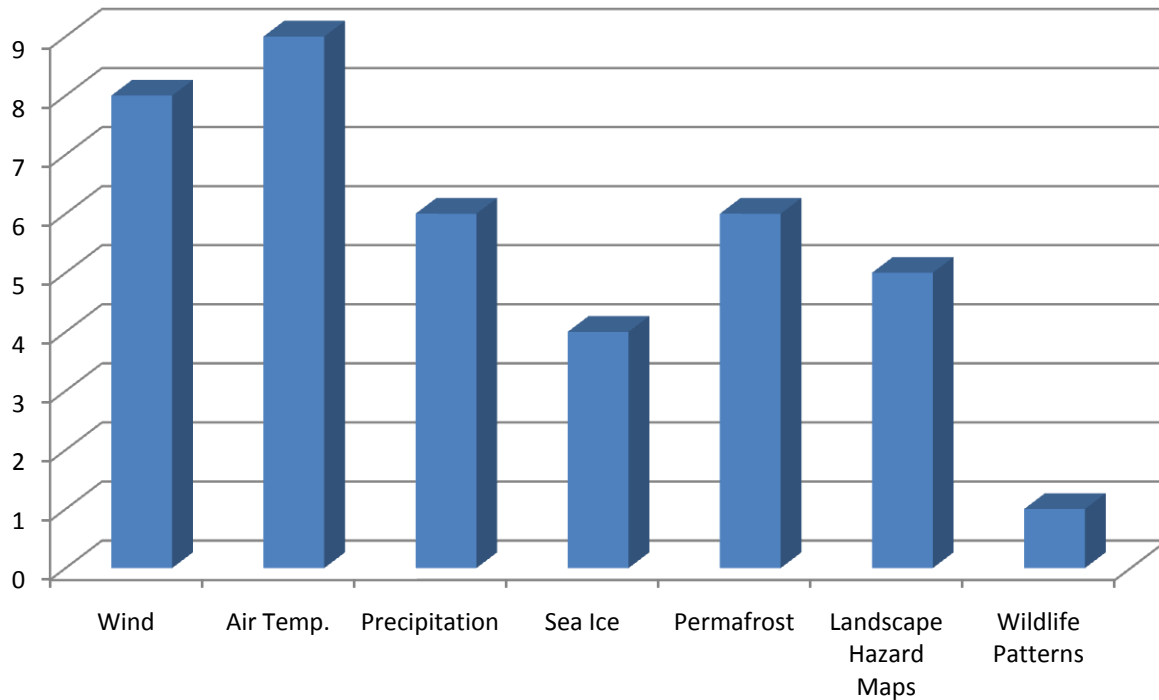
The majority of respondents indicated that departments and agencies do not monitor climate change impacts or generate data that can benefit the Government in planning for adaptation. Those departments and agencies that indicated climate change-related monitoring is undertaken can generally be described as having responsibilities for delivering scientific, technical and engineering services. Not surprisingly, when monitoring is undertaken it is generally undertaken as part of other budgeted programming (i.e. Canadian Aviation Regulations (CARS) training, community planning, wildlife monitoring, infrastructure operation and maintenance) and not for the purpose of monitoring climate change impacts. Several departments indicated they have begun to take part in collaborative partnerships with university and government researchers (i.e. Nunavut Climate Change Partnership, Northern Regional Adaptation Collaborative) as a means of facilitating climate change research in Canada's Arctic region. Also, the Nunavut Research Institute was created in 1995 to promote, facilitate and support *Inuit Qaujimajatuqangit*, science and research in Nunavut, although the Institute does not undertake research itself.



What type of climate change-related information is used in your work?

While two-thirds of departments and agencies indicated they do not monitor climate change impacts or generate data that can benefit the Government in planning for adaptation, most indicated they use

climate change-related information in their work. More than half of the respondents indicated they use four or more types of information. The most common information used is wind, air temperature, precipitation and permafrost data.



What roles should departments and agencies provide to assist in climate change adaptation?

Departments and agencies were asked to respond to two questions with respect to roles and responsibilities: (1) what roles do they see themselves providing in climate change adaptation; and (2) what roles do they see the Department of Environment providing?

Fewer than half the departments and agencies responded to Question 1. The respondents tended to see their own department or agency's role as providing advice and assistance to others, or participating in joint work with other departments and agencies. Only two respondents identified specific roles and responsibilities they should be undertaking that are related to their own mandates. These were the education of youth and working towards the development of community adaptation plans.

More respondents provided suggestions on what role the Department of Environment (DoE) should provide as compared to their own department or agency. These responses were generally more specific in nature and action orientated than were the responses to Question 1. Three respondents suggested DoE compile scientific and technical research and make this available to others.

Table 1. The Role of the Department of Environment

- Compile and make available scientific information and data (3)
- Produce publications and videos (1)
- Be a resource for the Environment Technology Program (1)
- Coordinate a climate change adaptation strategy or plan (1)
- Assist in school curriculum development (1)
- Provide financial analysis of climate change impacts and adaptation (1)

Other responses ranged from policy development to providing cost analyses of climate change impact and adaptation measures. Table 1 summarizes the major responses.

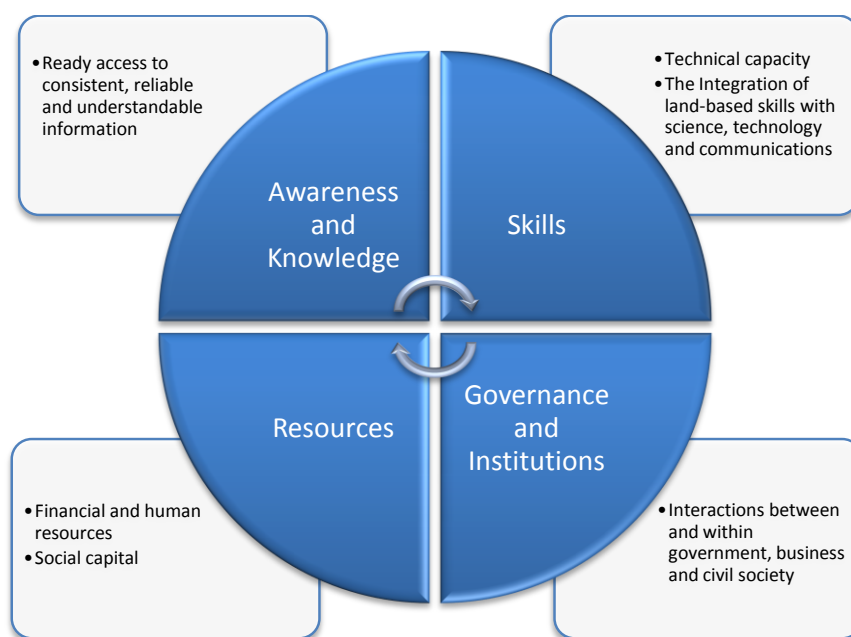
The responses to these inter-related questions suggest that most departments and agencies consider climate change first-and-foremost to be an environmental issue. Although the majority of respondents indicated they have observed impacts that are consistent with those predicted from a warming climate and their operations are vulnerable to further changes, the majority of respondents are looking elsewhere for a 'champion' or leader to emerge. The responses suggest they see the Department of Environment as being that leader.

Adaptive Capacity Assessment

Adaptive capacity enables an organization to design and implement effective strategies and programs so as to reduce the likelihood and magnitude of impacts resulting from climate change. Adaptive capacity also enables an organization to take full advantage of the opportunities and benefits associated with climate change.

Adaptive capacity is influenced by the presence or absence of a number of factors including social capital (i.e. strong government, social and cultural institutions, transparent decision-making processes, formal and informal networks that promote collective action), human resources (i.e. skills, awareness and knowledge) and financial resources. The amount and type of each factor required and their relative importance depend on the level of hazard and risk being faced and the nature of the adaptation actions being taken. Further, adaptation efforts will not be successful unless there is a willingness to adapt and a degree of consensus among decision-makers as to what types of actions are appropriate. Adaptive capacity therefore, depends both on the ability of an organization to act collectively and its ability to resolve conflicts between members, all factors that are heavily influenced by strong governance.

For the purpose of this assessment, four inter-related descriptors are used to describe the factors necessary to improve adaptive capacity. These descriptors are awareness and knowledge, skills, governance and institutions, and resources.¹⁶ Each is described further in the following sections.



Awareness and Knowledge

Developing a high level of awareness and knowledge of climate change is a foundation upon which adaptive capacity can be built. This awareness and knowledge may be developed using two different methods – informal education and formal education.

Informal education, or the transmission of land-based knowledge and *Inuit Qaujimajatuqangit*, has historically enabled Inuit to pass on the wisdom of generations to younger Inuit. This awareness and knowledge of the natural environment has enabled Inuit to adapt to a changing climate because of personal experiences and history. In 2001, the Nunavut Department of Environment began to collect and document climate change local knowledge and *Inuit Qaujimajatuqangit* through a series of regional, Elder and youth workshops. These activities have enabled this knowledge to better inform and influence the modern scientific research currently taking place in Nunavut. It has also provided important historical context on how Nunavummiut have observed and experienced climate change at the individual and community levels.

Whereas informal education is the awareness and knowledge society obtains through *Inuit Qaujimajatuqangit* and personal life experiences, formal education is the knowledge learned at schools, universities or other learning institutions.

The survey demonstrates that departments and agencies generally have a high level of awareness of climate change and recognition of the need to begin adapting to its impacts. While some of those surveyed displayed a broader perspective and understanding of climate change impacts than others, each respondent demonstrated a general knowledge of climate change, its impacts and the need to incorporate adaptation strategies into government decision-making. Although the majority of respondents indicated they have yet to implement changes to their operations and services to better respond to the observed impacts and vulnerabilities, there appeared to be an overall willingness and interest in learning more about how best to adapt. Not unexpectedly, those departments and agencies responsible for delivering scientific, technical and engineering programs indicated changes to operations and services necessitated by climate change are already underway.

Skills

Unlike awareness and knowledge, in most cases the scientific, technical and managerial skills necessary to adapt to climate change impacts are acquired through formal education, training and the use of modern technology and communications. The openness and willingness of individuals to learn these new skills is an important element of adaptive capacity.

Although the Government of Nunavut employs many professional staff (i.e. scientists, engineers, technologists and planners) at headquarters and in the Regions, much of the scientific and technical work required by government continues to be undertaken by contracting consultants or through partnership arrangements with federal departments (i.e. NRCan, Environment Canada), research agencies (i.e. National Water Research Institute) and universities. This ongoing need was confirmed by the majority of survey respondents who confirmed departments and agencies do not have the internal information and support required to effectively plan and implement climate change adaptation actions. This suggests a need to continue promoting development of scientific and technical skills among Nunavummiut in order to reduce the reliance on outside science, technical and planning expertise.

Collaborative partnerships offer a unique opportunity to share expertise and skills. Representatives from Nunavut communities, government departments and agencies, planning organizations and universities attending the Nunavut Climate Change Partnership Workshop held in Iqaluit in February 2011 acknowledged the significant collaborative efforts of the Partnership since it was initiated in 2006.

The Northern Regional Adaptation Collaborative¹ is another example of a partnership which is bringing together non-government expertise and skills to advance climate change knowledge and adaptive capacity in Nunavut.

Not all skills needed to improve adaptive capacity are scientific or technical in nature. Administrators with the managerial skills necessary to, for example, focus a group's ability to act collectively, facilitate the exchange of information or raise the priority of construction and maintenance capital projects needed to mitigate climate change impacts are also necessary to develop adaptive capacity. The development and retention of personnel possessing these managerial skills will better enable capacity building within departments and agencies.

Governance and Institutions

The development of climate change adaptive capacity requires collaboration and cooperation within and among multiple levels of institutions including national, territorial, community, academic and other non-government organizations. While a national governance framework on climate change adaptation is important if results-oriented approaches on adaptation are to be achieved in Canada, so too is an effective governance framework at the territorial level. By adopting the *Climate Change Strategy* in 2003, the Government of Nunavut formally committed to taking action on adaptation by identifying and monitoring climate change impacts and developing adaptation strategies. The *Strategy* began to outline essential policy-related goals and objectives and represented the first step towards establishing the processes, behaviors and interactions necessary to develop climate change adaptive capacity within the Government. At the time of preparing this assessment however, the Government of Nunavut had not adopted a formal plan identifying the specific actions it will be undertaking in order to achieve its climate change adaptation goals and objectives.

Territorial departments and agencies make a large number of decisions every day that affect a wide range of people and activities. These include governance-related decisions on legislation, regulations and policies, programs and related financial measures, operations and infrastructure. Effective climate change governance means holding government and society together, providing them with a sense of purpose and direction, and enabling them to integrate their daily decisions so as to enable adaptation to the changes brought on by a changing climate.

Another institutional dimension of adaptive capacity is the motivation and attitude of individuals. This aspect can also have a significant effect on the adaptive capacity of the organization as a whole. While it is widely known that climate change presents one of the greatest environmental, social and cultural challenges facing Nunavummiut, the survey results suggest that most departments and agencies still consider climate change to be first-and-foremost an environmental issue. Although most respondents acknowledged their own operations are vulnerable to climate change, they also indicated they are looking towards the Department of Environment to provide leadership on the issue. This implies further efforts need to be taken by the 'institution of government' to promote a greater level of personal ownership and commitment to climate change adaptation among employees and departments.

¹ The Regional Adaptation Collaborative is a three-year, \$30 million federal-provincial-territorial cost-shared initiative led by Natural Resources Canada and designed to advance regional climate change adaptation decision-making.

The majority of survey respondents also indicated there is inadequate opportunity for information transfer and capacity building within the Government of Nunavut. One mechanism for improving coordination and cooperation is through establishment of intra- and interdepartmental climate change working groups. These groups could be assigned responsibility for identifying work priorities, improving communications and providing technical and policy support.

Resources

Human and financial resources can strongly influence department and agency capabilities to cope or adapt to climate change impacts. While it can be argued that there will never be enough resources to do everything that must be done, the assignment of resources to the highest priority items and issues is one means of ensuring progress is achieved. By adopting the *2003 Climate Change Strategy*, the Government of Nunavut committed to investing the resources necessary to engage Nunavummiut in discussions surrounding climate change, advancing the knowledge and understanding of climate change impacts and adaptation strategies, and building partnerships at the community, regional, national and circumpolar levels.

Although having adequate human and financial resources is fundamental to building adaptive capacity, it is not the only resource element. Social capital contributes to an organization's ability to work collectively. It includes features such as high levels of interpersonal trust as well as establishing networks, committees and other forums that enable the exchange of information and knowledge.

Conclusions

This report highlights the current level of climate change impacts awareness and knowledge within Nunavut departments and agencies and provides suggestions on how the Government of Nunavut can further enhance its leadership role in preparing for the climate change challenges of the future.

Overall, the Government of Nunavut has responded to the need to engage Nunavummiut, other Canadians and the international community in discussions on climate change impacts and the necessity to adapt to these impacts. This has been a positive example of how governments can work collaboratively and cooperatively with partners and the public to increase the awareness and understanding of climate change and begin to establish a sound foundation for adaptation measures that will be necessary in the coming years. While much has already been accomplished, this analysis has identified a broad range of measures that could, if implemented, increase the internal adaptive capacity of Government itself. These are summarized and presented below.

Leadership: The strategic foundation for increasing the adaptive capacity of the Government of Nunavut was established in 2003 with adoption of the *Climate Change Strategy*. The next step should now be taken to develop and adopt a plan that commits the Government to specific measures directed at adapting to climate change impacts. This would further demonstrate overall leadership by assigning specific responsibilities for measures and ensuring climate change adaption is integrated into all Government decision-making. An adequate level of human and financial resources must accompany the plan if measures are to be implemented.

Awareness and Training: Departments and agencies are generally aware of climate change issues, but have yet to widely apply adaptation measures to their own programs. Departments responsible for delivering scientific, technical and engineering programs are more likely to plan and implement climate change adaptation measures than departments that deliver social programs or perform central-agency functions. Climate change orientation sessions, intra- and interdepartmental workshops and Internet-based information are examples of tools that could be utilized to increase climate change adaptation awareness among employees.

Coordination and Cooperation: Departments and agencies currently have uneven capabilities to develop and implement climate change adaptation policies and programs. Some departments are fully capable, while others are not. Developing the means to facilitate greater coordination and cooperation would assist in building adaptive capacity across the whole of government. The creation of interdepartmental networks and committees are examples of ways to better enable the exchange of climate change information and knowledge and bring resources together to perform tasks they have in common.

Build Working Relationships and Partnerships: Partnerships bring the benefit of 'economy of scale' with the sharing of both responsibility and funding requirements. Partnerships also bring increased credibility, merit and believability to the outcomes. The Government of Nunavut should continue to develop and maintain relationships and partnerships with federal departments, research institutions, universities, communities, industry and other non-government organizations as they apply to climate change impacts and adaptation.

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APPENDICES

APPENDIX A – SURVEY #1



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Avatiligiyiit

Department of Environment

Ministère de l'Environnement

Climate Change Vulnerability, Impacts and Adaptation

Under the Nunavut Climate Change Strategy (2003) the Department of Environment is mandated to “monitor the impacts of climate change on the Nunavut environment, and the development of strategies or material(s), which identify, report on, or illustrate the impacts of climate change on Nunavut and Nunavummiut.”

In following that mandate, DOE has developed the following survey to identify the Government of Nunavut's Departments and Agencies' knowledge of climate change vulnerability, impacts and adaptation. We intend to use this information to identify knowledge and capacity gaps as well as priority questions or issues to further the adaptive capacity of the GN.

By filling in this survey you will help DOE obtain a fuller picture of climate change knowledge and adaptive capacity within the GN. This in turn will help us understand where there are gaps that need to be filled.

The information obtained through this survey, followup interviews with key stakeholders and a literature review of relevant government documents will be contained in a report to be developed by DOE and distributed to all participating Departments/Agencies for review and consultation before being printed and released.

This survey forms one of three parts of comprehensive climate change vulnerability, impacts and adaptation gap analysis for Nunavut. A community level study will be undertaken by Inuit Tapiriit Kanatami and a systematic literature review of scientific information will be conducted by researchers from McGill University in collaboration with the Nunavut Research Institute.

Responses should be e-mailed to: freinhart@gov.nu.ca by August 20th, 2010.

If you need assistance filling in the survey questionnaire, please do not hesitate to contact:

Froeydis Reinhart,
Air Quality and Climate Change Coordinator,
Department of Environment
Phone: 975 – 7735
E-mail: freinhart@gov.nu.ca

We greatly appreciate you taking the time to answer the questions below.

Please fill in the following information:

Name:

Department:

Division:

We ask you to fill in your name as we may ask to interview you following the questionnaire. Your name will not appear in any reports and the information will only be used to determine knowledge of climate change impacts and adaptation within the Government of Nunavut.

“Vulnerability” refers to the degree to which a natural or man-made system is susceptible to, or unable to deal with, the impacts of change.

“Adaptation” refers to any action that reduces the negative impacts of climate change or takes advantage of potential new opportunities.

Climate change impacts are already being observed and studied in Nunavut. Examples include: earlier break up and later freeze-up of sea ice, rapid weather changes (e.g. wind direction, precipitation), degrading permafrost, changes in vegetation and wildlife (e.g. new species) and a general warming trend in air temperature. Climate change in this questionnaire refers to any change in climate over time whether it is caused by human activity or natural variation or a combination of both.

Section 1

IMPACTS

1. Has your Department/Agency observed impacts of a changing climate?

Yes ☐

No ☐

If yes, please describe the observed effects/impacts.

| |
|--|
| |
|--|

2. Is your Department/Agency's operations (projects/services) vulnerable to impacts of a changing climate (including both observed as well as anticipated impacts)?

Yes ☐

No ☐

If yes, please describe.

| |
|--|
| |
|--|

Section 2

ACTIONS

3. Has your Department/Agency changed operation/service provision to adapt to impacts or effects of a changing climate?

Yes ☐ No ☐

If yes, please describe.

4. Has your Department/Agency planned any changes in operation/service provision to adapt to impacts or effects of a changing climate?

Yes ☐ No ☐

If yes, please describe.

5. Has your Department/Agency had to react to climate related impacts? (E.g. patching, slumping roads and runways)

Yes ☐ No ☐

If yes, please describe.

6. If you have answered yes to the question above, could you please provide an approximation of the added costs (financial or other) of the actions/planned actions (changes to operation/service operation):

Section 3

INFORMATION AVAILABILITY AND ACCESS

For the following questions please mark off which you feel apply the most on a scale from strongly agree to strongly disagree. Please only check off one answer per question unless indicated otherwise.

7. There is enough information available on climate change impacts and adaptation for me to do my job.

| | |
|-------------------|--------------------------|
| Strongly agree | <input type="checkbox"/> |
| Agree | <input type="checkbox"/> |
| Undecided | <input type="checkbox"/> |
| Disagree | <input type="checkbox"/> |
| Strongly disagree | <input type="checkbox"/> |

8. Easier access to information on climate change impacts and adaptation would benefit me in my job.

| | |
|-------------------|--------------------------|
| Strongly agree | <input type="checkbox"/> |
| Agree | <input type="checkbox"/> |
| Undecided | <input type="checkbox"/> |
| Disagree | <input type="checkbox"/> |
| Strongly disagree | <input type="checkbox"/> |

9. Climate change will alter how I conduct my job.

| | |
|-------------------|--------------------------|
| Strongly agree | <input type="checkbox"/> |
| Agree | <input type="checkbox"/> |
| Undecided | <input type="checkbox"/> |
| Disagree | <input type="checkbox"/> |
| Strongly disagree | <input type="checkbox"/> |

10. Climate change will impact positively how my Division operates/provides services.

| | |
|-------------------|--------------------------|
| Strongly agree | <input type="checkbox"/> |
| Agree | <input type="checkbox"/> |
| Undecided | <input type="checkbox"/> |
| Disagree | <input type="checkbox"/> |
| Strongly disagree | <input type="checkbox"/> |

11. Climate change will impede how my Department operates/provides services.

| | |
|-------------------|--------------------------|
| Strongly agree | <input type="checkbox"/> |
| Agree | <input type="checkbox"/> |
| Undecided | <input type="checkbox"/> |
| Disagree | <input type="checkbox"/> |
| Strongly disagree | <input type="checkbox"/> |

12. How would you like to see information on climate change adaptation presented? Please check all that apply.

Website ☐
 Online database ☐
 Library (print) ☐
 E-mail updates ☐
 Other...specify ☐

13. What type of information indirectly or directly related to climate change do you use in your work? Please check all that apply.

Wind ☐
 Air temperature ☐
 Precipitation ☐
 Sea Ice ☐
 Permafrost ☐
 Landscape hazard maps ☐
 Not applicable ☐
 Other...specify ☐

14. Have you read in full or partially any of the following reports? Please check all that apply.

Arctic Climate Impact Assessment (ACIA, 2004) ☐
 Intergovernmental Panel on Climate Change
 Assessment Report (IPCC – AR4, 2007) ☐
 Nunavut Climate Change Strategy (2003) ☐
 NRTEE (National Roundtable on the Environment
 and the Economy) – True North (2009) ☐
 Stern Review - The Economics of Climate Change (2006) ☐
 Adapting to Climate Change in Ontario (2009) ☐
 Unikkaaqtigiit (2005) ☐
 Climate, Nature, People: Indicators of Canada's
 Changing Climate (2003) ☐
 From Impacts to Adaptation: Canada in a Changing
 Climate (2007) ☐

Section 4

MONITORING

15. Does your Department/Agency currently undertake any type of monitoring?

Yes ☐ No ☐

If yes, please describe.

16. Does your Department/Agency generate any data that can benefit the Government in adaptation planning?

Yes ☐ No ☐

If yes, please indicate what type of data and explain how this could facilitate adaptation planning.

17. What role do you see the Department of Environment providing which could help your Department/Agency adapt?

18. What role do you see your Department/Agency providing which could assist with adaptation?

19. Are you a member of a working group/panel that discusses climate change (impacts, vulnerabilities or adaptation) in any of its work?

| | |
|------------------------------------|--------------------------|
| Interdepartmental working group | <input type="checkbox"/> |
| National | <input type="checkbox"/> |
| International | <input type="checkbox"/> |
| Nunavut specific intergovernmental | <input type="checkbox"/> |
| Pan-territorial | <input type="checkbox"/> |
| Not applicable | <input type="checkbox"/> |

Thank you!
Qujannamik!

APPENDIX B – SURVEY #2

Although the Government of Nunavut has been involved in climate change mitigation and adaptation planning and implementation for many years, little is known about the state-of-knowledge and capacity of GN departments and agencies to participate in these key activities. In August 2010, Nunavut's Department of Environment circulated a questionnaire designed to obtain a fuller picture of climate change knowledge and adaptation capacity within the GN. This brief online survey is designed to build upon the results of the August 2010 questionnaire.

The ability of a community or organization to adapt to real or anticipated change depends on how well enabled the community or organization is to plan and implement adaptation measures. This adaptation capacity is often described using four inter-related descriptors – awareness, skills, knowledge and resources. The majority of respondents to the August 2010 questionnaire indicated that departments and agencies have observed the impacts of climate change and that their operations are vulnerable. However, approximately 90% of respondents also stated they were either undecided or disagree that there is currently enough information and support available on climate change impacts and adaptation for them to do their job. This online survey further explores this critical aspect.

This online survey should take no more than 10-15 minutes to complete.

Next


1. Identify your department/agency. Does your department/agency have the internal information and support that are required to effectively plan and implement climate change adaptation actions?

- ☐ Qulliq Energy Corporation
- ☐ Executive and Intergovernmental Affairs
- ☐ Community and Government Services
- ☐ Nunavut Arctic College
- ☐ Culture, Language, Elders and Youth
- ☐ Justice
- ☐ Economic Development and Transportation
- ☐ Health and Social Services
- ☐ Environment
- ☐ Education
- ☐ Nunavut Housing Corporation
- ☐ Finance
- ☐ Human Resources
- ☐ Yes
- ☐ No

2. If you answered YES to Question 1, what information and support capacity does your department/agency currently possess?

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3. If you answered NO to Question 1, what information or support would most benefit your department/agency in developing its climate change impacts and adaptation capacity?

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4. If you answered NO to Question 1, where are the greatest information gaps and what should the federal and territorial governments' priorities be in developing your department's/agencies' climate change impacts and adaptation capacity?

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5. Does your department/agency provide, or has it been provided with, adequate awareness and technical training on climate change impacts and adaptation?

- ☐ Yes
- ☐ No

6. If you answered YES to Question 5, describe the type of awareness and technical training that has been provided.

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7. If you answered NO to Question 5, what type of awareness and technical training on climate change impacts and adaptation is needed to better enable you to do your job?

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8. Are there adequate opportunities for climate change impacts and adaptation technology transfer and capacity building within your department/agency or within the government?

- ☐ Yes
- ☐ No

9. If you answered YES to Question 8, describe the current opportunities for climate change impacts and adaptation technology transfer and capacity building.

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10. If you answered NO to question 8, what climate change impacts and adaptation technology transfer and capacity building would better enable you to do your job?

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Prev

Done