Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

Report on Adaptation to Climate Change Activities in Arctic Canada

Indian and Northern Affairs Canada
Northern Affairs Program
Environment and Renewable Resources

Canada

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Executive Summary

The impacts of climate change are increasingly noticeable across the country, with more intensity in Northern regions. Indeed, northerners are experiencing changes at an intensity and speed never experienced before. Changes in temperature, wildlife, sea ice and water and permafrost thawing are only few of the elements affecting the livelihoods of northerners, as demonstrated in the Arctic Climate Impact Assessment (ACIA), and in the upcoming Canada National Assessment 2007 of climate change impacts.

In recent years, the Government of Canada provided support to numerous projects aimed at identifying the impacts of climate change and some of the potential adaptation options available to Canadians. In the North, Indian and Northern Affairs Canada (INAC), Natural Resources Canada (NRCan) and Environment Canada (EC) have played a key role in providing this support.

Since 2000, INAC has been supporting partners in Canada's Arctic regions in communicating and advancing adaptation to climate change issues. Through the Aboriginal and Northern Climate Change Program (ANCCP), and later the Aboriginal and Northern Community Action Program (ANCAP), Aboriginal and Northern partners accessed resources to: conduct workshops to raise awareness and gather observations of climate change, develop adaptation strategies and priorities, participate and provide input to the ACIA, conduct studies and assessments, as well as communicate the outcomes of ACIA.

In 2004, INAC and a group of partners created the Northern Climate Change Coordinating Committee (NC4). The NC4 is an information sharing and coordinating mechanism on climate change adaptation activities throughout the North. One of the key roles of the committee is to develop and implement a Northern Impacts and Adaptation Strategy which outlines the key priorities for adaptation actions required to ensure northerners have the tools to cope with adverse climate change impacts, and ensure they can maximize benefits from positive impacts.

NRCan support mainly came through the Climate Change Impacts and Adaptation Program (CCIAP). This program provided support for numerous research projects as well as the development of a research network, the Canadian Climate Impacts and Adaptation Network (C-CIARN), facilitating creation of a knowledge base on the impacts of climate change in the north.

EC, through the Northern Ecosystem Initiative (NEI), also provided support to research projects, knowledge gathering and communication related to ecosystems throughout the North of Canada.

In addition to the federal government, territorial governments, Aboriginal organizations, and other partners have put efforts toward developing strategies to

address the impacts of climate change and support adaptation throughout the North.

The three territorial governments have developed and are implementing mitigation strategies. They are working on adaptation strategies, and have contributed to numerous adaptation projects in their territories.

In the last 6 years, Aboriginal organizations have been active at gathering views and communicating science of climate change to their constituents in. This work allowed them to provide significant input and integrate TK in processes like the Arctic Climate Impact Assessment, the National Health Assessment and the National Assessment 2007.

Other players, such as the Northern Climate Exchange, are playing key roles in creating a dialogue between the research and northerners. Through coordinating research projects, creating networks of people interested in adaptation, organizing workshops on adaptation and development of communication products, these partners have contributed to increasing awareness and understanding of climate change and adaptation issues in northern Canada.

Adaptation in Arctic Canada

In Canada, the Northern context includes a complex governance structure established under the *Constitution Act* and land claim agreements. First, the federal government has significant role in ensuring northerners have access to the same level of servicing than the remaining of the Canadian population. Then there are diverse levels of devolution of those responsibilities from the federal government to territorial governments, Aboriginal governments and organizations, management boards, and specific communities. This requires that northern issues be approached in an integrated and comprehensive manner, involving a wide variety of stakeholders and interests.

In the north of Canada, some of the key issues are related to culture, health and safety of individuals and communities: food security, safety of travel on the land, damage to infrastructure, health impacts. In addition to climate change, the north of Canada is experiencing tremendous changes with the increasing economic development related to natural resources exploitation. This is creating increasing pressure for small communities that are at the same time dealing with housing shortage, lack of infrastructure and increasing energy costs.

In essence, climate change influences all aspects of northern societies directly or indirectly in a dynamic matrix of issues; where all issues are interconnected, even more when getting closer to the community level. This calls for a comprehensive and integrated approach, that considers the broad context of bio-physical, socio-economical and cultural aspects characterising societies, and seeks solutions that will support co-benefits on a number of fronts while minimising impacts on other fronts. Adapting to climate change is building sustainable communities relying on a long-term planning where social and physical and economic development, adaptation and energy management, and resources management are done in harmony with communities' culture and aspirations.

There are three main programs from the federal government that support adaptation to climate change projects in northern regions: the Climate Change Impacts and Adaptation Program (CCIAP) – Natural Resources Canada, the Aboriginal and Northern Community Action Program (ANCAP) – Indian and Northern Affairs Canada, and the Northern Ecosystem Initiative (NEI) – Environment Canada. In recent years, those programs contributed to gathering and advancing science and traditional knowledge, increasing understanding of climate change in the north, as well as raising awareness of climate change across the North.

Adaptation Activities, Measures and Knowledge

Permafrost mapping projects, coastal vulnerability studies, infrastructure assessments, health impact assessments, development of new technologies are some of the issues explored by research projects that have taken place in northern Canada in recent years (see APPENDIX B to E for lists of some projects that have taken place in the North).

All this information acquired through science projects is now starting to be integrated in the development of planning tools and decision-making resources aimed at facilitating the integration of climate change in decisions for local, territorial/provincial and federal governments.

Federal Government

Aboriginal and Northern Community Action Program

Since 2000, INAC and other institutions have supported Aboriginal and northern organizations in their exchange with their communities on climate change. This initiative allowed gathering precious information on aboriginal traditional knowledge, raising awareness and understanding of climate change science information at the community level, as well as defining priorities and strategies on adaptation to climate change for northern Aboriginal communities.

Through those same efforts, INAC also supported an active participation of northern Aboriginal organization to the ACIA process, facilitating incorporation of aboriginal traditional knowledge from northern Canada's Aboriginal peoples into the assessment.

In addition to those projects, in collaboration with other federal, provincial and territorial agencies, INAC supported a number of projects and studies on specific climate change impacts or impacts on specific sectors. For instance, a study is currently underway to assess the impacts of climate change on transportation in the Northwest Territories; another study is progressing in the north of Manitoba in the impacts of reduction of ice road season on First Nation communities.

Finally, building on those years of work and information gathering and awareness raising, in the fiscal year 2006-2007, INAC released calls for projects related to adaptation to climate change. The key principle of this process is to support Aboriginal and northern communities to engage in adaptation projects; the overall objective being to facilitate the development and implementation of adaptation at the community level.

For more information: http://www.ainc-inac.gc.ca/clc/index_e.html

Northern Ecosystem Initiative

The Canadian North is particularly vulnerable to the effects of climate change. Climate models project northern latitudes will experience more warming than anywhere else in the world. This change could have significant impacts on northern ecosystems, communities, and lifestyles. To date, climate change research has been largely focused on atmospheric and physical processes. Ecosystem impacts and responses are not as well understood. The Northern Ecosystem Initiative (NEI) supports projects that improve our understanding of how northern ecosystems, including communities, are affected by climate change.

The Northern Ecosystem Initiative (NEI) Climate Change Issue Table identified ecosystem and related community concerns that are shared between Environment Canada and its partners (northerners and northern science agencies). They include the following climate change priorities (a list of projects in included in Appendix D):

- **Caribou:** *Better understand and respond to climate impacts on habitat, movements, and calf survival.*

- **Community Knowledge and Leadership:**

  - Transforming knowledge into action: *Understand linkages between climate and land, water and people. Use local knowledge and experience to identify adaptation and management strategies*

  - Fostering engagement, participation, awareness: *Promote effective sharing of information, knowledge, and research. Combine local, traditional, and western science perspectives. Influence local, regional, national, and international fora*

- **Freshwater Ecosystems:** *Investigate changes to key physical processes and climate impacts on freshwater ecosystems*

- **Habitat and Migratory Birds:** *Using data from monitoring programs, results from research projects, and technological tools to provide a pan-northern view of potential and actual (measurable) habitat shifts, with particular attention to impacts on migratory birds*

- **Marine Ecosystems**: *Develop an integrated model of climate-induced changes to sea ice habitat*. *Research impacts to key species in support of adaptation measures*

- **Mercury-Climate**: *Investigate climate impacts on mercury levels in animals and ecosystem pathways*

For more information: http://www.mb.ec.gc.ca/nature/ecosystems/nei-ien/index.en.html

Climate Change Impacts and Adaptation Program

The Government of Canada's Climate Change Impacts and Adaptation Program, managed by Natural Resources Canada, provides funding for research and activities to improve our knowledge of Canada's vulnerability to climate change, to better assess the risks and benefits posed by climate change and to build the foundation upon which appropriate decisions on adaptation can be made. The Program also facilitates interaction between stakeholders and researchers through support of the Canadian Climate Impacts and Adaptation Research Network (C-CIARN), and supported the development of tools such as the *Municipal Primer on Impacts and Adaptation*, in which there is a northern case study included. (a list of projects is included in Appendix C)

The CCIAP also made progress on the policy front with the development of a *Provincial/Territorial/Federal Policy Framework for Adaptation* through the Intergovernmental Climate Change Impacts and Adaptation Working Group.

For more information: http://adaptation.nrcan.gc.ca/home_e.asp

International Polar Year

The Government of Canada has announced an investment of $150 million over six years to carry out an innovative and interdisciplinary Canadian Program for IPY. This Program includes science and research activities to focus on two important challenges for Canada's northern regions - climate change impacts and adaptation, and the health and well-being of northern communities - as well as other related elements, such as logistics, emergency preparedness, capacity building, training, communications, outreach and data management. The first Call for Proposals for science and research projects closed on March 31, 2006 and proposals are currently being reviewed.

On behalf of the Government of Canada, this Program is jointly managed by the departments of Indian Affairs and Northern Development, Environment, Fisheries and Oceans, Health, Industry, and Natural Resources Canada

Highlights of the Government of Canada Program for IPY include:

- A **targeted science and research** program that will build on and support existing programs, networks and facilities to focus on two important challenges for Canada's northern regions:
    - climate change impacts and adaptation; and

    - the health and well-being of northern communities.

- A **training** program to actively engage young scientists and Northern communities in on-the-ground training in science and research activities. This will lead to a new generation of polar scientists, particularly Northerners and Aboriginal peoples, to carry on strong northern research programs in the decades to follow.

- A **communications and outreach** program will focus on raising awareness of Northern and polar regions and issues, and celebrating northern, Aboriginal and scientific achievements.

As a host polar nation, Canada will work to ensure basic facilities and services are in place to accommodate the influx of researchers to Canada's North during the peak IPY period of 2007 to 2009. IPY will bring opportunities to welcome many top international scientists and other visitors to Canada.

IPY will involve northern residents in science and research planning and activities, through training programs, communications activities, and in the management and administration of the program.

For more information: www.ipy-api.ca/

Territorial governments

Nunavut

The Government of Nunavut recognizes that the impacts of a changing climate is a priority and are currently identifying ways to address the issue. One initiative currently being developed and coordinated by The Department of Environment is a climate change adaptation plan to complement their Nunavut Climate Change Strategy. This document will identify impacts and vulnerabilities of several remote communities and define priorities for adaptation in Nunavut. It aims to support development of comprehensive climate change projects, including both mitigation and adaptation objectives. The Department of Community and Government Services developed and released the Nunavut Energy Management Plan which is made up of three separate programs. They are the Nunavut Energy Retrofit Program, the Save 10 program, and the Facility Energy Efficiency Review Program.

The Nunavut Qulliq Energy Corporation, responsible for supplying safe, reliable and efficient energy to Nunavut customers is currently investigating potential alternative energy sources. On such example is the Iqaluit Area Hydro-Electric Generation project. Its aim is to identify and evaluate potential hydro-electric generation sites within 200km of Iqaluit. In complement with this, QEC is also investigating the potential for a Nunavut-Wide Alternative Generation Study. The

QEC has also established the Nunavut Energy Center that would facilitate energy efficiency and environmental management initiatives in Nunavut.

For more information:
http://www.gov.nu.ca/Nunavut/environment/home/climate.html

Northwest Territories

The Government of the Northwest Territories is experiencing problems related to a warmer climate, most notably through degradation of permafrost and impacts from a shortened winter road season. Various territorial government departments that are directly affected have begun adaptation activities and are considering the future consequences. The Department of Environment and Natural Resources is currently revising the NWT Greenhouse Gas Strategy and will place greater emphasis on coordination and assistance for impact and adaptation activities in the revised Strategy. A new Climate Change Specialist position will be staffed to assist with this initiative.

With support from the federal government, the Government of the Northwest Territories is conducting an assessment of the impacts of climate change on their transportation system; this project has a socio-economic component on which participate a number of federal agencies.

Also in the Northwest Territories, the Arctic Energy Alliance (AEA) has a mandate to work with communities, businesses and individuals in the NWT to increase energy efficiency and reduce the costs of energy and its environmental impacts. The AEA has been asked to expand its mandate to included services to Canada as a whole, including developing tools for Pathfinders across the country in the area of Community Energy Planning. The AEA operated the NWT Climate Change Centre for public awareness until the end of March 2006. The AEA is developing its internal capacity as well as communities' capacity to deal with adaptation through workshops and making technical resources available to communities.

With support from 3 federal agencies (Environment Canada, Indian and Northern Affairs Canada, and Natural Resources Canada), the Government of the Northwest Territories has undertaken a study of socio-economic impacts of climate change on its transportation system. This study is breaking grounds in socio-economic impact studies related to climate change. A final report of Phase I of the project is expected in the upcoming weeks.

For more information: http://www.gov.nt.ca/

Yukon

The Government of Yukon is currently actively working on its climate change strategy. Originally, Yukon focused on Energy Efficiency and adaptation to northern environments - covering both adaptation and mitigation. Examples included the work of Yukon housing with the National Research Council, NRCan CANMET and Canada Housing and Mortgage through both the Yukon Housing and the Energy Solutions Centre dealing with Energy efficiency and appropriately adapted commercial and residential structures. This included being a test bed for R2000 standards.

Yukon Forestry is now working with the Champagne-Aishihk First Nation on a strategy and action plan to adapt to bark beetle forest loss which was exasperated by warming. Support included financial support with Canada of the Northern Climate Exchange C-CAIRN at Yukon College; collaborating with partners in education and information programs at various trade fairs and forums.

The Dawson to Mayo grid connection was to reduce the cost of electricity in Dawson and also reduce the green house gas emissions form generators (mitigation) but it also provided a more dependable source of power which will contribute to improving community resilience. Yukon is considering further grid connections to other communities that are currently supplied only by diesel powered generators.

The Agricultural Training programs, in cooperation with Canada and the Yukon Agricultural Association, focuses on encouraging Yukon's agricultural industry to appropriate practices.

Various programs such as the Mining Petroleum Environmental Research Group (MPERG, YESSA, Best Practices etc.) incorporate advice on adaptation and research on impacts of changing climate.

The Yukon Premier is now championing the need for adaptation with other first Ministers at various forums.

Yukon industry has developed specialized services and products for the northern environment- examples: Northern Windows (a first nation owned company manufactures energy efficient windows and doors specially designed for the north), FSC Engineers and Architects and other Whitehorse base Architectural firms sell services to the circumpolar world - not only in the Yukon.

Two consultants work across Canada conduct wind energy and wind assessments.

Yukon Transportation is continuing to adapt road construction to the changing conditions they are facing.

The Yukon Government, the Yukon Private Sector, Yukon Chamber of Commerce and the Yukon College with Canada and outside partners such as U of Alberta to pursue a Cold Weather Innovation Cluster and Research Centre. This is all about adaptation. Business Case has been completed and the project is now into the next level of planning and implementation.

Many of the parties have actively engaged public awareness. Parties include the Yukon Science Institute, Yukon College and the Northern Research Institute, CYFN, the Girl Guides etc. There have been workshops, courses developed and in the case of the Guides, a merit badge.

The first actions have up to now been leaders and champions for the need for adaptive strategies to maintain their traditional and cultural values.

Some of the real progress is being made around all the various parties in the Yukon seeking a common will to cooperate on this topic. The lead on the ACIA in the Yukon - the aboriginal members helped getting collaboration going with many partners through the Arctic Council as did the Northern Climate Exchange and Energy Solutions Center. The Senators meeting was an example as was COP11. The city of Whitehorse has also been a real leader in installing infrastructure and programs to encourage people to adapt and change. They are doing more than many large Canadian municipalities - an example can be found at www.commuterchallenge.ca.

IPY is also contributing to increasing development of adaptation projects. The forest management initiative in Kluane and later in the Kaska country is another sign. The industry is also getting on board with projects such as the Innovation Cluster though to date First Nation representation hasn't been at the table, something that will be addressed. People are beginning to see that these issues are shared though the effects manifest differently in different communities and cultures. To deal with ones own issues you need to collaborate.

For more information: http://www.gov.yk.ca/

Aboriginal Organizations

Inuit Tapiriit Kanatami

ITK staff along with team members from IISD, IRC, IJS and CHUQ traveled to the Northwest Territories to conduct the planned Arctic Climate Change: Observations form the Inuvialuit Settlement Region project in the communities of Tuktoyaktuk, Aklavik and Inuvik. This project consisted of training four regional representatives from the Inuvialuit Settlement Region on methods for documenting climate change observations, effects, adaptations and indicators.

The project has produced several outcomes this quarter, including: Three community draft reports; a presentation on human health aspects of the project to the National Aboriginal Health Organization (NAHO) conference in Ottawa; a presentation on methods and preliminary results at the Snowchange conference in Tampere, Finland; and a written chapter to the Smithsonian Institutes' Frontiers In Science publication on Indigenous Observations of Climate Change. This publication aims to produce a comprehensive summary of the ongoing efforts in the documentation of Indigenous knowledge on climate change in the Arctic. In the book, *The Earth is Faster Now: Indigenous Observations of Arctic Environmental Change*, you will find further discussion on the beginnings of this work.

Community workshops continued in nine more workshops over the next three years, representing 14 communities Canada-wide. In total, eleven community reports and four regional reports resulted from the workshops and were made available on the ITK website.

In reaction to the release of the ACIA Report, ITK released a press kit on the ACIA that included a press release, a backgrounder, a Question & Answer document, an opinion-editorial and a service announcement aired via radio to reach Inuit communities. The kit also contained a translation of the Executive summary into Inuktitut. The press release with backgrounder on the ACIA was issued on Monday, November 8, 2004. A letter to the Prime Minister was also sent on November 8, 2004. The Question &Answer document is intended for help with media interviews and the opinion editorial appeared in the Globe & Mail.

In May of 2005 as part of the “Adapting to Climate Change in Canada 2005: "Understanding Risks and Building Capacity” conference in Montreal, Jose Kusugak presented as a member of the Plenary Panel: Managing Climate and Weather Impacts.

At this same conference, ITK organized a special session on the theme of Freshwater in the Canadian Arctic. This session was chaired by ITK and featured four presentations, three of which were prepared by the ACIA lead authors on freshwater, Terry Prowse, Fred Wrona and Jim Reist. The fourth contribution was a joint presentation by ITK and a member from the Inuvialuit Settlement Region on Inuit Concerns of Changing Aquatic Ecosystems. A paper with the same title was prepared previously to identify climate change related freshwater issues in Inuit regions.

On December 2nd 2005 at a United Nations Side Event, inside the United Nations Framework Convention on Climate Change (UNFCCC) COP11 is the formal Book Launch for *Unikkaaqatigiit - Putting the Human Face on Climate Change - Perspectives from Inuit in Canada*. This book is the culmination of a 4-year project, in partnership with the Nasivvik Centre for Inuit Health and

Changing Environments at Laval University, the Ajunnginiq Centre at the National Aboriginal Health Organization, the Inuit land-claim organizations, and communities across the Arctic.

Through 2005-2007, ITK and the Public Health Research Unit, Centre de recherche du CHUL-CHUQ are cooperating in a Northern Ecosystem Initiative funded Pilot project studying drinking water quality and climate change in two Inuit communities of Nunatsiavut. This project is currently in its second year.

ITK has so far been able to establish an incomplete compilation of research that has been conducted on Impacts and Adapations affecting Inuit, as well as an incomplete compilation of I&A projects undertaken with significant Inuit involvement. We have not been unable to complete these compilations due to lack of resources. An identified gap is a database on impacts and adaptations research relevant to Inuit communities and accessible to Inuit.

ITK has begun to analyse policy on federal policy reforms concerning impacts and adaptations to climate change with the preparation of five thematic papers. ITK will be seeking resources to further this policy research on impacts and adaptations, risks and adaptive capacity. An identified gap is an Inuit specific resource for policy makers to enhance adaptive capacity. Another identified gap is the formulation of linkages between mitigation and adaptation at the various government and jurisdictional levels, how those linkages transform by level and how this can be translated into meaningful policy advice and reform.

For more information: http://www.itk.ca/

Council of Yukon First Nations

CYFN worked on the development of a regional Impact and Adaptation strategy to establish a Management Framework and Communication Strategy within which CYFN communities to express their needs, concerns and interests regarding climate change and its impacts. The I&A strategy is intended to provide the basis for a collaborative partnership between CYFN, government and industry decision makers, acting as a catalyst to assist decision makers gain a fuller appreciation of community priorities and needs, and to enable them to integrate these insights into their own strategic initiatives and priorities.

In order to fulfill the objectives of this project, meetings were held with community members to provide an overview of the expectations of a climate change impact and adaptation strategy and allow for input into the development of the strategy from community members. CYFN has undertaken a review of previous climate change workshops and meetings. The development of an I&A Strategy reflects these previous discussions and issues and concerns that were raised has been included fit into the broad overview of an I&A Strategy.

The I&A Strategy incorporates the discussions from community workshops and meetings and puts international discussions into a context more understandable to communities. The has been developed with the following framework, CYFN Guiding Principles, Organization of Work, Implementation, and Major Issues Arising from ACIA report. CYFN has also reviewed the materials developed from its own community consultations conducted in parallel with the ACIA study and will use these communication and research themes to facilitate discussion among Yukon First Nation. These themes include food security, health and well being, resource use conflicts, and emergency preparedness.

CYFN, in collaboration with Dene Nation, produced a video on the observations of First Nations from the north of climate change impacts. Launched at COP 11 in Montreal, during the Arctic Day parallel event, the video discusses the indigenous culture and its capacity to adapt to change throughout their history.

The *Athabaskan* speaking peoples have practiced a way of way of life that began thousands of years ago. As Indigenous peoples their culture and language reflects a special, spiritual connection with the land. As nature changed, they changed. Today they face a great challenge: adapting to increasingly unpredictable climatic conditions that is transforming their environment in ways not seen for thousands of years. The Arctic Climate Impact Assessment (ACIA) report says that Western Arctic North America has experienced the most dramatic warming among any of the sub-regions of the circumpolar north (2004: p.119). The impact of global warming on their world has created uncertainty for the *Athabaskan* - speaking people of Arctic North America. With the advent of global warming, they now must live with this heightened uncertainty and their approach to the situation is something everyone can learn from.

The two-part series takes viewers through the history of the *Athabaskans* - from their arrival in North America 10,000 years ago to the present. It shows how adapting to changing climatic conditions has been part of the *Athabaskan* way of life for thousands of years - and forms part of the story of their success as a society and culture. It follows their yearly round, of fishing, hunting, gathering, trapping and community gatherings – working in a both wage and traditional economy settings – and graphically shows how global warming impacts are already affecting their livelihoods, shaping their identities as a people, and transforming their way of life as they individually and collectively prepare for an uncertain future.

As a society and culture, adaptation has always been a central feature of the *Athabaskan* way of life. Their psychological preparedness as *Athabaskan* peoples to meet the challenges posed by global warming is instructive to all peoples of the world. It demonstrates how pro-active leadership, through community-supported decision-making does not mean submitting to fate, but actively engaging it. The *Athabaskans* are showing this proactive approach not

only in practicing their traditional livelihoods, but in engaging with the industrial (oil and gas) economy – an increasingly wide-spread phenomena in the northwest Arctic North America. Not content to be the passive victims of the global effects of climate change, the *Athabaskans* have been active lobbying against oil and gas development in the Alaska Arctic National Wildlife Refuge (ANWR) for years. Now they are turning their attention to the threat global industrialization and the need for all nation-states to reduce green-house gas emissions – the root cause of global warming.

For more information: http://www.theyukon.ca/dbs/cyfn/

Dene Nation

Dene Nation worked on the development of an adaptation strategy in Denendeh. Dene Nation gathered Dene views and outreach research results on adaptation (research priorities and communication planning) through a series of workshop and interviews of key stakeholders. The strategy includes a communication plan and a strategic plan to advance adaptation to climate change issues in the Denendeh.

Dene Nation participation in understanding climate change impacts and adaptations domestically and in the north is important. So it is for DN participation in communications and outreach to southern audiences, and our active engagement with international audiences. This later engagement is facilitated by our participation with the Arctic Athabaskan Council (AAC). AAC is a permanent participant to the Arctic Council and this involvement has enabled us to translate domestic activities into international commitments in the Arctic Climate Impact Assessment, as part of Canada's commitment to Kyoto.

As mentioned above, Dene Nation worked in collaboration with CYFN in on the development of a video on Dene and climate change. This video was also released in Montreal during the COP 11 Arctic Day parallel event.

For more information: http://www.denenation.com/

Inuit Circumpolar Conference

The effects of climate change in the Arctic are no longer theoretical, changes are happening today. ICC has been working with ITK to develop a comprehensive national climate change program within Canada and ensuring this work reflects the international and circumpolar activities underway within the Arctic Council and other fora.

For many years ICC has been noted for its work on human rights and environmental protection. ICC has always viewed the two as fundamentally

linked—the careful management and protection of the Arctic environment is a requirement for the enjoyment of our human rights, particularly as they relate to our "subsistence" economy. Inuit in all regions of the circumpolar world are reporting changes to the natural environment as a result of climate change (global warming), which may be the ultimate, long-term threat to Inuit culture. While many in the South characterize climate change as an environmental and/or economic issue, to Inuit it raises questions of culture and survival. Science tells that these changes are a result, in large measure, of emission of greenhouse gases by the developed world.

For more information: http://www.inuitcircumpolar.com/index.php?ID=1&Lang=En

Other Networks and Organizations

The Northern Climate ExChange is an organization hosted at the Yukon College. Over the past six years, they have been raising awareness, creating a shared understanding and communicating independent information on climate change to northerners. Impacts and Adaptation activities include: organizing workshops across the North, representing northern issues at national events (e.g. Montreal 2005, COP 11), developing websites covering the ACIA and I&A, developing a database of resources on I&A, conducting a research needs survey, and supporting the coordination of the Northern Chapter for the *National Assessment 2007*.

The Northern Climate Exchange also manages the Canadian Impacts and Adaptation Research Network (C-CIARN) node for the three territories. C-CIARN North brings together researchers, local experts, community members and decision makers to better understand vulnerability and resiliency to climate change and to identify appropriate adaptation measures. A description of Northern Climate Change I&A activities is included in Appendix E.

For more information: http://www.taiga.net/nce/

Defining Priorities

The impacts of climate change are felt by northerners. This contributed to increasing the understanding and awareness of climate change in the north, and it has been growing for a number of years. In 2004, in the context of the talks that were to lead to the release of the ACIA, INAC and a group of partners, representative group of key stakeholders from the north (Appendix A), including Aboriginal organizations, federal agencies and territorial governments, agreed on the need to create a coordination and information sharing mechanisms to support adaptation to climate change in the north. A few months later, the Northern

Climate Change Coordinating Committee was created with a first mandate to create and implement a *Northern Impacts and Adaptation Strat*egy.

The NC4 is an information sharing and coordinating mechanism on climate change adaptation activities throughout the North. One of the key roles of the committee is to develop and implement a *Northern Impacts and Adaptation Strategy* which outlines the key priorities for adaptation actions in the North (Box1) required to ensure northerners have the tools to cope with adverse climate change impacts, and ensure they can maximize benefits from positive impacts.

BOX 1

9 Priority Action Areas from the *Northern Impacts and Adaptation Strategy*

- Assess critical economic, social, environmental and security risks/vulnerabilities in the North, and establish northern needs and priorities for information and action.
- Assess community infrastructure vulnerability in the North, develop mitigation options and action plan, and incorporate climate considerations in future infrastructure planning.
- Work with a) renewable resource sector and b) non-renewable resource sector to share information, identify issues, and plan for adaptation in operations and emergencies.
- Assess major emergency preparedness and security issues, policies, legislations and capabilities to monitor and control increased traffic in the North.
- Work with Aboriginal leaders and organizations to develop options and plans for addressing the cultural and social impacts of climate change.
- Review existing northern policy and legislation, including land claims and implementation plans, as well as the northern dimensions of international initiatives, to identify major policy gaps and options for addressing climate change adaptation.
- Develop a plan for climate change science in the North, including both focused, short-term studies and longer-term observational needs and improve the outreach networks for dissemination of this information within and outside the North.
- Work with key education institutions domestically, and the University for the Arctic internationally, to develop a climate change curricula in order to build northern capacity.
- Establish a coordinated, partnership management approach to climate change actions in the North, and an envelope for funding specific priorities.
- Assess population health vulnerabilities to climate change across various regions of the North and identify effective solutions to manage health risks, including cross-sectoral interventions.

The NC4 recently held a risk assessment experts workshop to define some priorities and key actions for each of those priority action areas. The information gathered during that workshop will be integrated into the strategy. The report from this workshop is under development.

A number of federal departments and agencies are conducting risk assessment of their activities and programs to assess how climate change might impact them. The department of Fisheries and Oceans was one of the first to complete the exercise, and INAC is engaged in a similar process. This process allows departments and agencies to identify key risk areas and develop strategies to respond to those risk situation should they happen.

INAC, the Inuit Tapiriit Kanatami and the Assembly of First Nations are currently working on a climate change impact policy scoping exercise. This started in 2005-2006 with the development of a series of policy discussion papers on key policy issues created by climate change impacts and adaptation. Following this exercise, the three partners will develop action plans to advance understanding of key policy issues and develop courses of action for policy issues.

The Government of Canada is currently developing the *National Assessment 2007,* as well as a *Climate Change Health Assessment*. Both documents are organized in chapters covering each region; the north is one of them. Both reports are to be released during the spring of 2007.

More than an assessment of impacts, the *National Assessment 2007* process tries to address the issue of adaptive capacity; the focus of the assessment is to define the vulnerability of Canada's regions in relation to their adaptive capacity. During the process, authors consulted main stakeholders in the north, and organized a series of chapter review workshops in each territory, with support from INAC.

Challenges and catalysers

Through the work accomplished in the last few years, a number of challenges and elements impacting on implementation of adaptation appeared. First, there are numerous players in the north that are involved in some aspects of climate change. Unfortunately, there remains lack of communication and information transfer. Efforts to develop networks and communities of practice contribute to overcoming those challenges, and progress on this front is ongoing.

The second element that is often mentioned is that, when getting to the local level, mitigation and adaptation are the same issue: how to build better and more sustainable communities. Furthermore, at the local level, climate change is one of many issues communities are facing. It is therefore essential for them to deal with issues in an integrated and comprehensive manner, which facilitates chances of success. Partners continue efforts to close the gaps between adaptation and mitigation facilitating implementation of adaptation at the local level.

The information available from models and scenarios on climate forecast is available mostly at a large scale. Numerous research projects are ongoing to bring this information to a scale that is usable at the regional and local levels. Other projects aim at translating this same information into tools, guides and formats that can be used by planners, decision-makers, and northerners.

On the other hand, there are some elements supporting the implementation of adaptation. The culture of Aboriginal peoples, based on sharing and a close relationship to the land, has for a long time relied on a capacity to adapt to changing conditions and a strong basis of social capital, facilitating implementation of projects that are driven or strongly supported by the local level. Indeed, adaptation to climate change in the north can be facilitated by this spirit of collaboration creating a fertile ground for partnerships and collaboration. Another aspect of Aboriginal culture that can facilitate adaptation is the holistic approach of issues, since adaptation happens more easily at the local level when issues are dealt with in a comprehensive and integrated fashion.

International Involvement

In December 2005, Montreal was hosting the Conference of the Parties 11. During the event, INAC, ITK, Makkivik, CYFN and Dene Nation partnered to create Arctic Day. This event had the objective to make the world know about the Canadian Arctic: about its peoples, their culture, the climate change they are experiencing and the impacts on their livelihoods. Arctic Day was a very successful event during the conference and it increased awareness of Arctic climate change issues of representatives from around the world.

During the Montreal Conference, C-CIARN organised Adaptation Day, another successful event communicating knowledge of the impacts of climate change, as well as the challenge and benefits related to developing and implementing adaptation.

A number of partners, including CYFN and the Yukon College, are involved in the development of a climate change curriculum for the University of the Arctic. This degree will have portions dedicated to adaptation in the particular context of the North.

APPENDIX A: List of NC4 Partners

Indian and Northern Affairs Canada – Chair and Secretariat

Fisheries and Oceans Canada

Natural Resources Canada

Environment Canada

Health Canada

Transport Canada

Department of Foreign Affairs and International Trades Canada

Government of Nunavut

Government of Northwest Territories

Government of Yukon

Inuit Tapiriit Kanatami

Inuit Circumpolar Conference

Council of Yukon First Nations

Dene Nation

Nunavut Research Institute

Arctic Energy Alliance

Yukon College

APPENDIX B: List of ANCCP and ANCAP Projects

Aboriginal and Northern Climate Change Program		
FY	**Proponent**	**Project**
2000-2001	Tuktu and Nugak Project	Inuit knowledge of the relationship between climate change and caribou Climate Change
2000-2001	Yukon College	Climate Change in the Circumpolar North: Summit and Sustainable Technology Exposition
2001-2002	SENES Consultants Ltd.	Consultations with the Little Red River Cree Nation in Alberta
2001-2002	Centre for Indigenous Environmental Resources (CIER)	Climate Change and Energy Toolkit
2001-2002	Federation of Saskatchewan Indian Nations (FSIN)	information on issues that are critical to aboriginal Communities on the effects of Climate Change and its programs, during its conference
2001-2002	Inuit Circumpolar Conference (ICC)	Strategic Overview of Climate Change in the Arctic
2002-2003	International Institute for Sustainable Development (IISD)	Climate Change Coordination Mechanism
2002-2003	International Institute for Sustainable Development (IISD)	Inuit Observation on Climate Change - Re-editing a groundbreaking video to reach a global audience
2002-2003	Inuit Circumpolar Conference (ICC)	present current information to Inuit organizations of climate change activities in Canada and internationally, and to define collective Inuit positions and to develop climate change perspectives with specific reference to impact assessments, adaptations strategies, international policy needs, and renewable energy strategies, and convey this material and perspectives to federal agencies
2002-2003	Centre for Indigenous Environmental Resources (CIER)	Toolkit video
2002-2003	First Nations' Emergency Services (FNES)	Workshop and awareness
2002-2003	Council of Yukon First Nations (CYFN)	Climate Change and Energy Efficiency Mitigation and Adaptative Planning Initiative

2003-2004	First Nations' Emergency Services (FNES)	Workshop and awareness
2003-2004	Council of Yukon First Nations (CYFN)	First Nations communities will benefit by receiving information and developing their own local capacities to respond to climate change, project will contribute to the development of a pan-territorial Athabaskan strategic plan for managing climate change within First Nation traditional territories
Aboriginal and Northern Community Action Program		
FY	**Proponent**	**Project**
2003-2004	First Nations' Emergency Services (FNES)	Workshop and awareness
2003-2004	Council of Yukon First Nations (CYFN)	First Nations communities will benefit by receiving information and developing their own local capacities to respond to climate change, project will contribute to the development of a pan-territorial Athabaskan strategic plan for managing climate change within First Nation traditional territories
2003-2004	Aurora Research Institute	Document northern observations of climate change
2003-2004	Inuit Tapiriit Kanatami (ITK)	Consultations on climate change
2003-2004	CUSO	Communities and the impacts and adaptation to climate change workshop - Winnipeg
2003-2004	Environment Canada	Workshop on climate change and the Canadian economy
2003-2004	International Institute for Sustainable Development (IISD)	Facilitation of dialogue on climate change in northern Canada
2003-2004	Serrano Environmental Strategic Management Inc.	Report/Presentation Economic impacts of Climate Change North of 60
2003-2004	Assembly of First Nations	ClimateChange I&A workshop - Winnipeg
2004-2005	Consulting and Audit Canada (CAC)	Develop a Northern Impacts and Adaptation Strategy

2004-2005	Council of Yukon First Nations (CYFN)	Develop and implement an approach and a communication strategy for climate change I&A
2004-2005	Inuit Tapiriit Kanatami (ITK)	Communication strategy for climate change and ACIA
2004-2005	Inuit Circumpolar Conference (ICC)	Arctic ClimateChange briefing workshop, linked to ACIA
2004-2005	Dene Nation	Develop an adaptation strategy and an implementation plan
2004-2005	Senes Consultants Limited	Identify governmental needs for an adaptation strategy
2005-2006	Consulting and Audit Canada (CAC)	Develop a Northern Impacts and Adaptation Strategy
2005-2006	Environment Canada	Socio-economic study, climate change impacts NWT transportation
2005-2006	Council of Yukon First Nations (CYFN)	Climate change video
2005-2006	Inuit Tapiriit Kanatami (ITK)	Impacts and Adaptation Inuit Policy Papers
2005-2006	Assembly of First Nations	Impacts and Adaptation First Nations Policy Papers
2005-2006	Inuit Circumpolar Conference (ICC)	Climate Change work
2005-2006	Council of Yukon First Nations (CYFN)	University of the Arctic Climate Change Curriculum
2005-2006	Centre for Indigenour Environmental Resources (CIER)	Develop a FN climate change communtity planning tool
2005-2006	Centre for Indigenour Environmental Resources (CIER)	Study on climate change impacts on ice roads and impacts on FN communities

2005-2006	Yukon College	National Assessment 2007 - Northern Chapter Stakeholders Consultation
2005-2006	Inuit Tapiriit Kanatami (ITK)	Northern Climate Change Coordinating Committee (NC4) participation
FY	**Proponent**	**Project**
2005-2006	Nunavut Tunngavik Incorporated (NTI)	Inuktitut Climate Change Glossary
2005-2006	C-CIARN Atlantic	FN, Climate Change and potable water workshop - Moncton
2005-2006	Diverse - Participation COP/Arctic Day	Diverse contracts
2005-2006	Inuit Tapiriit Kanatami (ITK)	Participation to COP in Montreal
2005-2006	Council of Yukon First Nations (CYFN)	Participation to COP in Montreal and other things
2005-2006	Environment Canada	EC provided INAC with $165K for the set up of Arctic Day
2005-2006	Inuit Circumpolar Conference (ICC)	UNEP meeting
2005-2006	Consultant	Conduct I&A literature review

APPENDIX C: List of CCIAP Projects in the North

Nunavut

1. **Impacts & adaptation to climate change for fish and marine mammals in Canada´s Beaufort Sea**

   The purpose of this study is to identify vulnerabilities and potential adaptations to climate change for marine fish and marine mammals in the Canadian Beaufort Sea and the related sustainable harvest of these species. The research will use GIS analysis to examine relationships between climate-related variables such as diminishing ice thickness and cover, changes to the temperature and circulation of the atmosphere and marine waters, changes in nutrients and related impacts of fish and marine mammals, and the introduction of non-traditional freshwater and marine species. Additional analysis will focus on the current and future role of joint management structures and institutions and the capacity to respond to the impacts of climate change.

   Contact: Magdalena Muir
   makmuir@ieels.com
   Arctic Institute of North America
   (403) 276-1055

   Partners:
   - Fisheries Joint Management Committee
   - University of Calgary

   Project Classification:
   - Fisheries

   Location:
   - Northwest Territories
   - Nunavut
   - Yukon

   Project Status: In Progress

   Further Research Information:

   Link available

2. **The Impact of Climate Change on Food Security on Three Northern Aboriginal Communities – Plans for Adaptation**

   This study will investigate the potential health impacts of climate change on three northern aboriginal communities; Beaver Creek, Yukon; Fort Providence, Northwest Territories; and Kangiqsujuaq, Québec (Nunavik). Results will enable a better understanding of the specific impacts climate change is having and will have on aspects of aboriginal communities traditional food security in the North. Its overall goal is to help communities and health professionals characterize the specific nutrient and contaminant related impacts resulting from changes in country food availability related to climatic change.

   Contact: Laurie Chan
   Laurie.chan@mcgill.ca

McGill University
(514) 398-7765

Partners:
- o CHUL Research Centre-Public Health Research Unit
- o Centre Hospitalier Universitaire de Québec
- o Dene Nation
- o Council of Yukon First Nations

Project Classification: o Health

Location:
- o Northwest Territories
- o Nunavut
- o Québec
- o Yukon

Project Status: In Progress

3. **Climate Change Impacts and Adaptations on Sea Ice Transportation in Canada's Northwest Passage**

The relatively short and sparse climate data record of Canada's Arctic hampers our ability to predict its future conditions. The Canadian global climate models (GMC=s) suggests that if warming trends continue, by 2050 sea ice in the Canadian Arctic will no longer be present during summer months. This loss of seasonal ice could have significant impacts in northern Canada, as it plays an important role in the biological, economic, and cultural components of the Arctic ecosystem. Researchers will: (1) identify what sea ice thresholds and parameters affect transportation usage, and how these may influence future behaviour; (2) increase communication and interaction between northern communities, shippers and researchers and; (3) interpret and synthesize climate change scenarios that describe future seas ice conditions. The goal of this project is to define the potential impacts of climate change on sea ice in Canada's Northwest Passage in order to make useful and understandable adaptation and policy recommendations to decision makers and stakeholders.

Contact: Roger De Abreu
Roger.DeAbreu@ec.gc.ca
Environment Canada
(613) 995-5125

Partners:
- o Fisheries and Oceans Canada
- o University of Calgary
- o University of Western Ontario
- o C-CIARN
- o Canadian Arctic Resources Committee

Project Classification: o Transportation

Location:
- o Northwest Territories
- o Nunavut
- o Yukon

Project Status: In Progress

4. **Mapping Permafrost Degradation (Yukon Territory, Nunavut Territory)**

This project investigated the impacts of climate change on permafrost in high and low Arctic environments. Researchers assessed the potential impacts of climate change in areas of ice-rice permafrost and used a combination of remote sensing and field observation to assess recent terrain disturbance. The project also involved examining changes in thaw activity over the past 40-50 years to determine whether trends could be related to observed climate change.

Contact: Wayne Pollard
pollard@felix.geog.mcgill.ca
McGill University
(514) 398-4454

Partners: o Natural Resources Canada

Project Classification: o Landscape Hazards

Location: o Nunavut
o Yukon

Project Status: Complete

Further Research Information:

Link available

5. **Climatic Impact upon Arctic Ice: Threat and Opportunity**

Researchers assessed the reliability of different projections of climate change impacts on Arctic sea ice by bringing together data on sea ice (e.g., from data atlases, satellite products, and ice observing stations) with computer projections from climate centers and regional ice/ocean modeling. They found that ice has been thinning at a rate of 0-5% per decade, rather than by 40% over a few decades, as has been published in previous studies. They concluded that shifting patterns of Arctic ice, together with the timing and location of submarine surveys, led other researchers to overestimate the rate of recent ice thinning.

Contact: Greg Holloway
hollowayg@dfo-mpo.gc.ca
Fisheries and Oceans Canada
(250) 363-6725

Partners:

Project Classification: o Landscape Hazards

Location: o Northwest Territories
o Nunavut

o Yukon

Project Status: Complete

Further Research Information:

Link available

Full Report Location:

Link available

6. **Impacts on Ringed Seal Distribution**

This project set out to investigate the potential impacts of climate change on key ringed seal habitat variables by comparing latitudinal and longitudinal gradients throughout the ringed seals´ range, and linking these with pup production and survival. Small changes in climate, such as the timing of snowfall, can influence, when ice forms, how long the ice stays and the amount and duration of snow cover; all of which directly affect the biology of ringed seals. Calm or stormy weather during freeze up, is also important to the quality of seal habitat. Many of these variables are expected to change with climate warming.

Contact: Rob Stewart
StewartRE@dfo-mpo.gc.ca
Fisheries and Oceans Canada
(204) 983-5023

Partners:
- o Fisheries and Oceans Canada
- o University of Manitoba

Project Classification: o Fisheries

Location: o Nunavut

Project Status: Complete

7. **Combining Multidisciplinary Datasets to Assess Vulnerability of Rangifer (reindeer/caribou) Populations to Climate Change**

Large migratory caribou herds in North America exploit a variety of strategies to cope with the climatic and physical environments within which they evolved. The suite of potential abiotic factors that influence herd/individual productivity includes depth, hardness and duration of snow cover, timing and pattern of snow melt, duration and intensity of insect harassment (i.e., summer temperatures and wind dynamics), and frequency and extent of fall icing. Herds suffer if “harsh” conditions exist over a number of years. It is important therefore to assess the capacity of individual herds to be resilient to recent trends of warmer springs and winters. Throughout arctic North America, aboriginal communities are located to intercept annual migrations of caribou. Hunting success is associated with the abundance of caribou, annual migration patterns, and environmental

conditions (breakup, snowmelt). Hunters and trappers spend a significant amount of time on-the-land, are keen observers of change and have detailed perceptions of how caribou are reacting to changing environmental conditions.

Contact: Don Russell
Don.Russell@ec.gc.ca
Environment Canada
(867)393-6801

Partners:
- 1. Environment Canada
- 2. Arctic Borderlands Ecological Knowledge Cooperative
- 3. University of Alaska

Project Classification:
- Ecosystems

Location:
- Northwest Territories
- Nunavut
- Yukon

Project Status: In Progress

Further Research Information:

Link available

8. **Climate Change Impacts, Infrastructure Risks, and Adaptive Capacity of Arctic Coastal Communities**

This research proposes to focus on coastal hazards and adaptation strategies, with particular attention to infrastructure vulnerability in light of environmental and climate change in the Canadian Arctic. The broad goals of this research are to assess the biophysical exposure and hazards on Arctic coasts subject to effects of climate change, identify past and current management strategies employed to manage risks in coastal communities which have already experienced environmental change, and to assess the adaptive capacity of communities for dealing with coastal hazards throughout the Arctic. This project has a broad scope and will include fieldwork and a number of community visits.

Contact: Norm Catto
ncatto@mun.ca
Memorial University of Newfoundland
(709)737-8413

Partners:
- 1. Natural Resources Canada
- 2. Ryerson Polytechnic University
- 3. McGill University
- 4. Laval University
- 5. Aurora College
- 6. University of Alaska Fairbanks
- 7. Memorial University of Newfoundland
- 8. University of Guelph
- 9. Alfred-Wegener-Institute for Polar and Marine Research

- 10. Nunavut Research Institute

Project Classification:
- Coastal Zones

Location:
- Northwest Territories
- Nunavut

Project Status: In Progress

Further Research Information:

Link available

9. **Assessing Vulnerability to Sea Ice Change: An example from Igloolik, Nunavut**

Sea ice plays an important role in the life of Arctic coastal communities. The case study will bring together existing research on local adaptive capacity, sea ice observations, traditional knowledge, and scientific sea ice modelling to examine current and future vulnerability of the community of Igloolik to changes in climate.

Contact: William Gough
gough@utsc.utoronto.ca
University of Toronto
(416) 287-7245

Partners:
- Government of Nunavut
- Igloolik Research Centre
- Igloolik Hunters' and Trappers' Association
- Municipality of Igloolik

Project Classification:
- Communities

Location:
- Nunavut

Project Status: In Progress

10. **Impact of Climate Change on Arctic Shipping: Vessel Damage and Regulations**

This project will assess the impacts of climate change on the operations of Arctic shipping and examine how these impacts may affect shipping regulations in the Canadian Arctic. To do this, it has two objectives: first, it will examine the potential for different ice regimes to damage vessels and, second, it will address the impacts of climate change on the pollution prevention regulations governing ship traffic in the Arctic. Researchers will determine the changes that may be required to current regulations while providing shipping companies with information that will help them evaluate the length of shipping seasons and the types of vessels required to meet pollution regulations.

Contact: Ivana Kubat
Ivana.kubat@nrc-cnrc.gc.ca

National Research Council
(613) 993-7695

Partners:
- Transport Canada
- Enfotec

Project Classification:
- Transportation

Location:
- Northwest Territories
- Nunavut
- Yukon

Project Status: Complete

Full Report Location:

Link available

Northwest Territories

1. **Impacts & adaptation to climate change for fish and marine mammals in Canada´s Beaufort Sea**

   The purpose of this study is to identify vulnerabilities and potential adaptations to climate change for marine fish and marine mammals in the Canadian Beaufort Sea and the related sustainable harvest of these species. The research will use GIS analysis to examine relationships between climate-related variables such as diminishing ice thickness and cover, changes to the temperature and circulation of the atmosphere and marine waters, changes in nutrients and related impacts of fish and marine mammals, and the introduction of non-traditional freshwater and marine species. Additional analysis will focus on the current and future role of joint management structures and institutions and the capacity to respond to the impacts of climate change.

   Contact: Magdalena Muir
   makmuir@ieels.com
   Arctic Institute of North America
   (403) 276-1055

   Partners:
   - Fisheries Joint Management Committee
   - University of Calgary

   Project Classification:
   - Fisheries

   Location:
   - Northwest Territories
   - Nunavut
   - Yukon

Project Status: In Progress

Further Research Information:

Link available

2. **The Impact of Climate Change on Food Security on Three Northern Aboriginal Communities – Plans for Adaptation**

This study will investigate the potential health impacts of climate change on three northern aboriginal communities; Beaver Creek, Yukon; Fort Providence, Northwest Territories; and Kangiqsujuaq, Québec (Nunavik). Results will enable a better understanding of the specific impacts climate change is having and will have on aspects of aboriginal communities traditional food security in the North. Its overall goal is to help communities and health professionals characterize the specific nutrient and contaminant related impacts resulting from changes in country food availability related to climatic change.

Contact: Laurie Chan
Laurie.chan@mcgill.ca
McGill University
(514) 398-7765

Partners:
- CHUL Research Centre-Public Health Research Unit
- Centre Hospitalier Universitaire de Québec
- Dene Nation
- Council of Yukon First Nations
-

Project Classification:
- Health

Location:
- Northwest Territories
- Nunavut
- Québec
- Yukon

Project Status: In Progress

3. **Climate change, permafrost degradation and infrastructure adaptation: community case studies in the Mackenzie Valley**

In many northern communities much of the infrastructure, including roads, foundations and utilities, relies on the strength of permafrost for stability. As such, the effects of climate warming on permafrost represent a key concern in the north. To help the towns of Norman Wells and Tuktoyaktuk prepare for potential changes, researchers conducted in-depth assessments of current and future permafrost conditions and infrastructure sensitivity through the use of literature reviews and thermal modelling. Stakeholders were involved throughout all stages of the project, and results were presented and made available to community officials, planners and engineers for use in their decision-making. The researchers also provided each town with ideas and tools for developing adaptation strategies to deal with the projected changes in permafrost.

Contact: Stephen Robinson
srobinson@stlawu.edu
St. Lawrence University
(315) 379-5239

Partners:
- Natural Resources Canada —Geological Survey of Canada
- Town of Norman Wells
- Government of the Northwest Territories - Municipal and Community Affairs~ Highways Division~ Airport Division
- Environment Canada - Adaptation Impacts Research Group
- National Research Council
- Enbridge Pipelines (NW) Ltd
- ESSO Resources
- EBA Engineering Consultants

Project Classification:
- Communities

Location:
- Northwest Territories

Project Status: Complete

4. **Prehistoric Adaptation in the Western Canadian Arctic**

This project studied the extent to which prehistoric human populations on western Victoria Island, Northwest Territories responded to changes in the climate. Researchers examined the relationships between major environmental changes and human colonization and population sizes. They found that initial colonization of the island by Paleoeskimos occurred during a warm postglacial period, when summer sea ice cover was low. Population sizes grew until a major cooling trend began, at which point populations declined sharply. While this decline in population may be partly attributable to climate, other factors, including resource overexploitation may also be to blame.

Contact: James Savelle
jsavel@po-box.mcgill.ca
McGill University
(514) 398-7163

Partners:

Project Classification:
- Ecosystems

Location:
- Northwest Territories

Project Status: Complete

Further Research Information:

Link available

5. **Climate Change Impacts and Adaptations on Sea Ice Transportation in Canada's Northwest Passage**

The relatively short and sparse climate data record of Canada's Arctic hampers our ability to predict its future conditions. The Canadian global climate models (GMC=s) suggests that if warming trends continue, by 2050 sea ice in the Canadian Arctic will no longer be present during summer months. This loss of seasonal ice could have significant impacts in northern Canada, as it plays an important role in the biological, economic, and cultural components of the Arctic ecosystem. Researchers will: (1) identify what sea ice thresholds and parameters affect transportation usage, and how these may influence future behaviour; (2) increase communication and interaction between northern communities, shippers and researchers and; (3) interpret and synthesize climate change scenarios that describe future seas ice conditions. The goal of this project is to define the potential impacts of climate change on sea ice in Canada's Northwest Passage in order to make useful and understandable adaptation and policy recommendations to decision makers and stakeholders.

Contact: Roger De Abreu
Roger.DeAbreu@ec.gc.ca
Environment Canada
(613) 995-5125

Partners:
- Fisheries and Oceans Canada
- University of Calgary
- University of Western Ontario
- C-CIARN
- Canadian Arctic Resources Committee

Project Classification:
- Transportation

Location:
- Northwest Territories
- Nunavut
- Yukon

Project Status: In Progress

6. **Climate-Induced Impact Mapping for Route Selection Applications in Permafrost Regions**

Higher temperatures are expected to decrease both the extent and thickness of permafrost in the Mackenzie Valley, as well as increase the temperature of the permafrost that is preserved. All of these factors could compromise the reliability and stability of transportation routes and other engineered structures. Most permafrost maps do not contain sufficient information to address the relationship between climate change and permafrost. In this study, researchers used models to define the associations between changing climate and ground temperatures. Work is now underway to apply these modelling approaches to high-resolution (<100 m) spatial data for the Mackenzie Valley in support of transportation decision-making, including selecting potential new road and pipeline routes.

Contact: Fred Wright
fwright@NRCan.gc.ca
Natural Resources Canada
(613) 996-9324

Partners:
- Government of the Northwest Territories

- Carleton University

Project Classification: - Transportation

Location: - Northwest Territories

Project Status: Complete

Further Research Information:

Link available

Full Report Location:

Link available

7. **Climate Change Adaptation and Transportation in the Northwest Territories**

This project will assess the vulnerability of road and runway infrastructure in the Northwest Territories to climate change. Key concerns for transportation in the North include increases in ground subsidence and more frequent slope failures induced by higher temperatures and changes in precipitation. Researchers will examine whether the current transportation system is capable of handling projected changes in climate and will determine critical thresholds; the points at which the realized impacts make it impossible to maintain current activities. Researchers will also develop adaptation strategies, aimed at reducing the impacts of climate change on the transportation network.

Contact: Shane LeBouthillier
Shane_LeBouthillier@gov.nt.ca
Government of the Northwest Territories
(867) 920-8822

Partners:
- Transport Canada
- Environment Canada
- Natural Resources Canada

Project Classification: - Transportation

Location: - Northwest Territories

Project Status: In Progress

8. **Climate Change and Sea-level Hazards on the Canadian Beaufort Sea Coast**

This project focussed on the low-lying, ice-rich Western Arctic coast where, under current conditions, erosion rates can exceed 20 metres per year. More than 100 metres of coastal retreat has occurred at Tuktoyaktuk since 1947. Researchers refined and

calibrated storm-surge models for the Beaufort Sea; developed scenarios of the impact of climate change on storm frequency, intensity, direction, and ice conditions, and mapped areas of sensitivity to flooding and potential erosion under present and future storm-surge scenarios.

Contact: Steve Solomon
ssolomon@nrcan.gc.ca
Natural Resources Canada
(902) 426-8911

Partners:
- Natural Resources Canada — Geological Survey of Canada
- Fisheries and Oceans Canada
- Environment Canada
- Triton Consulting
- Atmospheric Dynamics
- Arctic College

Project Classification:
- Coastal Zones

Location:
- Northwest Territories

Project Status: Complete

Further Research Information:

Link available

9. **Climate Change Impacts on Productivity and Health of Aspen Forests in the Western Canadian Interior**

Trembling aspen is important for wildlife, recreation and the forest industry in western Canada. Researchers analysed tree rings from 72 aspen stands across the Prairie Provinces to determine how climate variation, insects and other factors have affected aspen growth and health. They found that insect defoliation and drought were the most important factors driving year to year variation in aspen productivity. This research will help in understanding the response of aspen forests to future climate change.

Contact: Ted Hogg
thogg@NRCan.gc.ca
Natural Resources Canada
(780) 435-7225

Partners:
- Natural Resources Canada - Canadian Forest Service
- Environment Canada -Atmospheric Environment Branch

Project Classification:
- Forestry

Location:
- Alberta
- British Columbia
- Manitoba
- Northwest Territories

- Saskatchewan

Project Status: Complete

Further Research Information:

Link available

Full Report Location:

Link available

10. **Enhanced Indicators of Climate Change Impacts on Forest Hydrology**

This study developed indicators to demonstrate the sensitivity of the forest water balance to climate variability. This will assist the forestry sector in evaluating land use adaptation strategies, especially in regions where persistent water deficits may develop in the next century.

Contact: Raoul Granger
Raoul.Granger@ec.gc.ca
Environment Canada
(306) 975-5758

Partners:
- University of Saskatchewan
- Natural Resources Canada - Canadian Forest Service
- United Kingdom Meteorological Office - Hadley Centre for Climate Change and Prediction
- Indian and Northern Affairs Canada - Northern Affairs Programme
-

Project Classification:
- Forestry

Location:
- Northwest Territories
- Ontario
- Saskatchewan
- Yukon

Project Status: Complete

11. **Climatic Impact upon Arctic Ice: Threat and Opportunity**

Researchers assessed the reliability of different projections of climate change impacts on Arctic sea ice by bringing together data on sea ice (e.g., from data atlases, satellite products, and ice observing stations) with computer projections from climate centers and regional ice/ocean modeling. They found that ice has been thinning at a rate of 0-5% per decade, rather than by 40% over a few decades, as has been published in previous studies. They concluded that shifting patterns of Arctic ice, together with the timing and

location of submarine surveys, led other researchers to overestimate the rate of recent ice thinning.

Contact: Greg Holloway
hollowayg@dfo-mpo.gc.ca
Fisheries and Oceans Canada
(250) 363-6725

Partners:

Project Classification: o Landscape Hazards

Location:
- o Northwest Territories
- o Nunavut
- o Yukon

Project Status: Complete

Further Research Information:

Link available

Full Report Location:

Link available

12. **A Workshop on Climate Change Impacts and Adaptation Strategies for Canada's Northern Regions: Acting on the Priorities**

This project involved a workshop aimed at improving understanding of the data and research required for developing appropriate adaptations to climate change in Canada´s northern territories. Over 130 participants from federal and territorial governments, municipalities, land claim and hunter/trapper organizations, aboriginal groups, academia, private sector organizations, and environmental groups participated in the workshop. Participants attended talks, presented viewpoints, participated in discussions, and provided input into what could be done to prepare for, and adapt to, climate change in the north.

Contact: Larry Dyke
ldyke@NRCan.gc.ca
Natural Resources Canada
(613) 996-1967

Partners:
- o Environment Canada
- o Aurora College (Inuvik)
- o Yukon College (Whitehorse)
- o Nunavut College (Iqaluit) — Nunavut Research Institute
- o Government of the Northwest Territories
- o Department of Indian and Northern Affairs
- o Parks Canada
- o Fisheries and Oceans Canada

Project Classification: o Crosscutting

Location: o Northwest Territories

Project Status: Complete

Full Report Location:

Link available

13. **Impact of Climate Change on Migratory Caribou: Herd-specific assessments and application of tools to evaluate public policy options**

This project examined the potential impacts of climate change on large migratory caribou herds in North America. Researchers conducted a herd assessment, and compiled the data in a North American caribou database. The project also involved assessment of historical climate trends and trends in calving and post-calving habitats. Linkages between annual green-up pattern and the location of calving grounds were determined. Community involvement played an important role throughout the project, and a web-based model of "Possible Futures" was developed so that communities and local and regional governments could explore the implications of policies for caribou in light of projected climate change impacts.

Contact: Don Russell
Don.Russell@ec.gc.ca
Environment Canada
(867) 393-6700

Partners:
- o University of Alaska
- o University of British Columbia

Project Classification: o Ecosystems

Location:
- o Northwest Territories
- o Yukon

Project Status: Complete

Full Report Location:

Link available

14. **Climate Change and Permafrost in the Environmental Atlas of the Beaufort Coastlands**

This project examined the impact of climate change on the western Arctic coast of the Northwest Territories and Yukon. Results were incorporated into an Environmental Atlas

of the Beaufort Coastlands, which provides a compendium of baseline information on the environment and physical setting of this region, and highlights potential sensitivities to climate change.

Contact: Stephen Wolfe
Stephen.Wolfe@NRCan.gc.ca
Natural Resources Canada
(613) 992-7670

Partners:
- Inuvik Research Centre
- Aurora Research Institute
- Carleton University
- ASL Environmental Sciences
- Communities of Tuktoyaktuk and Inuvik
- Inuvialuit Petroleum Corporation

Project Classification:
- Ecosystems
- Landscape Hazards

Location:
- Northwest Territories
- Yukon

Project Status: Complete

Full Report Location:

Link available

15. **Recent and Future Warming in Northern Peatlands**

The objective of this project was to examine and quantify the impacts of recent warming on permafrost stability in peatlands of the upper Mackenzie Valley. Researchers used aerial photographs and high-resolution satellite images spanning at least 50 years to quantify thaw at four locations (total 6 sites) ranging in latitude from 60 to 64°N. Results showed that significant thaw of permafrost has occurred at all sites over the past 50 years, resulting in a 33.9 to 79.2 % increase in unfrozen peatland area. Permafrost thaw in peatlands affects vegetation cover, drainage patterns, and rates of carbon accumulation.

Contact: Stephen Robinson
srobinson@stlawu.edu
St. Lawrence University
(315) 229-5239

Partners:
- Natural Resources Canada

Project Classification:
- Ecosystems
- Landscape Hazards

Location: o Northwest Territories

Project Status: Complete

Full Report Location:

Link available

16. **Combining Multidisciplinary Datasets to Assess Vulnerability of Rangifer (reindeer/caribou) Populations to Climate Change**

Large migratory caribou herds in North America exploit a variety of strategies to cope with the climatic and physical environments within which they evolved. The suite of potential abiotic factors that influence herd/individual productivity includes depth, hardness and duration of snow cover, timing and pattern of snow melt, duration and intensity of insect harassment (i.e., summer temperatures and wind dynamics), and frequency and extent of fall icing. Herds suffer if "harsh" conditions exist over a number of years. It is important therefore to assess the capacity of individual herds to be resilient to recent trends of warmer springs and winters. Throughout arctic North America, aboriginal communities are located to intercept annual migrations of caribou. Hunting success is associated with the abundance of caribou, annual migration patterns, and environmental conditions (breakup, snowmelt). Hunters and trappers spend a significant amount of time on-the-land, are keen observers of change and have detailed perceptions of how caribou are reacting to changing environmental conditions.

Contact: Don Russell
Don.Russell@ec.gc.ca
Environment Canada
(867)393-6801

Partners:
- o 1. Environment Canada
- o 2. Arctic Borderlands Ecological Knowledge Cooperative
- o 3. University of Alaska

Project Classification: o Ecosystems

Location:
- o Northwest Territories
- o Nunavut
- o Yukon

Project Status: In Progress

Further Research Information:

Link available

17. **An Evaluation of the Role of Climate Change in the emergence of pathogens and diseases in Arctic and Subarctic ungulate populations**

Knowledge of the pathogen fauna in wildlife and the role of pathogens in the health of wildlife populations is an important component of informed wildlife management. Equally important is knowledge of the zoonotic agents and associated risks for people harvesting, handling, and consuming wildlife. This project will address the effects of climate change on the diversity, geographic distribution, epidemiology, and effects of the micro and macro parasites in important ungulate species in Canada´s western Arctic and subarctic. The bulk of the work will focus on caribou in the western Canadian Arctic and subarctic, and will also look at muskoxen, moose, Dall´s sheep, wood bison and white-tailed deer. The project team will work with local stakeholders, including harvesters, co-management boards, and outfitter groups, to develop recommendations for specific research targeted at anticipating and monitoring the response of these host-pathogen systems to climate change.

Contact: Susan Kutz
susan.kutz@usask.ca
University of Saskatchewan
(306)966-7242

Partners:
- Government of the Northwest Territories
- Government of Yukon
- Environment Canada
- Sahtu Renewable Resources Board
- U.S. Department of Agriculture

Project Classification:
- Ecosystems

Location:
- Northwest Territories
- Yukon

Project Status: In Progress

Further Research Information:

Link available

18. **Climate Change Impacts, Infrastructure Risks, and Adaptive Capacity of Arctic Coastal Communities**

This research proposes to focus on coastal hazards and adaptation strategies, with particular attention to infrastructure vulnerability in light of environmental and climate change in the Canadian Arctic. The broad goals of this research are to assess the biophysical exposure and hazards on Arctic coasts subject to effects of climate change, identify past and current management strategies employed to manage risks in coastal communities which have already experienced environmental change, and to assess the adaptive capacity of communities for dealing with coastal hazards throughout the Arctic. This project has a broad scope and will include fieldwork and a number of community visits.

Contact: Norm Catto
ncatto@mun.ca
Memorial University of Newfoundland
(709)737-8413

Partners:
- 1. Natural Resources Canada
- 2. Ryerson Polytechnic University
- 3. McGill University
- 4. Laval University
- 5. Aurora College
- 6. University of Alaska Fairbanks
- 7. Memorial University of Newfoundland
- 8. University of Guelph
- 9. Alfred-Wegener-Institute for Polar and Marine Research
- 10. Nunavut Research Institute

Project Classification:
- Coastal Zones

Location:
- Northwest Territories
- Nunavut

Project Status: In Progress

Further Research Information:

Link available

19. **Effects of Climate Change on Waterfowl in the Western Boreal Forest and Implications for Food Supply and Adaptation Strategies**

The objective of this project is to identify climate change impacts on waterfowl in the western boreal forest that may be critical to long term conservation and land use strategies under a changing climate, and that could help northern communities adapt to a potentially changing food supply. Results should provide early warning of potential changes in subsistence food supply, development of adaptation strategies to climate-induced changes in traditional food supply, analysis of adaptation strategies in light of uncertainties in supply and demand, identification of waterfowl production areas that would become critically important under climate change, facilitation of conservation strategies, guidance to resource managers in developing harvest policies, and directing future research to areas where climate-impacts are likely to be most severe.

Contact: Ann Chan-McLeod
allaye@interchange.ubc.ca

Partners:
- 1. University of British Columbia
- 2. University of Victoria
- 3. Environment Canada
- 1. Saskatchewan Environment
- 2. Saskatchewan Research Council
- 3. Peter Ballantyne Cree Nation
- 4. Deschambault Lake Co-Management Board
- 5. Prairie Adaptation Research Collaborative

Project Classification:
- Food Supply

Location:
- o Alberta
- o Northwest Territories
- o Saskatchewan
- o Yukon

Project Status: In Progress

20. **Integrated assessment of vulnerability and adaptive capacity in a northern community: Fort Resolution, Northwest Territories**

This project will assess vulnerability to climate change and associated impacts using a multi-scale livelihood approach and contribute to building capacity to proactively adapt to change in the Slave River Delta region. Working in collaboration with the community of Fort Resolution, the research team will identify opportunities to build adaptive capacity and strategies and options available to the community that address the risks of climate change.

Contact: Derek Armitage
darmitag@wlu.ca
Derek Armitage
(519)884-0710 ext. 2653

Partners:
- o Deninu Kué First Nation

Project Classification:
- o Communities

Location:
- o Northwest Territories

Project Status: In Progress

21. **Adaptive Decision and Planning Tools (ADAPT) in Canadian Artic Communities**

Arctic communities face multiple forces of change at the same time, including climate change. The purpose of this research in the north is to develop decision-aiding tools to assist communities in planning strategically under conditions of high uncertainty. Currently there are no analytic tools that can be easily adopted by Arctic communities to work toward assessing their own vulnerability and plan to adapt to a change in climate. This project will work collaboratively with the communities of Cambridge Bay, Baker Lake and Pond Inlet to create these tools.

Contact: Hadi Dowlatabadi
hadi.d@ubc.ca
University of British Columbia
(604)822-0008

Partners:
- o Municipality of Cambridge Bay

- o Economic Development~ Training and Education Committee for the Hamlet of Pond Inlet
- o Municipality of Baker Lake

Project Classification: o Communities

Location: o Northwest Territories

Project Status: In Progress

22. **Costs and cost difference assessment for impacts of permafrost degradation on community building foundations in the Northwest Territories under different climate change and adaptation scenarios**

This project aims to improve the understanding of the costs of climate-induced permafrost degradation to northern communities, the difference in the costs due to different rates of climate change and the timeframes when the costs may occur. Communities in the Northwest Territories will participate in the case study. A permafrost model developed to specifically address permafrost response to climate change for buildings will be used to simulate potential changes in the depth of active layers due to climate change in the future. These changes will then be translated into building foundation risks. The research team will use this information to estimate costs to adaptation with respect to infrastructure within different timeframes.

Contact: Fuqun Zhou
zhou@nrcan.gc.ca
Natural Resources Canada
(613)947-5282

Partners:
- o Government of Northwest Territories~ Public Works and Services
- o Government of Northwest Territories Municipal and Community Affairs

Project Classification: o Communities

Location: o Northwest Territories

Project Status: In Progress

23. **Impact of Climate Change on Arctic Shipping: Vessel Damage and Regulations**

This project will assess the impacts of climate change on the operations of Arctic shipping and examine how these impacts may affect shipping regulations in the Canadian Arctic. To do this, it has two objectives: first, it will examine the potential for different ice regimes to damage vessels and, second, it will address the impacts of

climate change on the pollution prevention regulations governing ship traffic in the Arctic. Researchers will determine the changes that may be required to current regulations while providing shipping companies with information that will help them evaluate the length of shipping seasons and the types of vessels required to meet pollution regulations.

Contact: Ivana Kubat
Ivana.kubat@nrc-cnrc.gc.ca
National Research Council
(613) 993-7695

Partners:
- Transport Canada
- Enfotec

Project Classification:
- Transportation

Location:
- Northwest Territories
- Nunavut
- Yukon

Project Status: Complete

Full Report Location:

Link available

Yukon

1. **Impacts & adaptation to climate change for fish and marine mammals in Canada´s Beaufort Sea**

The purpose of this study is to identify vulnerabilities and potential adaptations to climate change for marine fish and marine mammals in the Canadian Beaufort Sea and the related sustainable harvest of these species. The research will use GIS analysis to examine relationships between climate-related variables such as diminishing ice thickness and cover, changes to the temperature and circulation of the atmosphere and marine waters, changes in nutrients and related impacts of fish and marine mammals, and the introduction of non-traditional freshwater and marine species. Additional analysis will focus on the current and future role of joint management structures and institutions and the capacity to respond to the impacts of climate change.

Contact: Magdalena Muir
makmuir@ieels.com
Arctic Institute of North America
(403) 276-1055

Partners:
- Fisheries Joint Management Committee
- University of Calgary

Project Classification:
- Fisheries

Location:
- Northwest Territories

- Nunavut
- Yukon

Project Status: In Progress

Further Research Information:

Link available

2. **The Impact of Climate Change on Food Security on Three Northern Aboriginal Communities – Plans for Adaptation**

This study will investigate the potential health impacts of climate change on three northern aboriginal communities; Beaver Creek, Yukon; Fort Providence, Northwest Territories; and Kangiqsujuaq, Québec (Nunavik). Results will enable a better understanding of the specific impacts climate change is having and will have on aspects of aboriginal communities traditional food security in the North. Its overall goal is to help communities and health professionals characterize the specific nutrient and contaminant related impacts resulting from changes in country food availability related to climatic change.

Contact: Laurie Chan
Laurie.chan@mcgill.ca
McGill University
(514) 398-7765

Partners:
- CHUL Research Centre-Public Health Research Unit
- Centre Hospitalier Universitaire de Québec
- Dene Nation
- Council of Yukon First Nations
-

Project Classification:
- Health

Location:
- Northwest Territories
- Nunavut
- Québec
- Yukon

Project Status: In Progress

3. **Climate Change Impacts in Northern Canada: Assessing Our Current Knowledge**

In this project, researchers assessed the current understanding of climate change and its impacts in northern Canada by reviewing scientific, local and traditional knowledge. The assessment revealed that there is much more information available on physical processes, rather than biological or socio-economic systems, and greater knowledge and confidence concerning baseline information and predicted changes for temperature, than for other climate components. Researchers found that although much local and traditional knowledge exists regarding climate change impacts, relatively little has been

documented. This assessment will help facilitate the identification of priorities for climate change research, monitoring, technological development, and policy development in Canada´s north.

Contact: Aynslie Ogden
aogden@yukoncollege.yk.ca
Northern Climate ExChange
(867) 668-8735

Partners:
- Government of Yukon/Yukon College
- Environment Canada
- Ryerson Polytechnical University
- University of Alberta
- Legend Seekers Anthropological Research
- Geonorth Consultants Ltd.

Project Classification: o Crosscutting

Location: o Yukon

Project Status: Complete

Further Research Information:

Link available

Full Report Location:

Link available

4. **Climate Change Impacts and Adaptations on Sea Ice Transportation in Canada's Northwest Passage**

The relatively short and sparse climate data record of Canada's Arctic hampers our ability to predict its future conditions. The Canadian global climate models (GMC=s) suggests that if warming trends continue, by 2050 sea ice in the Canadian Arctic will no longer be present during summer months. This loss of seasonal ice could have significant impacts in northern Canada, as it plays an important role in the biological, economic, and cultural components of the Arctic ecosystem. Researchers will: (1) identify what sea ice thresholds and parameters affect transportation usage, and how these may influence future behaviour; (2) increase communication and interaction between northern communities, shippers and researchers and; (3) interpret and synthesize climate change scenarios that describe future seas ice conditions. The goal of this project is to define the potential impacts of climate change on sea ice in Canada's Northwest Passage in order to make useful and understandable adaptation and policy recommendations to decision makers and stakeholders.

Contact: Roger De Abreu
Roger.DeAbreu@ec.gc.ca
Environment Canada

(613) 995-5125

Partners:
- Fisheries and Oceans Canada
- University of Calgary
- University of Western Ontario
- C-CIARN
- Canadian Arctic Resources Committee

Project Classification: o Transportation

Location:
- Northwest Territories
- Nunavut
- Yukon

Project Status: In Progress

5. **Mapping Permafrost Degradation (Yukon Territory, Nunavut Territory)**

This project investigated the impacts of climate change on permafrost in high and low Arctic environments. Researchers assessed the potential impacts of climate change in areas of ice-rice permafrost and used a combination of remote sensing and field observation to assess recent terrain disturbance. The project also involved examining changes in thaw activity over the past 40-50 years to determine whether trends could be related to observed climate change.

Contact: Wayne Pollard
pollard@felix.geog.mcgill.ca
McGill University
(514) 398-4454

Partners:
- Natural Resources Canada

Project Classification: o Landscape Hazards

Location:
- Nunavut
- Yukon

Project Status: Complete

Further Research Information:

Link available

6. **Enhanced Indicators of Climate Change Impacts on Forest Hydrology**

This study developed indicators to demonstrate the sensitivity of the forest water balance to climate variability. This will assist the forestry sector in evaluating land use adaptation strategies, especially in regions where persistent water deficits may develop in the next century.

Contact: Raoul Granger
Raoul.Granger@ec.gc.ca
Environment Canada
(306) 975-5758

Partners:
- University of Saskatchewan
- Natural Resources Canada - Canadian Forest Service
- United Kingdom Meteorological Office - Hadley Centre for Climate Change and Prediction
- Indian and Northern Affairs Canada - Northern Affairs Programme
-

Project Classification:
- Forestry

Location:
- Northwest Territories
- Ontario
- Saskatchewan
- Yukon

Project Status: Complete

7. **Climatic Impact upon Arctic Ice: Threat and Opportunity**

Researchers assessed the reliability of different projections of climate change impacts on Arctic sea ice by bringing together data on sea ice (e.g., from data atlases, satellite products, and ice observing stations) with computer projections from climate centers and regional ice/ocean modeling. They found that ice has been thinning at a rate of 0-5% per decade, rather than by 40% over a few decades, as has been published in previous studies. They concluded that shifting patterns of Arctic ice, together with the timing and location of submarine surveys, led other researchers to overestimate the rate of recent ice thinning.

Contact: Greg Holloway
hollowayg@dfo-mpo.gc.ca
Fisheries and Oceans Canada
(250) 363-6725

Partners:

Project Classification:
- Landscape Hazards

Location:
- Northwest Territories
- Nunavut
- Yukon

Project Status: Complete

Further Research Information:

Link available

Full Report Location:

Link available

8. **Impact of Climate Change on Migratory Caribou: Herd-specific assessments and application of tools to evaluate public policy options**

This project examined the potential impacts of climate change on large migratory caribou herds in North America. Researchers conducted a herd assessment, and compiled the data in a North American caribou database. The project also involved assessment of historical climate trends and trends in calving and post-calving habitats. Linkages between annual green-up pattern and the location of calving grounds were determined. Community involvement played an important role throughout the project, and a web-based model of "Possible Futures" was developed so that communities and local and regional governments could explore the implications of policies for caribou in light of projected climate change impacts.

Contact: Don Russell
Don.Russell@ec.gc.ca
Environment Canada
(867) 393-6700

Partners:
- University of Alaska
- University of British Columbia

Project Classification:
- Ecosystems

Location:
- Northwest Territories
- Yukon

Project Status: Complete

Full Report Location:

Link available

9. **Climate Change and Permafrost in the Environmental Atlas of the Beaufort Coastlands**

This project examined the impact of climate change on the western Arctic coast of the Northwest Territories and Yukon. Results were incorporated into an Environmental Atlas of the Beaufort Coastlands, which provides a compendium of baseline information on the environment and physical setting of this region, and highlights potential sensitivities to climate change.

Contact: Stephen Wolfe
Stephen.Wolfe@NRCan.gc.ca
Natural Resources Canada
(613) 992-7670

Partners:
- Inuvik Research Centre
- Aurora Research Institute
- Carleton University
- ASL Environmental Sciences
- Communities of Tuktoyaktuk and Inuvik
- Inuvialuit Petroleum Corporation

Project Classification:
- Ecosystems
- Landscape Hazards

Location:
- Northwest Territories
- Yukon

Project Status: Complete

Full Report Location:

Link available

10. **Combining Multidisciplinary Datasets to Assess Vulnerability of Rangifer (reindeer/caribou) Populations to Climate Change**

Large migratory caribou herds in North America exploit a variety of strategies to cope with the climatic and physical environments within which they evolved. The suite of potential abiotic factors that influence herd/individual productivity includes depth, hardness and duration of snow cover, timing and pattern of snow melt, duration and intensity of insect harassment (i.e., summer temperatures and wind dynamics), and frequency and extent of fall icing. Herds suffer if “harsh” conditions exist over a number of years. It is important therefore to assess the capacity of individual herds to be resilient to recent trends of warmer springs and winters. Throughout arctic North America, aboriginal communities are located to intercept annual migrations of caribou. Hunting success is associated with the abundance of caribou, annual migration patterns, and environmental conditions (breakup, snowmelt). Hunters and trappers spend a significant amount of time on-the-land, are keen observers of change and have detailed perceptions of how caribou are reacting to changing environmental conditions.

Contact: Don Russell
Don.Russell@ec.gc.ca
Environment Canada
(867)393-6801

Partners:
- 1. Environment Canada
- 2. Arctic Borderlands Ecological Knowledge Cooperative
- 3. University of Alaska

Project Classification:
- Ecosystems

Location:
- Northwest Territories
- Nunavut

- Yukon

Project Status: In Progress

Further Research Information:

Link available

11. **An Evaluation of the Role of Climate Change in the emergence of pathogens and diseases in Arctic and Subarctic ungulate populations**

Knowledge of the pathogen fauna in wildlife and the role of pathogens in the health of wildlife populations is an important component of informed wildlife management. Equally important is knowledge of the zoonotic agents and associated risks for people harvesting, handling, and consuming wildlife. This project will address the effects of climate change on the diversity, geographic distribution, epidemiology, and effects of the micro and macro parasites in important ungulate species in Canada´s western Arctic and subarctic. The bulk of the work will focus on caribou in the western Canadian Arctic and subarctic, and will also look at muskoxen, moose, Dall´s sheep, wood bison and white-tailed deer. The project team will work with local stakeholders, including harvesters, co-management boards, and outfitter groups, to develop recommendations for specific research targeted at anticipating and monitoring the response of these host-pathogen systems to climate change.

Contact: Susan Kutz
susan.kutz@usask.ca
University of Saskatchewan
(306)966-7242

Partners:
- Government of the Northwest Territories
- Government of Yukon
- Environment Canada
- Sahtu Renewable Resources Board
- U.S. Department of Agriculture

Project Classification:
- Ecosystems

Location:
- Northwest Territories
- Yukon

Project Status: In Progress

Further Research Information:

Link available

12. **Effects of Climate Change on Waterfowl in the Western Boreal Forest and Implications for Food Supply and Adaptation Strategies**

The objective of this project is to identify climate change impacts on waterfowl in the western boreal forest that may be critical to long term conservation and land use strategies under a changing climate, and that could help northern communities adapt to a potentially changing food supply. Results should provide early warning of potential changes in subsistence food supply, development of adaptation strategies to climate-induced changes in traditional food supply, analysis of adaptation strategies in light of uncertainties in supply and demand, identification of waterfowl production areas that would become critically important under climate change, facilitation of conservation strategies, guidance to resource managers in developing harvest policies, and directing future research to areas where climate-impacts are likely to be most severe.

Contact: Ann Chan-McLeod
allaye@interchange.ubc.ca

Partners:
- 1. University of British Columbia
- 2. University of Victoria
- 3. Environment Canada
- 1. Saskatchewan Environment
- 2. Saskatchewan Research Council
- 3. Peter Ballantyne Cree Nation
- 4. Deschambault Lake Co-Management Board
- 5. Prairie Adaptation Research Collaborative

Project Classification:
- Food Supply

Location:
- Alberta
- Northwest Territories
- Saskatchewan
- Yukon

Project Status: In Progress

13. **Impact of Climate Change on Arctic Shipping: Vessel Damage and Regulations**

This project will assess the impacts of climate change on the operations of Arctic shipping and examine how these impacts may affect shipping regulations in the Canadian Arctic. To do this, it has two objectives: first, it will examine the potential for different ice regimes to damage vessels and, second, it will address the impacts of climate change on the pollution prevention regulations governing ship traffic in the Arctic. Researchers will determine the changes that may be required to current regulations while providing shipping companies with information that will help them evaluate the length of shipping seasons and the types of vessels required to meet pollution regulations.

Contact: Ivana Kubat
Ivana.kubat@nrc-cnrc.gc.ca
National Research Council
(613) 993-7695

Partners:
- Transport Canada
- Enfotec

Project Classification: o Transportation

Location: o Northwest Territories
o Nunavut
o Yukon

Project Status: Complete

Full Report Location:

Link available

APPENDIX D: List of NEI Projects

Past and Present NEI supported Climate Change Projects under Climate Change and Monitoring Program Priorities

Note: Monitoring projects are included as they indicate major drivers of change
* indicates projects currently underway

PRIORITY: CLIMATE CHANGE	
Marine Subcategory:	
Project Lead	**Project Title**
Canadian Wildlife Service	Climate, Heavy Metals, and Population Dynamics of King Eiders
Canadian Wildlife Service	Ecological Studies of the Belcher Islands Polynyas: Annual Report 2002
Canadian Wildlife Service	Long-term Monitoring of Marine Bird Populations in the Canadian Arctic
Canadian Wildlife Service	Understanding relationships between common eider breeding distribution, distribution of other breeding seabirds, composition of benthic communities, and coastal ecosystem function in Labrador, and their vulnerability to human-related activities
*Canadian Wildlife Service	Modeling the role of sea ice on High Arctic marine birds and communities: application of scientific and local ecological knowledge
Canadian Wildlife Service	Summary of Research Carried out on Seabirds at Prince Leopold Island, Nunavut, in 2002 with some preliminary analyses
Canadian Wildlife Service	Students on Ice Arctic Expedition 2002: Youth Marine Field Training – High Arctic Ecosystems Lancaster and Jones Sounds
Canadian Wildlife Service	Long-term Trends in the Population Ecology of Polar Bears in western Hudson Bay in relation to climatic change
Canadian Wildlife Service and Société Duvetnor Ltée, Rivière-du-Loup, Québec	Improved Eiderduck Management in Nunavik
Canadian Wildlife Service	Climate Change, Marine Birds and Polar Marine Ecosystems: Literature, Local Knowledge and Linkages
Fisheries and Oceans	Sea Ice Variability and Climate Change- "*Two Ways of Knowing"* – Identifying Future Research Priorities
*Fisheries and Oceans	Understanding sea ice and snow variability and climate change through scientists and community partnerships
*Fisheries and Oceans	Understanding the impacts of Climate Change on Arctic Sea Ice Conditions: A community-based research initiative – land fast ice and ringed seal productivity
Fisheries and Oceans	Ringed Seals and Remote Sensing: Monitoring the adaptive capacity of a species to climate variability and anthropogenic changes in the sea-ice environment of coastal Labrador
*Labrador Inuit Association	Monitoring common eider population trends and ecosystem interactions in Labrador
National Water Research	Using Inuit knowledge and Observations to assess the Health

Institute	and Status of Arctic Marine Mammal Populations
*University of Toronto	Bridging Inuit and scientific perspectives on sea ice: Importance, Observation, and Change
Caribou Subcategory	
Beverly-Qamanirjuaq Caribou Management Board Project Coordinator	Range-Wide Monitoring of Beverly and Qamanirjuaq Caribou Habitat, and Community Use in Relation to Changing Climate and Land Use Activities
Canadian Wildlife Service	Relative value of Calving Grounds to North American Caribou Herds: Integrating Climate Change and Development
*Environment Canada	Impacts of Global Change on *Rangifer (reindeer/caribou):* A Circumarctic Monitoring Program
Cree Regional Authority	Quebec-Labrador Caribou – From Science to Communities
Naskapi Nation of Kawawachikamach, Quebec	Program to Monitor the Body Condition of Caribou from the George River and Leaf River Herds
Ross River Dena Council	Effects of Climate Change on the Caribou Herds Located on Ross River Dena Lands
Freshwater Subcategory	
*Environment Canada	Impacts of Changes to Northern Lakes' Water and Energy Budgets
*Inuit Tapiriit Kanatami and Centre Hospitalier Universitaire de Quebec	Drinking Water and Climate Change in Labrador: A Pilot Project for Two Inuit Communities
Inuit Tapiriit Kanatami	Inuit Concerns of Changing Aquatic Ecosystems in Arctic Communities
*National Water Research Institute	Climate Change and Northern Aquatic Ecosystems & Monitoring of Climate Change Effects on Northern Aquatic Ecosystems
Mercury Subcategory	
*National Water Research Institute	Investigating the Linkage of Climate Warming and Increasing Mercury in Landlocked Char in the High Arctic
National Water Research Institute	Spatial Trends in Loadings and Historical Inputs of Mercury Inferred from Pan-Northern Lake Sediment Cores
National Water Research Institute	Factors Affecting Latitudinal Gradients and Spatial Variations in Mercury Concentrations in Predatory Fish in Lakes in the Mackenzie River Basin: Implications to the Traditional Fisheries
National Water Research Institute	Investigating linkages between climate warming and increasing mercury in Arctic lakes
National Water Research Institute	Factors influencing Heavy Metal Dynamics in Arctic Marine Ecosystems
Community Knowledge	
Champagne and Aishihik First Nations	Ice Patch Research, Education, and Communications – southern Yukon
Council of Yukon First Nations	Through Arctic Eyes- The Human Face of Global Warming
Council of Yukon First Nations	CYFN Elders Panel on Climate Change information pamphlet "Helping the Environment"
Council of Yukon First Nations	Improving Yukon Climate Change Research-Community Communications
Cree Regional Authority	Elements of a Strategy to Promote & Facilitate Access to

	Environmental Knowledge in the Aboriginal Communities of Northern Quebec
Dene Nation	Denendeh Environmental Working Group: Climate Change and water
*Environment Canada	Eagle and Kenamu Wetland Project
Environment Canada	Detecting Ecosystem Impacts of Climate Change using Community-based Knowledge: the Arctic Borderlands Ecological Co-op
Environment Canada	Evolution of the Cultural Landscape Unit Approach - From Ashkui to Caribou Crossing Interception Areas: Linking Western Science and Innu Knowledge
Environment Canada	Labrador Biodiversity and Environmental Monitoring Project
Gorsebrook Research Institute	Capacity Building to Address Resource Use Impacts* on the Labrador Ecosystems: Innu Environmental Guardians Program and Caribou Crossing Interception Area (CCIA) Projects
Inuit Tapiriit Kanatami	Inuit Observations on Climate and Environmental Change: Perspectives form Kugaaruk, Nunavut and Inuit Observations on Climate and Environmental Change: Perspectives from Repulse Bay, Nunavut
Inuit Tapiriit Kanatami	Inuit Response to Climate Change: Developing a Coordinated Approach
Inuit Tapiriit Kanatami	Arctic Climate Change: Observations from the Inuvialuit Settlement Region
Inuit Tapiriit Kanatami	Inuit Observations on Climate and Environmental Change: Perspectives from Arctic Bay, Nunavut
*Northern Climate ExChange	Managing in the Face of Climate Change: Building the Environment Information Base in Southwest Yukon
*Plantwatch North	Plantwatch North: monitoring climatic trends and changes in the ecoregions of Canada's North
Public Health Research Unit, Centre Hospitalier Universitaire de Québec (CHUQ)	Identifying, Selecting, and Monitoring Indicators of Climate Change in Nunavik and Labrador
*Public Health Research Unit, Centre Hospitalier Universitaire de Québec (CHUQ) ; Kativik Regional Government	Climate Change in Nunavik: Land and Resource Access Issues
PRIORITY: MONITORING	
*EMAN-North	Northern Ecological Monitoring Community of Practice and Provision of Ecosystem Status and Trends Information
Environment Canada	Northern Quebec Environmental Monitoring and Follow-up Networks Directory
*Memorial University	Monitoring for Ecosystem Change in the Labrador Highlands Using Integrated Multivariate Field and Geospatial Techniques
*University of British Columbia	Yukon Boreal Forest Monitoring Project
*Université Laval; Université du Québec á Rimouski	Monitoring the environmental and ecological impacts of climate change on Bylot Island, Sirmilik National Park
Université du Québec á	Maintaining the CANTTEX site at Baker Lake

Trois Rivieres	
Miscellaneous Subcategory	
Canadian Wildlife Service	Oil and gas development, climate change, and monitoring of Tundra Swan populations in the Mackenzie Delta, Northwest Territories
Meteorological Service of Canada	Climate-fire-ecosystem interactions in a changing northern environment
University of Saskatchewan	Climate Change, Fire History, Wetland Conditions, and the Distribution and Breeding Success of Scoters in the Mackenzie Delta, Northwest Territories

APPENDIX E: Northern Climate Exchange Work

Northern Climate ExChange
Climate Change Adaptation Activities

C-CIARN North

C-CIARN North, administered by the NCE in partnership with the Nunavut Research Institute and Ecology North, has offices in Whitehorse, Iqaluit and Yellowknife. The objectives of this program are to coordinate and facilitate climate change impacts and adaptation research, disseminate information and research results, build research capacity, maintain a database and web site, provide training opportunities, promote stakeholder involvement, and provide continuity in the effort to develop scholarship and a shared understanding of present-day and future climate impacts, vulnerabilities, risks, resiliency and adaptation.

C-CIARN North continues to be an anchor of the national network, maintaining a strong voice and a self-imposed heavy workload. C-CIARN has been and will continue to undergo a review process (2005-07) to improve it and align it with emerging needs for impact and adaptation expertise.

Key Adaptation Presentations

Over the course of the past year, NCE staff were called upon to give approximately 30 presentations on the subject of climate change. Much of the content of these presentations focused on the impacts and adaptation to a changing climate within the North.

Websites

NCE website host climate change information relevant to Canada's North. Along with information about the NCE, the websites provide current climate change news, reports, information, conferences, resources, and funding opportunities. Statistics indicate our main site receives more than 500 hits per day.

Websites

Northern Climate ExChange	**www.taiga.net/nce/**
ACIA outreach	**www.taiga.net/acia/**

Adaptation Focused Websites

C-CIARN North	**www.taiga.net/c-ciarn-north/**
Forest Management for SW Yukon	**www.yukon.taiga.net/swyukon/**

Infosources Database

This Database of Climate Change Information Sources for Northern Canada, or Infosources, contains over 2500 records, ranging from journal articles to entire data sets.

NCE's Weathering Change Newsletter

The quarterly NCE Newsletter, *Weathering Change* is devoted to disseminating information on climate change impacts and adaptation to managers, practitioners, policy makers, and academic audiences. *Weathering Change* summarizes the latest in research and technical information that is of relevance to northern communities and environments, with the objective of improving information exchange and increasing the visibility and understanding of climate change impacts and adaptation issues.

Research Needs Survey

In the previous fiscal year C-CIARN North published the Research Needs Survey for the Yukon. This year we were excited to publish the Research Needs Survey for Nunavut, and to complete the fieldwork for the Northwest Territories.

United Nations Climate Change Conference in Montreal (COP11)

The Northern Climate ExChange assisted in the development and coordination of NRCan's Adaptation Day parallel event called "Living with Climate Change: sharing Adaptation Experiences." This event was designed to highlight domestic and international examples of successful, sector-specific adaptation, and to provide an opportunity to see and benefit from the experience of others in the global community through the sharing of adaptation lessons-learned. The day was divided into four panel sessions, each dedicated to adaptation issues within a specific sector:

- Food Security
- Water Resources
- Coastal Zones
- Communities/Infrastructure

NCE staff coordinated the Communities/Infrastructure session.

Other involvement included partnering with the Yukon Government and the Council of Yukon First Nations to produce and deliver a booth featuring the Yukon, helping out with Arcitc Day which was hosted and organized by Indian and Northern Affairs Canada, and giving a presentation on *The Impacts of Climate Change in the Arctic* to the United Nations International Youth Summit.

Adaptation 2005

In May of this year, the first major Canadian conference on climate change impacts and adaptation was held in Montreal: *Adapting to Climate Change in Canada 2005: Understanding Risks and Building Capacity*. Hosted by Natural Resources Canada, the NCE was significantly involved in the planning and delivery of this conference. In particular we helped develop the program, reviewed abstracts and participated in the steering committee.

The NCE Coordinator was invited to chair one of the sessions: *Traditional Knowledge and Scientific Research*. The overall meeting provided an excellent

forum for researchers and decision-makers from a wide range of disciplines to share results and information.

Rapid Landscape Change Conference

In June of 2005, the NCE hosted an international conference at the Yukon College entitled: Rapid Landscape Change and Human Response in the Arctic. It was the sixth and final conference in the International Council for Science Dark Nature project series. The 3-day meeting reviewed current research on the effects of climate and landscape change in the North throughout the Holocene, and on the chronology and nature of past environmental events. It sought insights from past landscape changes and the way ancient peoples responded that might be useful for today's changing environments.

The conference had close to one hundred participants coming from a half dozen countries. The quote below is taken from the conference declaration:

> *Climate change will affect everyone on our planet, but particularly aboriginal people, whose sustaining culture is tied more closely to the local environment than the lifestyles of western civilization. This Conference urges decision makers to improve research on past environmental change and the human response to such change, in order to prepare northern societies for the challenges we will soon face. The conference urges First Nations' governments and Western scientists to integrate their efforts so that the results of research may be utilized rapidly by northerners to prepare for the future.*

Innovation Cluster

Over the past year, the NCE, the Yukon private sector, the National Research Council, the government of the Yukon, the Whitehorse Chamber of Commerce and Yukon College worked together to assess the viability of an innovation cluster in the Yukon. The innovation cluster would concentrate on the development, commercialization, and export of technologies and related solutions for cold-weather regions around the world. Included in the cold-weather focus was an interest in climate change variability, risks and adaptation.

Climate Change Impacts and Adaptation Assessment

Natural Resources Canada is directing the Canadian Climate Change Impacts and Adaptation Assessment to be completed in early 2007. The Assessment is broken into Canadian regional chapters, one of which is focused on the Territorial North. Similar to the Arctic Climate Impact Assessment, the Canadian Assessment includes consideration of all pertinent existing primary and grey literature on climate change, as well as expert opinion and traditional knowledge whenever possible.

To this end, the Northern Node of the Canadian Climate Impacts and Adaptation Research Network (C-CIARN North) in cooperation with the chapter leads, Chris Furgal (Laval University) and Terry Prowse (Environment Canada and University

of Victoria) held three consultations in the North, one in each territory. The intent of these were to present an overview of the developing chapter to key groups to allow for review, critique and most importantly, input into the process prior to completion of the full first draft in April of 2006. Meeting reports have been published and the author team has expressed the importance that this process has contributed to the chapter.

Forest Management in a Changing Climate

Healthy forests are the foundation of the Strategic Forest Management Plan for the Champagne and Aishihik Traditional Territory. It is therefore important to determine how forests in the region might be affected by global warming. Climate-associated impacts such as drought, wildfire, and outbreaks of insects and diseases – already concerns in Southwestern Yukon – are projected to become more frequent and severe, affecting forest productivity, ecosystem functioning and habitat values. The development of a sound, knowledge-based decision-making capacity for the region is critical.

The NCE, funded by Environment Canada's Northern Ecosystem Initiative, administered a project to synthesize available information on climate change for the southwest Yukon. The project conducted a preliminary exploration of forest management actions that could be undertaken to reduce the vulnerability of forest ecosystems, and the people and economies that depend on them, to climate change. Intended as the first step in a longer-term process of evaluating climate impacts, assessing risks to ecosystem and community values, and developing scenarios for adaptation, the project aims to support informed forest management decision-making in light of climate change.

The project culminated this year with the publication of an overview report and presentations at the very successful workshop *Climate Change in Our Backyard*.

Climate Change in our Backyard

This workshop was a partnership with the Champagne & Aishihik First Nations (CAFN) & Alsek Renewable Resource Council (ARRC) Council of Yukon First Nations (CYFN) and Yukon Forestry. *Climate Change in Our Backyard* was held in Haines Junction, Yukon from March 30-April 2, 2006.

The workshop raised understanding of global and local climate change issues as well as measures to mitigate and adapt to the change. Local people gathered with experts to exchange views, experiences, and concerns about the changes occurring in the Champagne & Aishihik Traditional Territory. The local, traditional and scientific knowledge bases were combined to inform the Strategic Forest Management Planning Process.

NWT Community Climate Change Workshops

In 2005, the Northwest Territories office of C-CIARN North initiated a series of Community Climate Change Impacts and Adaptation Workshops, designed to

determine the degree of climate change already occurring in the NWT, as well as to identify research gaps that are missing in the literature available to northern communities.

University of the Arctic, Advanced Emphasis on Climate Change

The NCE continued to work in partnership with the Artic Athabaskan Council and the University of the Arctic, to develop an advanced emphasis on climate change for the University of the Arctic Bachelor of Circumpolar Studies (BCS) program. This year the team developed the structure of the degree. This included course outlines and identification of topics, modules and learning outcomes. Discussion and development continue on detailed curriculum as well as alternate course delivery methods.

NCE Gap Analysis Project

Beginning in 1999, the Northern Climate ExChange coordinated a major project aimed at assessing the current state of knowledge about climate change in northern Canada. Through this project the NCE set out to meet several major objectives, with an overall goal of determining where information on climate change is adequate and where there are gaps. IN March of 2002 the NCE published the Gap Analysis Overview Report and CD-ROM.

Arctic Climate Impact Assessment Outreach

The Arctic Climate Impact Assessment (ACIA) was released in 2004. In support of the ACIA policy goals to disseminate the results to circumpolar communities, the NCE has begun an extensive outreach promote the ACIA message. We reproduce and distribute the ACIA DVDs (with permission from CICERO). We identified a lack of web presence and so developed an informative outreach website with the encouragement from the ACIA steering committee chair. Finally we take every opportunity to incorporate the ACIA graphics and key messages into our public presentations.

Contact

For more information on these programs and initiatives, please contact us at:
Northern Climate ExChange,
Northern Research Institute, Yukon College,
PO Box 2799, 500 College Drive,
Whitehorse, YT,
Y1A 5K4
p: 867.668.8735
f: 867.668.8734
e: nce@yukoncellege.yk.ca
w: www.taiga.net/nce