

CLIMATE CHANGE

ADAPTATION RESOURCE GUIDE

Nunavut's Emergency Planning and Extreme Weather



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Building *Nunavut* Together
Nunavut liuqatigiingniq
Bâtir le *Nunavut* ensemble



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1 INTRODUCTION

Climate change is happening, as is evident from increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global sea levels.¹ In Nunavut the annual average temperature is rising twice as fast as the rest of the world.² Meanwhile, there is evidence that warming temperatures cause increased risk of extreme weather events, including heavier rainfalls, flooding and increased forest fire conditions.³ In Nunavut specifically, the number and frequency of extreme weather events such as ice storms, windstorms, and storm surges are expected to rise.⁴

Climate change adaptation is about taking action and changing behaviour to reduce the negative impacts of climate change and take advantage of new opportunities. In the context of a changing climate and changes to extreme weather events, climate change adaptation also acts as a risk-reduction mechanism to natural disasters.

This resource guide provides an easy-to-use reference base for policymakers and practitioners within the emergency preparedness and management sector in Nunavut. The goal of this resource guide is to provide an overview of the information and resources that are available to assist in incorporating adaptation-based activities and policies, recognizing climate-related vulnerabilities, and reducing risk.

2 CURRENT CONTEXT

2.1 Extreme Events and Emergency Preparedness in Nunavut

Currently emergency planning is coordinated by the Government of Nunavut in conjunction with local communities, federal agencies, and volunteer organizations. In the communities of Nunavut, remote access, small populations and resource constraints play a role in how emergency response and preparedness is put into practice. In emergency situations it is likely that locals will be the first to respond, and they therefore want to have the necessary training and resources to play a key role in Search and Rescue and Emergency Response. Nunavummiut are interested in opportunities to build a circumpolar network of northern communities aimed at Arctic safety and security.⁵

¹ International Panel on Climate Change [IPCC], 2007

² Centre for Climate and Energy Solutions [C2ES], 2014

³ IPCC, 2012

⁴ Nunavut Climate Change Centre, 2014; Schiermeier, 2011

⁵ Munk-Gordon Arctic Security Program, 2013

⁶ Information on climate change impacts comes from Government of Nunavut 2003, 2005 a,b,c,d, 2011 and 2014.

2.2 Climate Change Impacts and Projected Changes in Nunavut⁶

Climate change impacts are already being witnessed by hunters, elders, and others in Nunavut. Over the past 100 years the Arctic has experienced an average warming of 1.5°C, with regional increases between 1 and 3°C. Over the next 100 years, average temperatures are expected to increase by 5 to 7°C in Nunavut, with shorter winters, longer summers, and more extreme weather events. Many of the changes which have already been witnessed are projected to increase over time, and still more changes are projected to occur in the future. The climate-related changes which have been witnessed in Nunavut thus far, or are projected to occur in the future, include changes in flooding and sea-level rise, changes in freeze and melt dates, thinner ice and other changes in ice conditions, and increases in number of storms.

FLOODING AND SEA LEVEL RISE

- One potential impact of climate change is flooding of low-lying coastal areas as a result of rising sea levels.
- Projections of sea level rise in Nunavut vary greatly due to the potential impact of isostatic rebound, where land is still rising due to the disappearance of the ice from the last ice age.
- An increase in sea level and flooding could cause further shoreline erosion, thus decreasing the stability of coastal areas for infrastructure.
- Rapidly melting snow and increases in quantity of rain have been noted by members of most Nunavut communities.

FREEZE-UP AND MELT

- Ice cover on Arctic lakes, rivers, and the ocean is developing later and melting earlier than before.
- The number of ice-free days on Arctic lakes, rivers, and oceans is increasing.
- Changes in both sea ice and lake ice have been observed by elders, hunters, and community members.

CHANGES IN ICE CONDITIONS

- The extent of Arctic sea ice has decreased every decade for which we have available satellite imagery.
- Decreased ice thickness and coverage is attributed to loss of multi-year sea ice that is being replaced by younger and less-stable ice.
- Formerly inaccessible waters may become accessible for the first time, and increased access may mean that there is an increased risk of environmental incidents requiring urgent response.
- Nunavut glaciers are both retreating and shrinking, in part due to iceberg calving. Among other impacts, this could cause changes in quality, quantity, salinity, and availability of drinking water.
- Many community members note the increasing uncertainty and unpredictability surrounding the safety of ice travel.

STORMS

- Inuit hunters and elders have noted the unpredictability of weather, where it changes faster than it did before and where storms often blow up unexpectedly.
- Unpredictable weather and increases in rain have been noted in some communities, and while some communities report increases in blizzards, others report decreases.
- An increase in extreme weather could cause storm surges, which could impact shoreline erosion.

3 ONLINE RESOURCES

The list of resources in this section is not comprehensive; however it does include those which were identified as the most applicable for the extreme events and emergency preparedness sector in Nunavut. The resources listed are all available online and include publications, websites, online tools, and case studies.

3.1 Publications and Websites

3.1.1 Nunavut-specific Publications and Websites

This section includes a list of resources specific to Nunavut or produced in Nunavut that provide information on climate change, extreme events and emergency preparedness.

Title: Nunavut Climate Change Centre

Agency: Government of Nunavut, Climate Change Section

Summary: The Nunavut Climate Change Centre (NC3) is a web-based climate change resource centre intended to provide current climate change information relevant to Nunavummiut. It was developed with the Government of Nunavut (GN) Department of Environment.

Link: <http://www.climatechangenunavut.ca/>

Title: Community Emergency Plans

Agency: Government of Nunavut and Nunavut communities

Summary: Twenty-two Nunavut communities have worked with the territorial government to create community emergency plans. Improvements to the Iqaluit plan were also initiated following a six-hour power outage in 2012.

Title: Community Climate Change Adaptation Action Plans

Agency: Government of Nunavut and Canadian Institute of Planners

Summary: Community Climate Change Adaptation Action Plans were developed for Arviat, Cambridge Bay, Clyde River, Hall Beach, Iqaluit, Kugluktuk, and Whale Cove. These plans contain many useful tools and resources, including hazard maps and recommendations for adaptations with respect to extreme weather events. In conjunction with these adaptation plans, a Nunavut Toolkit for Climate Change Adaptation Planning was developed for use in other communities for the development of their own community climate change adaptation plans.

Link: <http://www.climatechangenunavut.ca/en/resources/publications>
<http://www.planningforclimatechange.ca/wwwroot/Docs/Library/CIPReports/NUNAVUT%20TOOLKIT%20FINAL.PDF>

Title: Coastal Hazard Assessment for Adaptation Planning

Agency: C-Change

Summary: A working paper outlining a Coastal Hazard Assessment for Adaptation Planning in Iqaluit was published in 2011, describing a variety of changes, hazards, and ongoing adaptation projects within the community, with attention to the impacts of extreme weather events.

Link: http://www.coastalchange.ca/images/stories/Documents_Tab/workingpaper23_hatcherforbes_manson_2011.pdf

Title: Community Climate Change Hazards Mapping Projects

Agency: Government of Nunavut with community and academic partners

Summary: Community Climate Change Hazards Mapping projects have been or are being undertaken in a number of Nunavut communities as part of the Nunavut Climate Change Partnership. The goal is to create hazards maps for communities as a useful tool for planners and engineers in Nunavut. The projects involve evaluating existing and potential landscape hazards and the impacts that climate change may have on infrastructure and resource development in communities.

Link: <http://gov.nu.ca/eia/news/climate-change-community-consultations>
<http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb>
<http://arviat.tv/compendium-of-research/2011/item/290-arviat-research-climate-change-hazard-mapping-nunavut>

Title: Assessing permafrost conditions in support of climate change adaptation in Pangnirtung, Nunavut

Agency: Nunavut Climate Change Partnership

Summary: The Nunavut Climate Change Partnership provides a dataset entitled Assessing permafrost conditions in support of climate change adaptation in Pangnirtung, Nunavut, in PDF format. This data is intended to provide a tool in support of economic development through infrastructure maintenance and community planning.

Link: <http://data.gc.ca/data/en/dataset/d29bf844-b480-5e6a-9d40-0b0781e8299d>

Title: National Municipal Adaptation Survey

Agency: National Municipal Adaptation Project

Summary: A National Municipal Adaptation Survey (NMAP) was conducted for Alberta, Northwest Territories, and Nunavut, and provides a variety of information from local governments regarding adaptation, risks, challenges, and resources in their communities.

Link: <http://www.localadaptation.ca/resources/NMAP%20FS%20-%20Alberta,%20NWT%20and%20Nunavut%20J2014.pdf>

Title: Get Prepared

Agency: Government of Canada

Summary: The Government of Canada Get Prepared website has developed a list of regional emergency risks and hazards for Nunavut, with links to facts and safety sheets about each risk or hazard. The website also offers a disaster database, information for emergency planning, and other resources.

Link: <http://www.getprepared.gc.ca/index-eng.aspx>
<http://www.getprepared.gc.ca/cnt/hzd/rgnl/nu-eng.aspx>

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3.1.2 Northern Publications and Websites

This section includes a list of resources specific to the Circumpolar North or produced in the Circumpolar North that provide information on climate change, extreme events and emergency preparedness.

- Title:** Managing the Risks: A Guide for Arctic and Northern Communities
Agency: Centre for Indigenous Environmental Resources (CIER)
Summary: The Centre for Indigenous Environmental Resources (CIER) provides a guide entitled Managing the Risks: A Guide for Arctic and Northern Communities, intended to assist these communities in applying a step-by-step risk management framework to identify impacts and vulnerabilities to climate change in a local context. Included is an interactive map of summer and winter risks, several reports, and worksheets, as well as the Guide itself.
Link: <http://ccrm-cier.redrockconsulting.com/>
- Title:** Climate Change Planning Tools for First Nations
Agency: Centre for Indigenous Environmental Resources
Summary: The Centre for Indigenous Environmental Resources also provides several guidebooks in a series entitled Climate Change Planning Tools for First Nations. These guidebooks are intended for use in First Nations communities to enable them to walk through the process of planning and preparing for climate change in their communities.
Link: <http://www.yourcier.org/climate-change-planning-tools-for-first-nations-guidebooks-2006.html>
- Title:** Climate Telling
Agency: Health Canada
Summary: The website Climate Telling is produced as part of Health Canada's Climate Change and Health Adaptation Program. It is intended to provide a central communication hub for climate change and health-related issues in the Arctic, and intends to facilitate knowledge dissemination by accommodating multimedia research outputs and stimulating dialogue through social media platforms used universally among youth.
Link: <http://climatetelling.ca/>

3.1.3 External Publications and Websites

This section includes a list of relevant resources from other areas of Canada or other non-circumpolar countries that provide information on climate change, extreme events and emergency preparedness.

- Title:** Database of Climate Change Adaptation Resources
Agency: Ouranos
Summary: A searchable database of existing climate change adaptation resources is provided by OURANOS (Consortium on Regional Climatology and Adaptation to Climate Change). This includes a search engine which is searchable by geographic region of interest, by topic of interest, and by subtheme.
Link: <http://adaptation.ouranos.ca/en/>
- Title:** Community-based Risk and Vulnerability Assessments
Agency: Various
Summary: Van Aalst et al. present an assessment of the value of community-based risk assessments (CBRAs) in community-level adaptation to climate change. It is noted that CBRAs work to foster community engagement in climate risk reduction, particularly given that many strategies to deal with current climate risks also help to reduce vulnerability to climate change. A number of challenges are also presented. Climate Change Vulnerability Assessments have also been carried out in select communities in PEI.
Link: <http://www.sciencedirect.com/science/article/pii/S0959378007000453>
<http://atlanticadaptation.ca/pei-community-assessment>
- Title:** Minimum Standards for Local Climate-Smart Disaster Risk Reduction
Agency: International Federation of Red Cross and Red Crescent Societies
Summary: The International Federation of Red Cross and Red Crescent Societies published a document outlining Minimum Standards for Local Climate-Smart Disaster Risk Reduction. This document is a practical checklist to help local community leaders and disaster risk reduction practitioners ensure that their risk-reduction efforts are "climate-smart" and contribute to climate change adaptation.
Link: <http://www.climatecentre.org/downloads/File/Minimum%20Standards/Minimum%20Standards%20for%20climate-smart%20DRR%20%202.0%20NOV%202013.pdf>
- Title:** A Survey of Climate Change Adaptation Planning
Agency: H. John Heintz III Centre for Science, Economics, and the Environment
Summary: A resource entitled A Survey of Climate Change Adaptation Planning has been produced by the H. John Heintz III Centre for Science, Economics, and the Environment. It provides an introductory survey of worldwide climate change adaptation efforts and a number of case studies of adaptations within Canada.
Link: http://www.tribesandclimatechange.org/docs/tribes_89.pdf
- Title:** Adapting to Climate Change: A Risk-Based Guide for Local Governments
Agency: Federation of Canadian Municipalities
Summary: A report entitled Adapting to Climate Change: A Risk-Based Guide for Local Governments presents a risk-based approach to adapting to climate change for planning and responses, and illustrates how the risk management process can help users determine optimum solutions to complex issues. It is intended to help local officials to identify and manage climate-related risks.
Link: https://www.fcm.ca/Documents/tools/PCP/Adapting_to_Climate_Change_a_Risk_Based_Guide_for_Local_Governments_EN.pdf



Title: Climate Change and Emergency Management in Nova Scotia
Agency: Atlantic Climate Adaptation Solutions Association
Summary: The Atlantic Climate Adaptation Solutions Association has published an overview document of Climate Change and Emergency Management in Nova Scotia. It identifies hazard assessment, public education and capacity building, and land-use planning as the three key tools in the integration of climate change adaptation and emergency management practice. It also features a review of relevant literature and a number of case studies of the integration of climate change adaptation and emergency management practice, including floods in Norway.
Link: http://atlanticadaptation.ca/sites/discoveryspace.upei.ca.acasa/files/Climate%20Change%20Emergency%20Planning%20in%20Nova%20Scotia_0.pdf

Title: An assessment of storm water drainage and flooding
Agency: Atlantic Climate Adaptation Solutions
Summary: The Town of Stratford, P.E.I. completed an assessment of storm water drainage and flooding and its potential impacts in the context of climate change.
Link: <http://atlanticadaptation.ca/pei-stormwater-stratford>

Title: Coastal Flood Risk Assessments
Agency: Atlantic Climate Adaptation Solutions
Summary: Climate-change-related coastal flood risk assessment has been undertaken in Nova Scotia in two projects entitled Construction and Analysis of Flood Risk Maps for Select Coastal Communities in Nova Scotia, and Integrated River and Coastal Hydrodynamic Flood Risk Mapping. These risk assessments are useful in informing climate change adaptation efforts.
Link: <http://atlanticadaptation.ca/node/128>
<http://atlanticadaptation.ca/node/293>

Title: Sea-level rise (SLR) and storm surge hazard mapping
Agency: Atlantic Climate Adaptation Solutions
Summary: Sea-level rise (SLR) and storm surge hazard mapping was undertaken in Prince Edward Island to determine PEI-specific climate change scenarios and develop a publicly-accessible hazards map reflecting SLR and storm surge hazards.
Link: <http://atlanticadaptation.ca/pei-slr-hazardmapping>

Title: Extreme Events: Adaptation Strategies
Agency: SaskAdapt
Summary: SaskAdapt has a website outlining the seven principal strategies they have undertaken in response to changes in extreme events. These include strategies related to emergency management, emergency preparedness and response, warning systems, insurance, disaster response, community planning and design, and infrastructure and building design.
Link: <http://www.parc.ca/saskadapt/extreme-events/extreme-adapt>

Title: Municipal Preparedness for Climate Change in Nova Scotia: Evaluating Municipal Capacity to Respond to Climate Change through Adaptation
Agency: Atlantic Climate Adaptation Solutions
Summary: A project was undertaken entitled Municipal Preparedness for Climate Change in Nova Scotia: Evaluating Municipal Capacity to Respond to Climate Change through Adaptation. This culminated in the release of reports for each community detailing examination of policy and plans and discussion, interpretation of content thereof, and a synthesis of findings with respect to directions for future climate change adaptation planning efforts.
Link: <http://atlanticadaptation.ca/node/198>

Title: Climate Adaptation Knowledge Exchange
Agency: EcoAdapt
Summary: The Climate Adaptation Knowledge Exchange (CAKE) provides a shared knowledge base and community of practice related to climate change adaptation. The CAKE website offers a number of resources, including a wide variety of case studies, a virtual library, planning tools, and a directory of people and organizations involved in climate change adaptation work.
Link: <http://www.cakex.org/directory>

Title: Adaptation Toolkit
Agency: Atlantic Climate Adaptation Solutions
Summary: An Adaptation Toolkit was developed for the Tantramar region of southeast New Brunswick. This toolkit provides information about climate change and adaptation, and features a number of specific adaptation projects and projects aimed at mitigating undesired effects of climate change in New Brunswick communities.
Link: <http://atlanticadaptation.ca/sites/discoveryspace.upei.ca.acasa/files/Tantramar-adaptation-toolkit-2013-8MB.pdf>

Title: Adapting to Climate Change: An Introduction to Canadian Municipalities
Agency: Natural Resources Canada
Summary: Natural Resources Canada has produced a guide entitled Adapting to Climate Change: An Introduction to Canadian Municipalities, which provides a brief overview of climate change adaptation for municipal officials and staff. It familiarizes readers with climate change terminology, types of adaptation, and vulnerability assessment. It also includes several adaptation guides available to be utilized by communities, and provides examples of frameworks adopted and actions taken by local governments across Canada. The guide includes eleven case studies of communities in which adaptation projects have been carried out, including storm water management plans, planning for sea-level rise, water conservation, fire management, and more.
Link: <http://www.nrcan.gc.ca/environment/resources/publications/impacts-adaptation/reports/municipalities/10079>

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Title: Canadian Communities' Guidebook for Adaptation to Climate Change
Agency: Environment Canada and the University of British Columbia
Summary: Environment Canada and the University of British Columbia have published a resource entitled Canadian Communities' Guidebook for Adaptation to Climate Change. This guidebook is especially intended for local governments and others looking for 'win-win' solutions which both reduce greenhouse gas emissions and manage risks related to climate change (e.g. more frequent heat waves, water shortages, and sea-level rise).
Link: http://www.fcm.ca/Documents/tools/PCP/canadian_communities_guidebook_for_adaptation_to_climate_change_EN.pdf

Title: Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Action
Agency: ICLEI Canada
Summary: ICLEI Canada has produced a toolkit called Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Action. This describes in-depth a six-step adaptation process, and a companion volume which presents and explains 14 tools geared for adaptation planning, including a stakeholder identification worksheet, barriers document, and a risk assessment scenario worksheet.
Link: http://www.fcm.ca/Documents/tools/PCP/changing_climate_changing_communities_guide_for_municipal_climate_adaptation_EN.pdf

Title: Adaptation 101
Agency: Natural Resources Canada
Summary: The Natural Resources Canada Climate Change Impacts and Adaptation Directorate provides an Adaptation 101 website with information about climate change impacts, adaptation, adaptive capacity, resources, adaptation initiatives in Canada, and more.
Link: <http://www.nrcan.gc.ca/environment/impacts-adaptation/adaptation-101/10019>

Title: Coastal Climate Adaptation
Agency: National Oceanic and Atmospheric Administration (NOAA)
Summary: The National Oceanic and Atmospheric Administration (NOAA) of the United States offers a Coastal Climate Adaptation website which includes adaptation plans, action plans, case studies, strategies, guidebooks, risk assessment material, stakeholder engagement guides, training resources, and more.
Link: <http://coastalmanagement.noaa.gov/climate/adaptation.html>

Title: Municipal Resources for Adapting to Climate Change
Agency: Federation of Canadian Municipalities
Summary: The Federation of Canadian Municipalities provides a report entitled Municipal Resources for Adapting to Climate Change, which provides an introduction to municipal adaptation, examples of adaptation, and additional resource lists.
Link: http://www.fcm.ca/Documents/reports/PCP/Municipal_Resources_for_Adapting_to_Climate_Change_EN.pdf

Title: Retooling for Climate Change
Agency: Fraser Basin Council
Summary: A website entitled Retooling for Climate Change provides a number of useful tools, resources, and case studies of climate change adaptation. Specific sections with resources are included for infrastructure, hazards management, water, management, and more.
Link: http://www.retooling.ca/retooling_essentials.html

3.2 Case Studies & Best Practices

3.2.1 Nunavut-specific Case Studies & Best Practices

This section includes a list of case studies and best practices specific to Nunavut or produced in Nunavut that provide information on climate change, extreme events and emergency preparedness.

Title: Vulnerabilities and Adaptation to Meteorological and Related Hazards
Agency: ArcticNet
Summary: A project was undertaken in Nunavut entitled Vulnerabilities and Adaptation to Meteorological and Related Hazards, to analyze hazards, how they impact communities, and how they will change with a changing climate, and to gather data on these hazards.
Link: <http://www.arcticnet.ulaval.ca/pdf/phase1/43.pdf>

Title: Elder's Conference on Climate Change
Agency: Nunavut Tunngavik Inc.
Summary: An Elder's Conference on Climate Change was held in March 2001 with the objective of gathering Inuit Qaujimagatuqangit and experiences of Elders concerning climate change and its effects in Nunavut.
Link: <http://www.polarnet.ca/ntilands/pdfdoc/elders.pdf>

Title: Nunavut Emergency Management Roundtable
Agency: The Gordon Foundation
Summary: A Nunavut Emergency Management Roundtable was held in Iqaluit in October 2013 to examine the state of emergency preparedness in Nunavut, to review and discuss the findings of a case study practice exercise involving the sinking of a cruise ship, and to identify and discuss priorities and recommendations for future directions in emergency preparedness in the Arctic. Findings included a strong desire for training of community members in all aspects of emergency response, a need for clarification of jurisdiction, and desire for development of culturally-appropriate search and rescue policies and prevention/awareness campaigns, and integration of different level of search and rescue policies. Associated with this, twenty-six policy options were identified. Noted issues included a lack of 911 service, lack of local training, lack of northern-based SAR aircraft, aging and vulnerable critical infrastructure, spring flooding, and more unpredictable travel in the context of climate change.
Link: <http://gordonfoundation.ca/publication/727>

Agency: Pan-Territorial Adaptation Partnership
Summary: The Pan-Territorial Adaptation Partnership held a Pan-Territorial Permafrost Workshop in November 2013. This workshop brought together front-line decision makers and permafrost researchers from Nunavut, NWT, and Yukon to share knowledge, form connections and look at possibilities for adaptation in the future. Presentations and materials from the workshop are available online.
Link: <http://www.northernadaptation.ca/node/59>

3.2.2 Northern Case Studies & Best Practices

This section includes a list of case studies and best practices specific to the Circumpolar North or produced in the Circumpolar North that provide information on climate change, extreme events and emergency preparedness.

- Title:** Traditional Knowledge Research for Increased Unpredictable Severe Weather and Travel Safety Impacts on Community Health: Tools for the Development of Adaptation Plans
Agency: Institute for Circumpolar Health Research
Summary: A community-based project entitled Traditional Knowledge Research for Increased Unpredictable Severe Weather and Travel Safety Impacts on Community Health: Tools for the Development of Adaptation Plans was carried out by the Dene Nation in NWT in cooperation with the Institute for Circumpolar Health Research. The intent of this project was to amplify the voices of the Elders, traditional harvesters, and youth so they can have a chance to elaborate their own adaptation plans. Youth developed their research skills and produced a documentary entitled "The Land of Our Future".
Link: <http://www.ichr.ca/#!/the-land-of-our-future/ci6w>
- Title:** Alaska Village Relocation Projects
Agency: Climate Adaptation Knowledge Exchange (CAKE)
Summary: A number of village relocation projects have been undertaken in Alaska to relocate native settlements which are being threatened by flooding due to climate-change-related coastal erosion. Villages which have undergone or are undergoing partial or total relocation include Kivalina, Newtok, and Shishmaref.
Link: <http://www.cakex.org/case-studies/relocating-village-kivalina-alaska-due-coastal-erosion>
<http://www.cakex.org/case-studies/relocating-native-village-shishmaref-alaska-due-coastal-erosion>
<http://www.cakex.org/case-studies/relocating-village-newtok-alaska-due-coastal-erosion>
- Title:** Homer, Alaska's Climate Adaptation Progress Despite Uncertainties
Agency: ICLEI USA
Summary: The Homer Global Warming Task Force was commissioned to make recommendations on climate change impacts and futures for Homer, Alaska. The case study document associated with this, Homer, Alaska's Climate Adaptation Progress Despite Uncertainties, describes a number of climate change adaptation options and actions, including emergency preparedness measures. Among these measures are inventories of stormwater runoff, increased firefighting capability, and protection of wetlands and watersheds.
Link: http://www.icleiusa.org/action-center/learn-from-others/ICLEI_case%20study_Homer_adaptation.pdf

3.2.3 External Case Studies & Best Practices

This section includes a list of relevant case studies and best practices from other areas of Canada or other non-circumpolar countries that provide information on climate change, extreme events and emergency preparedness.

- Title:** Climate SMART Community Action Guide to Climate Change and Emergency Preparedness
Agency: Halifax Regional Municipality
Summary: The Halifax Regional Municipality released a Climate SMART Community Action Guide to Climate Change and Emergency Preparedness. This document identifies climate change mitigation and adaptation actions that can be taken on a municipal and sub-municipal level in Halifax, with special reference to the role of climate change in planning for emergencies. It also provides guidelines for the creation and implementation of emergency-related climate adaptation plans in other communities.
Link: http://www.halifax.ca/climate/documents/ClimateSmartGuide_Final_PressRes.pdf
- Title:** Climate Change and Extreme Weather: Designing Adaptation Policy
Agency: Adaptation to Climate Change Team (ACT) at Simon Fraser University
Summary: ACT at Simon Fraser University has published a background report and a summary of recommendations on Climate Change and Extreme Weather: Designing Adaptation Policy. Among other sections, these reports outline major recommendations to support the development of Canadian climate adaptation policies on the community level, with special attention to the impacts of climate change on extreme weather events.
Link: <http://act-adapt.org/extreme-weather/>
- Title:** Adaptation: Linking Research and Practice
Agency: Natural Resources Canada
Summary: This chapter of the Natural Resources Canada report Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, examines the current status of adaptation in Canada with respect to both research and practice, based on scientific and grey literature. It includes a discussion of how we have progressed and overcome barriers, as well as changes in research, engagement, and action. It also includes case studies focused on a range of issues.
Link: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/assess/2014/pdf/Chapter9-Adaptation_Eng.pdf
- Title:** Human Health
Agency: Natural Resources Canada
Summary: This chapter of the Natural Resources Canada report Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, reports on the finding of recent research focusing on health outcomes related to climate change. It discusses how risks to health could increase as the climate continues to change, and what adaptation options and tools are available to public health and emergency management officials.
Link: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/assess/2014/pdf/Chapter7-Human-Health_Eng.pdf

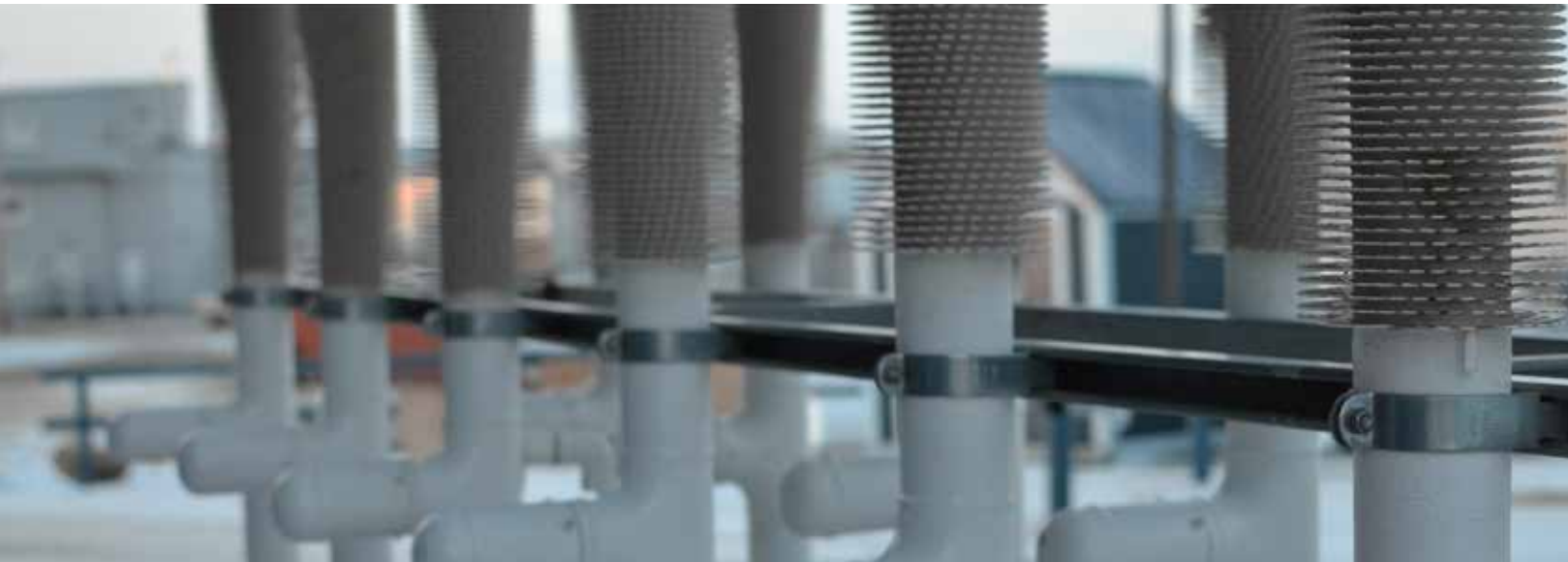
4 COURSES & TRAINING

4.1 Extreme Events and Emergency Preparedness Courses & Training

- Title:** Disaster Preparedness
Agency: Coursera
Summary: This free online course focuses on the disaster cycle, in particular the mitigation and recovery phases. Topics covered include preparing a personal preparedness plan, institutional and government preparedness.
Link: <https://www.coursera.org/course/disasterprep>
- Title:** Introduction to Emergency Management in Canada
Agency: Justice Institute of British Columbia
Summary: This course teaches the basic concepts and structure of emergency management in Canada. The course gives an overview of the framework, priorities and components involved in managing emergencies or disasters.
Link: <http://www.jibc.ca/course/em110>
- Title:** Current Trends in Security and Disaster Management
Agency: Justice Institute of British Columbia
Summary: The Justice Institute of British Columbia has a variety of courses focused on emergency management including this course, which is an elective in the Bachelor of Emergency and Security Management Studies program. The course looks at current topics and research in the area of health emergency management, climate change, cyber security, impacts of social media, and disaster management from a global perspective.
Link: <http://www.jibc.ca/course/esm442>

4.2 Climate Change and Adaptation Courses & Training

- Title:** Climate Insights 101
Agency: Pacific Institute for Climate Solutions (PICS)
Summary: The Pacific Institute for Climate Solutions (PICS) offers a Climate Insights 101 online short course, intended to provide users with an in-depth understanding of climate science and related issues. Two modules on the science of climate change and mitigation have been produced, and two modules on adaptation and regional climate change impacts are upcoming.
Link: <http://pics.uvic.ca/education/climate-insights-101>
- Title:** Introductory e-Course on Climate Change
Agency: United Nations Climate Change Learning Partnership
Summary: The United Nations Climate Change Learning Partnership offers an online Introductory e-Course on Climate Change with six modules, including one focused specifically on climate change adaptation. Those who complete the quizzes accompanying each module receive a certificate.
Link: <http://unccelearn.org/>
- Title:** Various: Climate Change and Climate Literacy
Agency: Coursera
Summary: The online e-Learning platform Coursera presently offers four courses in climate change and climate literacy. These courses are entitled Global Warming: The Science of Climate Change, Climate Literacy: Navigating Climate Conversations, Climate Change, and Climate Change in Four Dimensions, and are offered by the University of Chicago, University of British Columbia, the University of Melbourne, and University of California San Diego, respectively.
Link: <https://www.coursera.org/course/globalwarming>
<https://www.coursera.org/course/climateliteracy>
<https://www.coursera.org/course/climatechange>
<https://www.coursera.org/course/4dimensions>
- Title:** University of Chicago
Agency: Global Warming: Understanding the Forecast
Summary: The University of Chicago offers free online access to course materials to their Global Warming: Understanding the Forecast course. Though all lectures in the course are relevant to climate change science, the lectures of Chapter 12 cover emergency and disaster-related impacts of climate change.
Link: <http://forecast.uchicago.edu/lectures.html>
- Title:** Climate Change
Agency: Open2Study
Summary: Open2Study offers a free open study course in climate change offered through Macquarie University, which provides information about climate change impacts on food security, the economy, society, and more.
Link: <https://www.open2study.com/courses/climate-change>



Title: Leading Change and Action on Climate Change
Agency: Oxford University
Summary: Oxford University offers an online course entitled Leading Change and Action on Climate Change. This course examines climate change issues, current approaches to leadership at the local, national and global level and supports students in developing their own approach to leading change and innovation on climate change in a personal, local or professional context.
Link: <https://www.conted.ox.ac.uk/courses/details.php?id=L100-11&search=climate%20change&submitbutton=Search&multisearch=single>

Title: Certificate in Decision Making for Climate Change
Agency: Northwestern University
Summary: Northwestern University offers a Certificate in Decision Making for Climate Change in a 100% online format. This course teaches student to understand the impact of climate change and to make educated decisions about adapting to and minimizing its effects. It is intended for municipal, regional, and federal officials, environmental planners and managers, corporate and utility managers, and consultants. The course is offered in partnership with the University of Washington, University of California – Irvine, and the University of British Columbia.
Link: <http://sps.northwestern.edu/program-areas/professional-development/climate-change/>

Title: Assessing the Hydrologic Impacts of Climate Change
Agency: Toronto and Region Conservation
Summary: The website Water and Climate Change Adaptation by Toronto and Region Conservation provides an e-Learning course entitled Assessing the Hydrologic Impacts of Climate Change.
Link: <http://waterandclimate.ca/WP/index.php/technical-training/web-based-elearning-course/>

5.1 Nunavut Contacts

Agency: Government of Nunavut, Climate Change Section
Summary: The Climate Change Section of the Government of Nunavut Department of Environment coordinates the online Nunavut Climate Change Centre, and provides information about climate change adaptation programs and initiatives occurring in Nunavut. The Nunavut Climate Change Centre is a web-based climate change resource centre intended to provide current climate change information relevant to Nunavummiut. It shares and distributes climate change knowledge in Nunavut and makes information more accessible to the public.
Address: PO Box 1000 Stn 1360
 Iqaluit, NU X0A 0H0
Phone: 867-975-7700
Email: climatechange@gov.nu.ca
Website: www.climatechangenunavut.ca/
www.env.gov.nu.ca/node/93

Agency: City of Iqaluit Department of Emergency and Protective Services
Summary: The City of Iqaluit Department of Emergency and Protective Services works to provide for the protection of life, property, and the environment. It is composed of three sections: Fire Department, Ambulance, and Communications/Dispatch.
Address: PO Box 460
 Iqaluit, NU X0A 0H0
Phone: 867-979-5650 (Business line for Emergency Services Dispatch)
Email: dispatch@city.iqaluit.nu.ca
info@city.iqaluit.nu.ca
Website: www.city.iqaluit.nu.ca/i18n/english/emergencyser.html

Agency: Government of Nunavut, Nunavut Emergency Management
Summary: Nunavut Emergency Management (part of Government of Nunavut Department of Community and Government Services) is responsible for developing territorial emergency response plans, coordinating GN emergency operations at the territorial and regional level, and supporting community emergency response plans. Among other roles, they provide a number of publications related to emergency planning and safe travel, and offer local training in several aspects of emergency planning and response.
Address: PO Box 1000 Stn 700
 Iqaluit, NU X0A 0H0
Phone: 867-975-5403
Website: <http://cgs.gov.nu.ca/en/commEmergency.aspx>

Agency: Government of Nunavut, Protection Services
Summary: Protection Services, a branch of GN Community and Government Services, includes the Fire Marshall's office, Search and Rescue Services, Emergency Management Organization, and more.
Address: PO Box 1000 Stn 700
 Iqaluit, NU X0A 0H0
Website: <http://cgs.gov.nu.ca/en/Protection.aspx>



Agency: Nunavut Research Institute (NRI)
Summary: The Nunavut Research Institute, a part of Nunavut Arctic College, acts as a gateway to research and technology development initiatives in Nunavut. NRI develops and promotes traditional knowledge, science, and technology as key local resources. It also shares information on research projects, provides advice on research funding programs, and assists in the development of proposals to research funding agencies.
Address: PO Box 1720 Building 959
 Iqaluit, NU X0A 0H0
Phone: 867-979-7280
Website: www.nri.nu.ca

5.2 Government Agencies

Agency: Aboriginal Affairs and Northern Development Canada (AANDC)
Summary: Aboriginal Affairs and Northern Development Canada (AANDC) support Aboriginal and northern communities to address risks and challenges associated with climate change and to become more resilient through its Climate Change Adaptation Program (CCAP). In its first three years, this program funded more than 90 projects in 80 communities.
Address: Climate Change Adaptation Program
 25 Eddy Street, 10th floor
 Gatineau, QC K1A 0H4
Phone: 819-953-2590
Email: adaptation@aandc-aadnc.gc.ca
Website: www.aadnc-aandc.gc.ca/eng/1329158189051/1329158264671

Agency: Government of the Northwest Territories, Climate Change Unit
Summary: The Climate Change Unit of the Government of the Northwest Territories Department of the Environment and Natural Resources provides information and coordinates action on climate change. They provide the Northwest Territories Climate Change Network, a web-based tool that provides a resource for members to share information, make contacts, and promote action on climate change in the Northwest Territories.
Address: PO Box 1320
 Yellowknife, NT X1A 2L9
Phone: 867-873-7654
Email: climatechange@gov.nt.ca
Website: www.nwtclimatechange.ca/nwt-climate-change-network

Agency: Government of Yukon, Climate Change Secretariat
Summary: The Climate Change Secretariat is a branch of Environment Yukon, Government of Yukon. They coordinate the Yukon's government-wide response to climate change, form partnerships, coordinate activities and develop climate change policies and strategies.
Address: PO Box 2703 (V-205)
 Whitehorse, YT Y1A 2C6
Phone: 867-456-5543 or 1-800-661-0408 ext. 5544
Email: climatechange@gov.yk.ca
Website: <http://www.env.gov.yk.ca/air-water-waste/climatechange.php>

Agency: Natural Resources Canada
Summary: Natural Resources Canada (NRCan) is the federal department responsible for natural resources, energy, minerals and metals, forests, earth sciences, mapping, and remote sensing. It works to ensure the responsible development of Canada's natural resources and builds and maintains an up-to-date knowledge base of the Canadian land mass and resources. The Impacts and Adaptation program at Natural Resources Canada includes programs such as the Adaptation Platform and the Regional Adaptation Collaboratives (RACs) program. Within the RACs, areas of focus for the individual collaboratives include flood protection (British Columbia), drought and flood planning (Prairies), extreme weather risk management (Ontario), and many more. The role of the collaborative is to develop knowledge, tools and networks to support practitioners and decision-makers in addressing climate change issues now and in the future.
Email: adaptation@nrcan.gc.ca
Website: www.nrcan.gc.ca/environment/impacts-adaptation
www.nrcan.gc.ca/environment/impacts-adaptation/regional-initiatives/collaboratives/10633

Agency: Public Health Agency of Canada
Summary: Health portfolio coordination for emergency preparedness and response in Nunavut is coordinated by the Public Health Agency of Canada and carried out by Health Canada.
Address: 180 Queen Street West, 11th floor
 Toronto, ON M5V 3L7
Phone: 416-973-0003
Website: www.phac-aspc.gc.ca/canada/on-nu/index-eng.php

Agency: Public Safety Canada, Emergency Management
Summary: Public Safety Canada, through the Emergency Management branch, works in collaboration to strengthen national emergency preparedness including planning, training, exercises, risk assessment, and shared lessons learned.
Address: 269 Laurier Avenue West
 Ottawa, ON K1A 0P8
Phone: 613-944-4875 or 1-800-830-3118
Website: www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/index-eng.aspx

GOVERNMENT OF NUNAVUT



GOVERNMENT OF NUNAVUT PARKS



Individual provinces and territories have organizations or departments for emergency management and preparedness:

British Columbia Emergency Management
<http://embc.gov.bc.ca/em/index.html>

Alberta Emergency Management Agency
<http://www.aema.alberta.ca/>

Saskatchewan Security
<http://gr.gov.sk.ca/Saskatchewan-Security>

Manitoba Emergency Measures Organization
<http://www.gov.mb.ca/emo/>

Emergency Management Ontario
<http://www.emergencymanagementontario.ca/english/home.html>

Emergency Preparedness Quebec
http://www.msss.gouv.qc.ca/en/sujets/organisation/emergency_preparedness.php

New Brunswick Emergency Measures Organization
http://www2.gnb.ca/content/gnb/en/departments/public_safety/emo.html

Nova Scotia Emergency Management Office
<http://novascotia.ca/just/EMO/>

Prince Edward Island Emergency Measures Organization
<http://www.gov.pe.ca/jps/index.php3?number=20720&lang=E>

Newfoundland and Labrador Fire and Emergency Services
<http://www.gov.nl.ca/fes/index.html>

Northwest Territories Emergency Preparedness
<http://www.maca.gov.nt.ca/home/for-community-governments/safety-emergencies/emergency-preparedness-for-community-governments/>

Yukon Emergency Measures Organization
<http://www.community.gov.yk.ca/emo/>

5.3 Climate Change Organizations

Agency: Adaptation to Climate Change Team (ACT), Simon Fraser University
Summary: The Adaptation to Climate Change Team (ACT) is the only think tank initiative on the topic of climate change adaptation in Canada. Among other roles, it publishes research reports identifying policy and resource opportunities to bridge theory and action in support of sustainable adaptation.

Address: Simon Fraser University
#3551, 515 West Hastings Street
Vancouver, BC V6B 5K3

Phone: 604-671-2449

Email: adapt@sfu.ca

Website: <http://act-adapt.org/about/>

Agency: Arctic Institute of Community-Based Research
Summary: The Arctic Institute of Community-Based Research (AICBR) facilitates and promotes community-based, northern-led health research activities aimed at improving the health of indigenous and non-indigenous Northerners.

Address: 308 Hanson Street
Whitehorse, YT Y1A 1Y6

Phone: 867-668-3393

Email: info@aicbr.ca

Website: www.aicbr.ca

Agency: Arctic Institute of North America, University of Calgary
Summary: The Arctic Institute of North America works to advance the study of the North American and circumpolar Arctic through the natural and social sciences, the arts and humanities. They also acquire, preserve and disseminate information on physical, environmental and social conditions in the North. Their website is home to the Arctic Science and Technology Information System (ASTIS) database, which contains records describing publications and research projects about northern Canada and the circumpolar Arctic.

Address: 2500 University Drive NW, ES-1040
Calgary, AB T2N 1N4

Phone: 403-220-7515

Email: arctic@ucalgary.ca

Website: www.arctic.ucalgary.ca

Agency: ArcticNet
Summary: ArcticNet is a Network of Centers of Excellence of Canada that brings together scientists and managers in the natural, human health, and social sciences with their partners from Inuit organizations, northern communities, federal and provincial agencies, and the private sector. The central objective of ArcticNet is to contribute to the development and dissemination of the knowledge needed to formulate adaptation strategies and national policies to help Canadians face the impacts and opportunities of climate change and modernization in the Arctic.

Address: Pavillon Alexandre-Vachon, Room 4081
1045, avenue de la Médecine, Université Laval
Québec, QC G1V 0A6

Phone: 418-656-5830

Email: arcticnet@arcticnet.ulaval.ca

Website: <http://www.arcticnet.ulaval.ca/aboutus/rationale.php>

Agency: Canadian High Arctic Research Station
Summary: The Canadian High Arctic Research Station (CHARS) will be a research station in Canada's Arctic with the goal of advancing Canada's knowledge of the Arctic in order to improve economic opportunities, environmental stewardship, and quality of life.
Phone: 819-953-1160
Email: chars-srcea@aandc-aadnc.gc.ca
Website: www.science.gc.ca/default.asp?lang=En&n=74E65368-1

Agency: Canadian Polar Commission
Summary: The Canadian Polar Commission is Canada's primary knowledge agency. It is a point of contact with the Canadian and international polar scientific communities. It encourages and facilitates cooperation and collaboration in polar knowledge and works with partners to determine scientific and other priorities.
Address: 2464 Sheffield Road
Ottawa, ON K1B 4E5
Phone: 613-998-8127
Email: mail@polarcom.gc.ca
Website: www.polarcom.gc.ca

Agency: Climate Change Adaptation Research Group, McGill University
Summary: The Climate Change Adaptation Research Group is based in the Department of Geography at McGill University. Most of the research activities carried out by the group focus on climate change vulnerability and adaptation among Indigenous populations and stakeholder engagement in adaptation planning, with several past and present research projects taking place across Nunavut.
Website: <http://www.jamesford.ca/>

Agency: ICLEI Canada – Local Governments for Sustainability
Summary: ICLEI Canada – Local Governments for Sustainability is an international organization of local governments and local government organizations that are committed to sustainable development. They provide a variety of services, including technical consulting, training and information services. They have worked with many Canadian communities to develop adaptation plans.
Address: 401 Richmond Street W., Studio 204
Toronto, ON M5V 3A8
Phone: 647-728-4308
Email: iclei-canada@iclei.org
Website: <http://www.iclei.org>

Agency: International Institute for Sustainable Development (IISD)
Summary: The International Institute for Sustainable Development is an international public policy research institute for sustainable development. The IISD focuses on adaptation, risk reduction, climate change and energy, economics, amongst other diverse topics. They host a number of initiatives, including the Community-based Risk Screening Tool – Adaptation and Livelihoods.
Address: 161 Portage Ave. East, 6th floor
Winnipeg, MN R3B 0Y4
Phone: 204-958-7700
Email: info@iisd.org
Website: www.iisd.org

Agency: Northern Climate ExChange, Yukon Research Centre, Yukon College
Summary: The Northern Climate ExChange (NCE) is a part of the Yukon Research Centre at Yukon College which provides a credible source of information, develops shared understanding, promotes action, and coordinates research on climate change in Yukon and across Northern Canada.
Address: PO Box 2799 500 College Drive
Whitehorse, YT Y1A 5K4
Phone: 867-668-8862
Website: http://www.yukoncollege.yk.ca/research/programs/northern_climate_exchange

Agency: Ontario Centre for Climate Impacts and Adaptation Resources, Climate Change Adaptation Community of Practice
Summary: A Climate Change Adaptation Community of Practice, through the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR), is an interactive online community that provides a space for policymakers, researcher, and practitioners from across the country to share information and communicate with others in the field of climate change adaptation. OCCIAR also has a number of resources available at their website.
Address: 935 Ramsey Lake Road
Sudbury, ON P3E 2C6
Email: amorand@mirarco.org (Climate Change Adaptation Community of Practice)
Website: <http://www.climateontario.ca>
<https://www.ccadaptation.ca/en/landing>

Agency: Pacific Institute for Climate Solutions (PICS)
Summary: The Pacific Institute for Climate Solutions (PICS) is a knowledge network hosted and led by the University of Victoria that integrates multi-disciplinary approaches to climate change. Its mandate is to develop innovative climate solutions, seek new opportunities for positive adaptation, and lead the way to a vibrant, low-carbon economy.
Address: PO Box 1700 Stn CSC
Victoria, C V8W 2Y2
Phone: 250-853-3595
Email: pics@uvic.ca
Website: www.pics.uvic.ca

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Government of Nunavut, 2005c. Inuit Qaujimajatuqangit of Climate Change in Nunavut: A sample of Inuit experiences of recent climate and environmental changes in Pangnirtung and Iqaluit, Nunavut. Government of Nunavut, Iqaluit, NU, 33pp., <http://env.gov.nu.ca/sites/default/files/South%20Baffin%20English.pdf>.

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For more information on climate change in Nunavut, please visit

www.climatechangenunavut.ca



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Building *Nunavut* Together
Nunavut liuqatigiingniq
Bâtir le *Nunavut* ensemble



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Aboriginal Affairs and
Northern Development Canada

Affaires autochtones et
Développement du Nord Canada