CLIMATE CHANGE

ADAPTATION RESOURCE GUIDE

Nunavut's Built Infrastructure

Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble

NUNAVUT CLIMATE CHANGE CENTRE

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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 climate change threatens built infrastructure across Canada and in the Arctic in particular. Highways, roads, airstrips, commercial and residential buildings, municipal infrastructure and commercial infrastructure are all vulnerable to climate change.[3]

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 context of a changing climate, adaptation of infrastructure also acts as a risk-reduction mechanism to permafrost degradation, changes in precipitation patterns, and more.

This resource guide provides an easy-to-use reference base for policymakers and practitioners concerned with built infrastructure 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 Built Infrastructure in Nunavut

The infrastructure in Nunavut is vulnerable to climate change, many of Nunavut's buildings, roads and airports were not built to sustain the environmental pressures that we are now expecting. New infrastructure is being built with a better understanding of what is required to plan for future changes. Current northern standards or general practices are sometimes better than general practices throughout the country due to the harsh conditions faced in the north. Currently both federal and northern resources are being focused on building knowledge around infrastructure challenges, and encouraging innovation to improve how we build, maintain, and repair our infrastructure.

2.2 Climate Change Impacts and Projected Changes in Nunavut[4]

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 ice conditions, changes in sea level, changes in permafrost, and changes in precipitation, all of which may have implications for built infrastructure.

[1] International Panel on Climate Change [IPCC], 2007
[2] Centre for Climate and Energy Solutions [C2ES], 2014
[3] Federation of Canadian Municipalities, 2013
[4] Information on climate change impacts comes from Government of Nunavut 2003, 2005 a,b,c,d, 2011 and 2014.
[5] British Columbia Ministry of Environment, 2013

CHANGES IN ICE CONDITIONS

- The extent of Arctic sea ice has decreased every decade since data began to be collected in the 1970s. Multi-year sea ice is being replaced by younger, less stable ice, resulting in decreased ice thickness and in late summer ice coverage.
- Nunavut glaciers are retreating and shrinking in part due to iceberg calving, where ice suddenly breaks off from glaciers or icebergs. This results in changes in run-off, impacting areas that depend on glacier-fed rivers, streams, and lakes.
- Increased glacial runoff can cause fluctuations of water levels, changes in salinity in both salt and fresh waters, changes to water quality, and availability and quality of water, all of which have implications for municipal infrastructures.

CHANGES IN SEA LEVEL

- 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 ice during the last ice age.
- While in some areas the land is rising and may continue to do so, still other areas may experience sea level rise.
- An increase in sea level could cause further shoreline erosion, thus decreasing the stability of coastal areas for infrastructure.
- Rises and fall in sea level have many implications of varying levels of urgency for coastal infrastructure.[5]

CHANGES IN PERMAFROST

- Every Nunavut community is underlain by permafrost.
- Permafrost depth and coverage throughout Nunavut is expected to decrease as average Arctic temperatures continue to increase.
- Thawing of permafrost with climate change and increasing temperatures poses a considerable engineering and design challenge for future and existing infrastructure.
- Shorelines that have ice-rich permafrost are highly susceptible to higher rates of erosion from wave action.
- Permafrost thaw could have negative impacts on archaeological resources in Nunavut; ground erosion and slumping could alter areas like tent rings and sod houses.
- This challenge is especially acute for structures intended to have a long operating life and those for which failure has a very serious impact, such as runways, roads, and waste containment facilities.

CHANGES IN PRECIPITATION

- The amount, type, and patterns of precipitation in Nunavut are expected to change with time. Current increases across the Arctic have averaged at eight percent over the last 100 years.
- Related to this, there are projected to be changes in the number, intensity, and duration of storms and other extreme weather events.
- Precipitation is difficult to predict, but it will ultimately have implications for infrastructure in Nunavut.

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 built infrastructure 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 and built infrastructure.

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: Homeowner's Guide to Permafrost in Nunavut
Agency: Government of Nunavut, Climate Change Section
Summary: A Homeowner's Guide to Permafrost in Nunavut is a document which provides homeowners in Nunavut with knowledge and resources to make simple changes around their homes to preserve the permafrost frozen beneath them. The guide also provides local decision-makers with adaptation actions that are relevant to the communities they serve.
Link: http://www.climatechangenunavut.ca/en/resources/news/homeowners-guide-permafrost-nunavut-just-released

Title: Permafrost Monitoring
Agency: Government of Nunavut & Natural Resources Canada
Summary: The Government of Nunavut partnered with Natural Resources Canada to install permafrost monitoring sites across Nunavut. These sites are currently generating ongoing information on the thermal conditions of the ground to depths of 15 metres, and will provide baseline information required for engineering design and community planning.
Link: http://climatechangenunavut.ca/en/project/nunavut-permafrost-monitoring-network

Title: Nunavut Terrain and Soil Analysis
Agency: Government of Nunavut
Summary: The Government of Nunavut Department of Community Development and Government Services released a report entitled Nunavut Terrain and Soil Analysis in 2011, which detailed the results of a study which used radar satellite images to determine terrain suitability for future development in 14 communities in Nunavut, in order to better assess climate change risks to development of these lands.
Link: http://www.climatechangenunavut.ca/sites/default/files/nunavut_terrain_and_soil_analysis_-_2011.pdf

Title: Pan-Territorial Permafrost Workshop
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

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 and built infrastructure.

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: True North: Adapting Infrastructure to Climate Change in Northern Canada
Agency: National Round Table on the Economy and the Environment
Summary: A report was produced by the National Round Table on the Economy and the Environment entitled True North: Adapting Infrastructure to Climate Change in Northern Canada. This report highlight risks to northern infrastructure posed by climate change and the opportunities in adaptation. Included are specific chapters covering northern infrastructure vulnerability, the role of governments in climate change adaptation, risk-based mechanisms for adaptation, and conclusions and recommendations.
Link: http://publications.gc.ca/collections/collection_2009/trnee-nrtee/En134-44-2009E.pdf

Title: Climate Change and Transportation in the NWT
Agency: Government of the Northwest Territories Department of Transportation
Summary: The Government of NWT Department of Transportation released a report in 2007 entitled Climate Change and Transportation in the NWT. It summarizes the potential impacts of climate change on NWT infrastructure and provides a framework for decision-makers and stakeholders to prepare adaptation measures. It also provides a number of suggested 'next steps' for future infrastructural adaptation options.
Link: http://www.dot.gov.nt.ca/_live/documents/content/Climate%20Change%20Report%20for%20posting%20to%20web.pdf

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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 and built infrastructure.

Title: Climate Change Adaptation and Canadian Infrastructure
Agency: International Institute for Sustainable Development
Summary: The International Institute for Sustainable Development released a literature review entitled Climate Change Adaptation and Canadian Infrastructure. This report covers both climate impacts by type of infrastructure (including transportation, building, water, wastewater, and marine infrastructures) as well as tools, approaches, and mechanisms to support climate resiliency (including government policy responses, codes, standards, and related instruments).
Link: http://www.iisd.org/pdf/2013/adaptation_can_infrastructure.pdf

Title: National Engineering Assessment Report
Agency: Engineers Canada
Summary: The Public Infrastructure Engineering Vulnerability Committee (PIEVC) of Engineers Canada conducted the first National Engineering Assessment Report. This covers specific case studies of buildings, roads and associated structures, stormwater and wastewater systems, and water resources in Canada. One case study specifically discussed the usage of thermosyphons in warm permafrost.
Link: http://pievc.com/e/doc_list.cfm?dsid=4

Title: National Survey of Canada's Infrastructure Engineers about Climate Change
Agency: Canadian Standards Association & Engineers Canada
Summary: A survey report was published by the Canadian Standards Association for Engineers Canada entitled National Survey of Canada's Infrastructure Engineers about Climate Change. Key findings of this survey included that the majority of engineers believed that climate change effects their practice, that three quarters of infrastructure engineers feel they need more information to address climate change in their practice, and that the main barriers preventing engineers from addressing climate change in their practice are lack of information and resources, their beliefs that climate change has no impact on their practice, and a lack of requirements in codes, standards, and policy.
Link: https://www.apeg.bc.ca/getmedia/4e003686-63dd-41c2-a5d6-27df561b76e4/Engineers-Canada-National-Survey-of-Canada-Infrastructure-Engineers-about-Climate-Change.pdf.aspx

Title: Mainstreaming Climate Change Adaptation in Canadian Water Resource Management
Agency: Toronto and Region Conservation
Summary: A report was published by Toronto and Region Conservation entitled Mainstreaming Climate Change Adaptation in Canadian Water Resource Management. This document describes the current state of action of climate change adaptation in the water resource management sector in Canada, provides summaries by water issue (including infrastructure and technology), and identifies strategic opportunities to move forward.
Link: http://waterandclimate.ca/WP/wp-content/uploads/2012/11/MainstreamReport_FINAL_FORMATTED_Nov17.pdf

Title: Infrastructure: Buildings, Support Systems, and Industrial Facilities
Agency: Arctic Climate Impact Assessment (ACIA)
Summary: The Arctic Climate Impact Assessment (ACIA) included a chapter entitled Infrastructure: Buildings, Support Systems, and Industrial Facilities. This includes an overview of infrastructure in the Arctic, engineering in a changing climate, and physical environment and processes related to infrastructure.
Link: http://www.acia.uaf.edu/PDFs/ACIA_Science_Chapters_Final/ACIA_Ch16_Final.pdf

Title: Climate Change and Airports: Adaptation Planning
Agency: C2HM Hill
Summary: An overview of Climate Change and Airports: Adaptation Planning was produced by C2HM Hill. It describes a variety of risks, impacts, and adaptation options for airports in Canada.
Link: http://www.aci-na.org/sites/default/files/vanderbilt.p-climatechangeadaptation-sunday.pdf

Title: Estimating Costs for Alaska Public Infrastructure at Risk from Climate Change
Agency: Institute of Social and Economic Research, University of Alaska
Summary: The Institute of Social and Economic Research at the University of Alaska produced a report entitled Estimating Costs for Alaska Public Infrastructure at Risk from Climate Change. This report estimated the additional costs to public infrastructure in the future in Alaska under different scenarios of climate change.
Link: http://www.iser.uaa.alaska.edu/Publications/JuneICICLE.pdf

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: 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: 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: 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: Managing Municipal Infrastructure in a Changing Climate
Agency: Atlantic Climate Adaptation Solutions
Summary: Managing Municipal Infrastructure in a Changing Climate is a workbook intended to help guide municipal officials in a series of exercises with the aim of identifying ways to protect municipal infrastructure to minimize vulnerability.
Link: http://atlanticadaptation.ca/vulnerability-assessment

Title: Climate Liability: Municipal Responsibilities in a Changing Climate
Agency: Federation of Canadian Municipalities
Summary: A webinar was held by the Federation of Canadian Municipalities entitled Climate Liability: Municipal Responsibilities in a Changing Climate. It describes the legal implications of climate change adaptation and the potential liabilities that arise for municipalities.
Link: http://www.fcm.ca/home/resources/multimedia/climate-liability-municipal-responsibilities-in-a-changing-climate.htm

Title: Australian Greenhouse Office
Agency: Climate Change Impacts and Risk Management: A Guide for Business and Governments
Summary: The Australian Greenhouse Office has produced a resource entitled Climate Change Impacts and Risk Management: A Guide for Business and Governments. While focused on Australia and New Zealand, the guide is also applicable to other jurisdictions. It is directed to elected officials, general managers, and specialist risk managers.
Link: http://www.climatechange.gov.au/sites/climatechange/files/documents/03_2013/risk-management.pdf

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Title: Developer's Risk Management Guide to Climate Change
Agency: Halifax Regional Municipality
Summary: The Halifax Regional Municipality developed a Developer's Risk Management Guide to Climate Change, which was created for developers if Halifax's coastal-low-lying fringe, and serves as a model for developers in other regions. It includes an overview of climate change, a step-by-step approach to risk assessment, and provides a checklist that can be used in planning and evaluating development proposals.
Link: https://www.halifax.ca/climate/documents/DevelopersGuidetoRiskManagment.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

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: Climate Change Impacts and Adaptation Resource Library
Agency: Clean Air Partnership
Summary: The Clean Air Partnership provides a web site with a large number of useful resources, information pieces, and links to documents related to climate change impacts and adaptation for buildings, development, and infrastructure. Subsections for specific subsectors are also included, including storm water and drainage, transportation, energy, and housing.
Link: http://www.cleanairpartnership.org/arc/resource_library/cc_impacts_adaptation_sector#Buildings_Development_Infrastructure

Title: Guidance Manual for Local Climate Change Visioning and Landscape Visualizations
Agency: University of British Columbia
Summary: The University of British Columbia Collaborative for Advanced Landscape Planning has published a Guidance Manual for Local Climate Change Visioning and Landscape Visualizations. Climate change visioning integrates climate science with local planning, using participatory processes and "virtual reality" techniques based on digital mapping and scientific data to accelerate community awareness, help to build a constituency for change, and support decision-making for climate change options. This particular guidance manual describes how visioning has informed adaptation in communities in British Columbia, and it provides guidance on how others with access to suitable technological expertise can do the same.
Link: http://web.forestry.ubc.ca/calp/CALP-Visioning-Guidance-Manual-V1-1.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: 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: 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 and built infrastructure.

Title: Case study of community-scale hazard mapping in Clyde River
Agency: Natural Resources Canada
Summary: A case study of community-scale hazard mapping in Clyde River, Nunavut, is available from Natural Resources Canada. This link describes the process of creating hazard maps for the community and its rationale.
Link: http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=224608

Title: Vulnerability of Community Infrastructure to Climate Change in Nunavut: A Case Study from Arctic Bay
Agency: Ford, J.D., Bell, T., and St-Hilaire-Gravel, D.
Summary: An article was published entitled Vulnerability of Community Infrastructure to Climate Change in Nunavut: A Case Study from Arctic Bay. This article applies a vulnerability approach to describe infrastructure in Arctic Bay, based from interviews with community members and geomorphological observation. Barriers to adaptation in the community are also identified, including financial constraints, lack of knowledge of climate change projections, and erosion of traditional knowledge.
Link: http://link.springer.com/chapter/10.1007%2F978-90-481-9174-1_5#page-1

Title: City of Iqaluit Climate Change Impacts, Infrastructural Risks, and Adaptive Capacity
Agency: Government of Nunavut
Summary: The City of Iqaluit Climate Change Impacts, Infrastructural Risks, and Adaptive Capacity project was undertaken by the Government of Nunavut, with an objective of identifying risks to its infrastructure (including buildings, roads, and water supply wastewater treatment, and water disposal systems) and developing adaptation options.
Link: http://www.cakex.org/virtual-library/880

Title: Integrated Community Sustainability Plans
Agency: Government of Nunavut
Summary: Between 2008 and 2009, the Government of Nunavut conducted an infrastructure consultation process to build twenty-six Integrated Community Sustainability Plans (ICSPs) for each of Nunavut's communities.
Link: http://www.buildingnunavut.com/en/abouticsptoolkit/abouttoolkit.asp

Title: Nunavut Permafrost Monitoring Network
Agency: Government of Nunavut & Natural Resources Canada
Summary: Between 2008 and 2010, the Government of Nunavut, Natural Resources Canada, and 10 Nunavut communities collaborated to install permafrost monitoring sites across Nunavut, creating the Nunavut Permafrost Monitoring Network. The data generated provides baseline information required for engineering design and community planning.
Link: http://www.climatechangenunavut.ca/en/project/nunavut-permafrost-monitoring-network

Title: Climate Change and Mining in Nunavut
Agency: Government of Nunavut & IMG-Golder Corporation
Summary: A project entitled Climate Change and Mining in Nunavut was carried out to assess the vulnerability of Nunavut's mining-related infrastructure, including mine waste management facilities, docks, ports, rods, airstrips, and railways, to climate change. Best management practices were recommended in order to inform future mining development in Nunavut.
Link: http://northernadaptation.ca/sites/default/files/vulnerability_assessment_in_eng_0.pdf
http://www.climatechangenunavut.ca/sites/default/files/task1_final.pdf
http://www.climatechangenunavut.ca/sites/default/files/task2_final.pdf

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

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 Qaujimajatuqangit and experiences of Elders concerning climate change and its effects in Nunavut.
Link: http://www.polarnet.ca/ntilands/pdfdoc/elders.pdf

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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 and built infrastructure.

Title: Northern Infrastructure Standardization Initiative
Agency: Standards Council of Canada
Summary: The Northern Infrastructure Standardization Initiative (NISI) works to ensure codes, standards, and other related instruments are effective in addressing the climate risks inherent in Northern infrastructure design, planning, and management. Four new standards are being developed by 2017 for northern infrastructure:

- design, maintenance, and installation of thermosyphon foundations;
- changing snow loads on roofs;
- managing the effects of permafrost degradation under existing buildings and;
- climate change informed community drainage plans.

Link: www.scc.ca/en/nisi
The Buildings in Permafrost Supported on Thermosyphon Foundations standard is available in draft at http://shop.csa.ca/en/canada/infrastructure-and-public-works/cancsa-s500-14/invt/27036862014.

Title: Northwest Territories Thermosyphon Foundations in Warm Permafrost: Building Resources Infrastructure
Agency: Engineers Canada
Summary: The Public Infrastructure Engineering Vulnerability Committee (PIEVC) of Engineers Canada contracted the production a document entitled Northwest Territories Thermosyphon Foundations in Warm Permafrost - Building Resources Infrastructure. This document makes seven recommendations to better assess the vulnerability and adaptive capacity to climate change of infrastructure foundations in permafrost regions.
Link: http://www.pievc.ca/e/casedocs/nwt-thermo/GNWT%20Foundations_Warm%20Permafrost_Summary.pdf

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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 and built infrastructure.

Title: Climate Change Adaptation in the Emergency Management and Critical Infrastructure Sectors
Agency: Clean Air Partnership
Summary: A workshop was held in 2011 entitled Climate Change Adaptation in the Emergency Management and Critical Infrastructure Sectors. This workshop provided a number of recommendations for climate change adaptation in the critical infrastructure sector, including building greater levels of redundancy into critical infrastructure, vulnerability assessments, mapping, upgrades to the building code, and more.
Link: http://www.cleanairpartnership.org/files/Emergency_Management_Workshop_Proceedings_Final.pdf

Title: PIEVC Engineering Protocol
Agency: Engineers Canada
Summary: The Public Infrastructure Engineering Vulnerability Committee (PIEVC) of Engineers Canada has produced a protocol entitled PIEVC Engineering Protocol, which is a five step process to analyze the engineering vulnerability of an individual infrastructure e.g. a building, an infrastructure system, or a potable water treatment and supply system to current and future climate parameters such as extreme heat or extreme rainfall.
Link: http://www.pievc.ca/e/doc_list.cfm?dsid=43

Title: National Engineering Assessment Report
Agency: Engineers Canada
Summary: The Public Infrastructure Engineering Vulnerability Committee (PIEVC) of Engineers Canada conducted the first National Engineering Assessment Report. This covers specific case studies of buildings, roads and associated structures, storm water and wastewater systems, and water resources in Canada. One case study specifically discussed the usage of thermosyphons in warm permafrost.
Link: http://pievc.com/e/doc_list.cfm?dsid=4

Title: Adapting Infrastructure to Climate Change in Canada's Cities and Communities
Agency: Infrastructure Canada
Summary: Infrastructure Canada produced a literature review in 2006 entitled Adapting Infrastructure to Climate Change in Canada's Cities and Communities. It provides an overview of past work and research on infrastructure and adaptation to climate change in Canada, and has sections reviewing specific types of literature, including transportation, water supply, and water/wastewater infrastructure.
Link: http://ipcc-wg2.gov/njlite_download.php?id=6305

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: Industry
Agency: Natural Resources Canada
Summary: This chapter of the Natural Resources Canada report Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, assesses the impact of climate change on Canadian industry, and prospects for adaptation to reduce the risks and realize potential for gain. It focuses on property insurance, tourism, residential construction, manufacturing and trade.
Link: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/assess/2014/pdf/Chapter5-Industry_Eng.pdf

Title: Water and Transportation Infrastructure
Agency: Natural Resources Canada
Summary: This chapter of the Natural Resources Canada report Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, focuses on climate change impacts and adaptation in relation to physical infrastructure related to water (water supply, storm and waste water) and transportation systems. It uses case studies to discuss key sensitivities, impacts and adaptive responses.
Link: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/assess/2014/pdf/Chapter8-Infrastructure_Eng.pdf

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4 COURSES & TRAINING

4.1 Built Infrastructure Courses & Training

Title: Adapting your Infrastructure to Climate Change
Agency: Canadian Standards Association
Summary: The Canadian Standards Association Learning Institute offers an online course entitled Adapting your Infrastructure to Climate Change. This course is intended for those responsible for or involved in impact assessment, risk evaluation and response planning in support of climate change adaptation of infrastructure, including municipal staff, elected officials and professional service providers.
Link: http://shop.csa.ca/en/canada/infrastructure-solutions/adapting-your-infrastructure-to-climate-change/invt/2703207wt

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 Hydologic 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 CONTACTS

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: Canada-Nunavut Geoscience Office (CNGO)
Summary: The Canada-Nunavut Geoscience Office (CNGO) is mandated to supply geoscience information and expertise in Nunavut in support of responsible exploration and development of mineral and energy resources, to build and maintain geoscience capacity and expertise in Nunavut, and to provide geoscience training opportunities, public outreach, and communicate awareness of earth science to Nunavummiut.
Address: PO Box 2319, 1106 Ikaluktuutiak Drive
Iqaluit, NU X0A 0H0
Phone: 867-975-4529
Email: serge.basso@nrcan-rncan.gc.ca
Website: http://cngo.ca/

Agency: City of Iqaluit Departments of Engineering and Public Works
Summary: The City of Iqaluit Departments of Engineering and Public Works are responsible for city roads and infrastructure and technical support services for municipal capital projects including planning, design, and construction of water and sewer distribution systems, roads, subdivisions, and much more.
Address: PO Box 460
Iqaluit, NU X0A 0H0
Phone: 867-979-5600
Email: info@city.iqaluit.nu.ca
Website: http://www.city.iqaluit.nu.ca/i18n/english/engineering.html
http://www.city.iqaluit.nu.ca/i18n/english/publicworks.html

Agency: Government of Nunavut Department of Community and Government Services
Summary: The Government of Nunavut Department of Community and Government Services (CGS) is responsible for capital planning, community development, and community land use planning in Nunavut.
Address: PO Box 1000 Stn 700, 4th floor, W.G. Brown Building
Iqaluit, NU X0A 0H0
Phone: 867-975-5400/5413
Website: http://cgs.gov.nu.ca/en/community.aspx

Agency: Government of Nunavut, Department of Economic Development and Transportation
Summary: The Government of Nunavut Department of Economic Development and Transportation (ED&T) is responsible for supporting the participation of Nunavummiut in the development and growth of the territory, to strengthen the economy, and to ensure the safe and effective transportation system. Among other divisions, this department includes the Transportation Policy and Planning Division and the Airport Divisions.
Address: PO Box 1000 Stn 1500
Iqaluit, NU X0A 0H0
Phone: 867-975-7800 or 1-888-975-5999
Email: edt@gov.nu.ca
Website: http://www.gov.nu.ca/edt/

Agency: Nunavut Housing Corporation
Summary: The Nunavut Housing Corporation (NHC) delivers a number of services to Nunavummiut, including education, support and training to local housing organizations, homeowner services, property management services, and the coordination of housing lobbying efforts.
Address: PO Box 1000 Stn 1400
Iqaluit, NU X0A 0H0
Website: http://www.nunavuthousing.ca/apps/authoring/dspPage.aspx?page=about

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

MARTIN FORTIER, ARCTICNET

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: Infrastructure Canada
Summary: Infrastructure Canada leads federal efforts towards modern public infrastructure, through investments, partnerships, policies, programs and fostering knowledge. The department addresses local and regional infrastructure needs.
Address: 180 Kent Street, Suite 1100
Ottawa, ON K1P 0B6
Phone: 613-948-1148 or 1-877-250-7154
Email: info@infc.gc.ca
Website: www.infrastructure.gc.ca

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
www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/collab/pdf/racfactsheet_e.pdf

Agency: Transport Canada
Summary: Transport Canada promotes a safe and secure, efficient and environmentally responsible transportation system. They focus on air, marine, rail and road transportation.
Address: 330 Sparks Street
Ottawa, ON K1A 0N5
Phone: 613-990-2309 or 1-866-995-9737
Website: http://www.tc.gc.ca/

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 adaption 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 Institute of Planners
Summary: The Canadian Institute of Planners is a federation that accredits, represents, and communicates with planners across Canada. They have developed a climate change adaptation website, which includes specific case studies, and also offers a course on climate change adaptation for professional planners.
Address: 141 Laurier Avenue West, Suite 1112
Ottawa, ON K1P 5J3
Phone: 613-237-7526 or 1-800-207-2138
Website: www.cip-icu.ca

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: Engineers Canada
Summary: The Public Infrastructure Engineering Vulnerability Committee (PIEVC) of Engineers Canada has the central objective of ensuring that professional engineers and geoscientists, as well as infrastructure owners and managers, always consider climate change as an integral part of planning, designing, construction, operating, maintaining, and rehabilitating civil infrastructure.
Website: www.pievc.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 Adapation 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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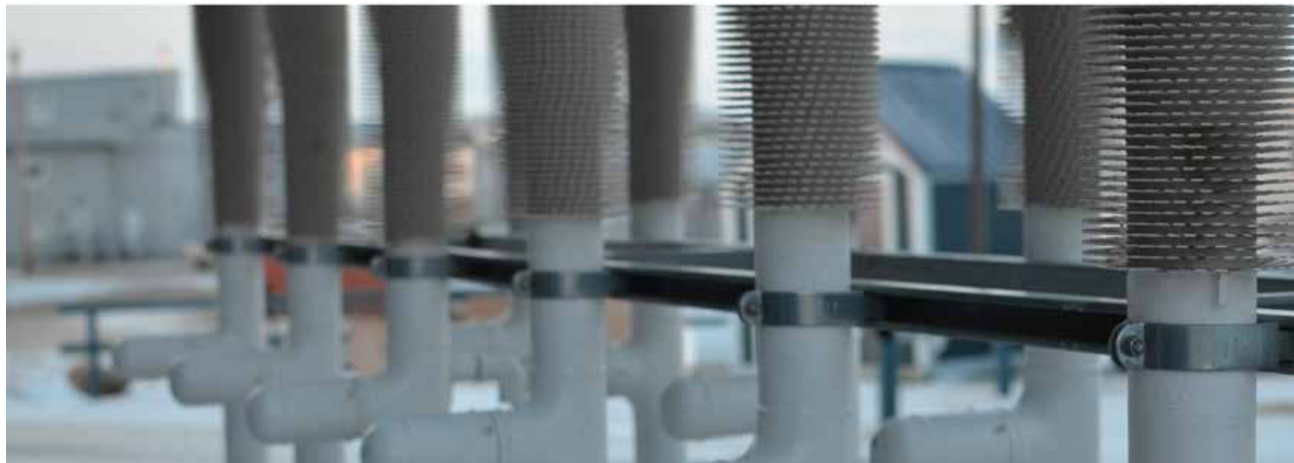

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For more information on climate change in Nunavut, please visit

www.**climate**change**nunavut**.ca

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

NUNAVUT CLIMATE CHANGE CENTRE

With funding assistance from:

Aboriginal Affairs and Northern Development Canada

Affaires autochtones et Développement du Nord Canada