



Climate Change IMPACTS and ADAPTATION Program

Communities



The overarching goal of the Government of Canada's Climate Change Impacts and Adaptation Program is to reduce Canada's vulnerability to climate change. The research program supports cost shared research to address gaps in our knowledge of Canada's vulnerability to climate change and to provide information for adaptation decision-making. Emphasis is placed on research that examines processes, barriers, and drivers for adaptation.

The program also supports the Canadian Climate Impacts and Adaptation Research Network (C-CIARN). This network facilitates linkages between stakeholders and researchers, promotes new research techniques and methodologies, disseminates information, and provides a voice for an emerging impacts and adaptation research community.

Between 1998 and 2003, the program has supported over 150 projects to examine the impacts of climate change on Canadians and the processes by which we adapt. Several of these projects related to communities and ranged from addressing questions of the impact of climate change on urban or coastal development to adaptation options for municipal infrastructure strategies.

Reports on these projects can be found on the program's website:

adaptation.nrcan.gc.ca

Here are some brief highlights of the projects funded.

1. Adaptation of Prairie Cities: The Role of Climate

Researchers examined the vulnerability of eight Prairie cities to climate change by investigating how city departments use climate and weather information in decision-making processes. This involved the use of literature reviews, expert judgement, stakeholder involvement, case studies and interviews. While climatic variables were shown to have substantial effects on city departments, such as transportation, planning and utility services, climate change was rarely considered a priority issue. The most vulnerable communities were found to be the ones where city departments were not aware of potential impacts and adaptation strategies, and did not use climate or weather information in decision-making. To decrease vulnerability, researchers recommended the implementation of no-regrets adaptation strategies, increased budget flexibility to allow departments to incorporate climate change into planning and deal with extreme events, and improved communication between scientists, decision-makers and the public.

Principal Investigator: Virginia Wittrock
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2. Climate Change, Permafrost Degradation and Infrastructure Adaptation: Community Case Studies in the Mackenzie Valley

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

Principal Investigator: Stephen Robinson
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3. Adaptation Strategies to Reduce Health Risks from Summer Heat in Toronto

This project examined the current and future risks of extreme summer heat for the residents of Toronto and developed a Heat Health Alert System to help prevent deaths and illnesses during heat waves. The elderly and homeless were found to be among the most vulnerable populations. The system was developed in collaboration with many governmental (e.g., emergency services, housing services, libraries) and non-governmental organizations (e.g., pharmacy chains, seniors' networks). An evaluation is made of different climatic factors and when an increased chance of mortality due to weather conditions is indicated, Environment Canada issues a Heat Alert. The response measures include warnings issued via the media, active intervention by public health and volunteer agencies (e.g., street patrols to locate and care for homeless people) and increased availability and accessibility of heated and air-conditioned public buildings, drop-in centres and shelters.

Principal Investigator: Eva Ligeti
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4. Municipal Infrastructure Risk Project

This project, led by the Federation of Canadian Municipalities (FCM), involved the use of meetings, presentations and interviews to raise awareness of climate change impacts on municipal infrastructure, and to facilitate interactions between climate change researchers and municipal staff. The project focused on six communities, with a key climate change impact defined for each (e.g., sea level rise in Charlottetown, PEI and permafrost change in Norman Wells, NT). This work resulted in a better understanding of what factors influence whether or not climate change is considered in infrastructure planning and decision-making. Characteristics that increase a community's adaptive capacity and ways to increase the inclusion of climate change in decisions were also identified.

Principal Investigator: Azzah Jeena
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5. Climate Change and Public Health in Nunavik and Labrador: What we know from Science and Traditional Knowledge

Researchers examined the potential health impacts of climate change on communities in Nunavik and Labrador by integrating information from scientific and Inuit traditional knowledge. In addition to conducting literature reviews and consultations with scientists and health professionals, the researchers also worked with groups of elders, hunters and women in the region. This allowed them to develop a better understanding of the main concerns related to climate change for communities in this area. The researchers used the information gathered to produce a series of fact sheets and identify areas in need of further research. This work will help northern decision-makers and residents to prepare for the potential impacts of climate change.

Principal Investigator: Pierre Gosselin
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6. Impacts and Adaptation in Conception Bay South on the Newfoundland Coast

Consulting with community residents to identify impacts of local concern was the critical first step of this study in Conception Bay south, Newfoundland. These concerns included coastal erosion, infrastructure damage and implications for town management and development. Researchers then used historic data to evaluate past climatic impacts and to identify which parts of the coast are most sensitive to flooding and erosion. Finally, options, such as preventing development in areas of known vulnerability and implementing setback limits, were recommended as a proactive means of limiting future impacts.

Principal Investigator: Norm Catto
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7. Evaluating Rooftop and Vertical Gardens as an Adaptation Strategy for Urban Areas

In urban areas, more frequent heat waves, higher temperatures and more intense precipitation events are key concerns related to climate change. Researchers found that the use of rooftop and vertical gardens has the potential to moderate these impacts, while simultaneously providing ancillary benefits, including reduced energy expenditures

and improved water quality. Researchers divided the roof of a test house in Ottawa, Ontario into two sections: one containing a rooftop garden (green roof), the other with conventional roofing (control). They found that the green roof was more effective at reducing heat loss, regulating the rate and quantity of runoff and reducing energy consumption. Vertical gardens were also found to reduce energy consumption in urban areas.

Principal Investigator: Dr. Bas. A. Baskaran
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8. Impacts & Adaptation of Drainage Systems, Design Methods and Policies

Since the majority of urban water drainage systems are designed based upon historical climate records, changes in precipitation patterns could cause some of these systems to fail. More intense precipitation events would tend to decrease the level of service that existing drains, sewers and culverts provide, and increase future drainage infrastructure costs. While making the necessary changes (e.g., increasing pipe sizes) will be expensive, the overall costs are expected to be lower than the losses that would result from not adapting. For example, insufficient pipe sizes would lead to an increase in sewer backups, basement flooding and associated health problems.

Principal Investigator: Daniel Jobin
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9. cities^{PLUS} Sustainable Urban Systems Design: Climate Change Impacts and Adaptation Component

The cities^{PLUS} initiative developed Canada's first 100-year plan for a sustainable metropolitan area (the Greater Vancouver Regional District), incorporating economic, social and environmental priorities in a systems approach. This project was part of the International Urban Systems Design Competition, involving eight countries and organized and partly sponsored by the International Gas Union. Due to the long-term nature of the plan, it was necessary to address the impacts of climate change. The report presents a preliminary assessment of the impacts of climate change on each of the urban systems in Greater Vancouver and also includes a description of key adaptation and general resiliency strategies for the region. The results of the project are being considered by the GVRD for inclusion

in their Liveable Region Strategic Plan and in their greenhouse gas reduction strategy. In June 2003 in Tokyo, the international judging panel awarded the competition's grand prize to the cities^{PLUS} Team.

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**Further information on the program
and funding opportunities can be
found on the web site:**

adaptation.nrcan.gc.ca

**or contact the
Climate Change Impacts and
Adaptation Directorate
Natural Resources Canada**

E-mail: adaptation@nrcan.gc.ca

10. Sea Level Rise and Climate Change: Impacts and Adaptation Needs, Prince Edward Island - A Case Study

The twenty three-member research team undertook a comprehensive analysis of the risk posed by sea level rise to Charlottetown and a section of the north coast of PEI. In Charlottetown, many commercial and residential properties are located in zones that are vulnerable to flooding events caused by storm surges. Researchers estimate that increases in storm-surge flooding, consistent with sea level projections for the next 100 years, could cause damages to properties assessed at values ranging from \$172 to \$202 million. Tourism could also be impacted, with 30 to 49 heritage properties being threatened by an increased risk of flood damage. City infrastructure (e.g., roads, water pipes, sewers) would also be impacted.

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11. Prairie rural communities and issues of climate change (PARC)

Interviews with community groups in the Prairies revealed that the largest climate change related concern for rural communities is the potential impact on water resources. Decreased wetlands, shifts in grassland regions and increased soil erosion were also identified as important impacts of climate change. To improve adaptive capacity and reduce vulnerability to these impacts, researchers recommended that communities focus on improving social cohesion, so as to enhance collaborations and benefit from shared knowledge and expertise.

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