CANADIAN CLIMATE INSTITUTE / L'INSTITUT CLIMATIQUE DU CANADA

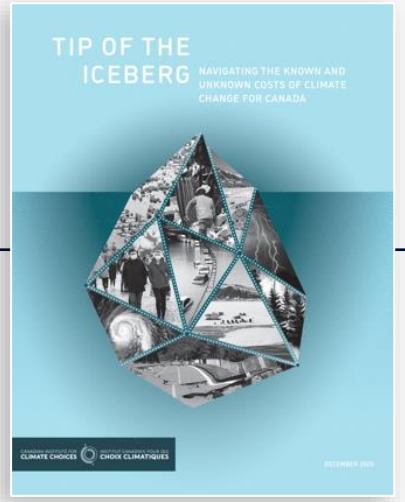
DUE NORTH

Dylan Clark
Ryan Ness

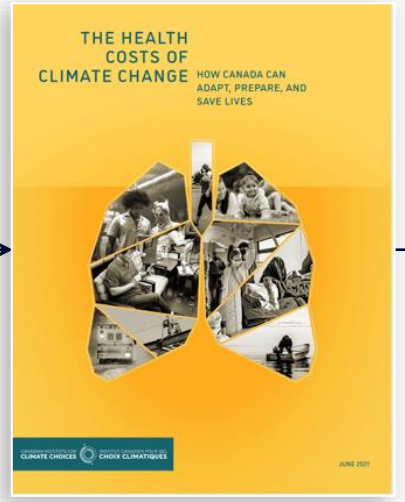
JUNE 2022

FACING THE COSTS OF CLIMATE CHANGE FOR NORTHERN INFRASTRUCTURE

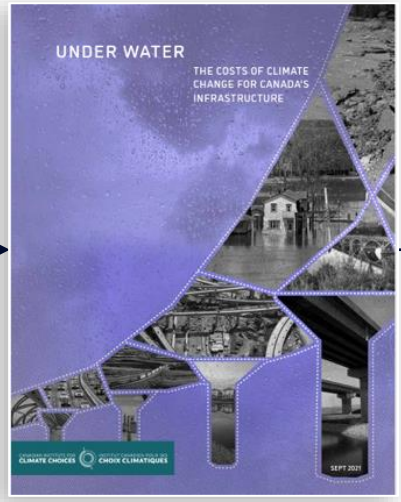
Costs of climate change series



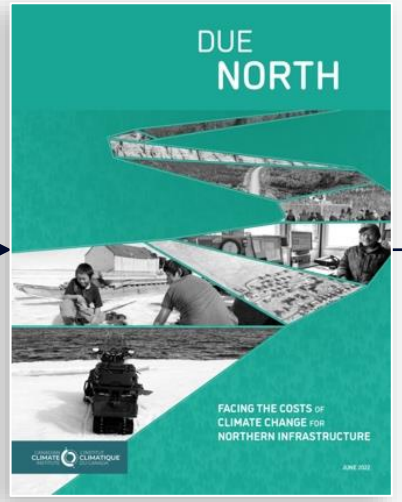
Tip of the Iceberg
December 2020



Health Costs
June 2021



Under Water
September 2021



Due North
June 2022

Macroeconomics
Fall 2022

Report objectives

Understand **costs associated with climate change impacts** on Northern infrastructure

Build the case for investment in Northern infrastructure and adaptation

Increase awareness of **the importance of infrastructure** in the North to lives and livelihoods, of **existing inequity of infrastructure services** in the North, and of the **consequences** of climate impacts

Equip Northern governments (territorial, Indigenous, and local) and other stakeholders and rightsholders **with additional information to advocate for support and investment** in infrastructure adaptation

Engagement

Early Engagement

Spring 2020

Project visioning with GNWT, YG, and GN as well as regional Indigenous stakeholders (CYFN, ICC, AFN-Yukon)

Summer 2020

Convene Advisory Group:
Ashlee Cunsolo; Brian Horton; Ian Mauro; Deborah McGregor; Enooyaq Sudlovenick

Spring 2021

Follow-ups with GNWT, YG, GN, and regional Indigenous Stakeholders

Midstream Engagement

November 2021

GNWT & YG, CYFN and AFN-Yukon, NWT Association of Communities , CIRNAC

December 2021

Northern Engagement Midstream Webinar, Polar Knowledge

January 2022

Métis National Council, Aurora Research Institute of the NWT, Tatâga Akta Înoxijabith Indigenous Consulting Firm, Yukon Chamber of Mines

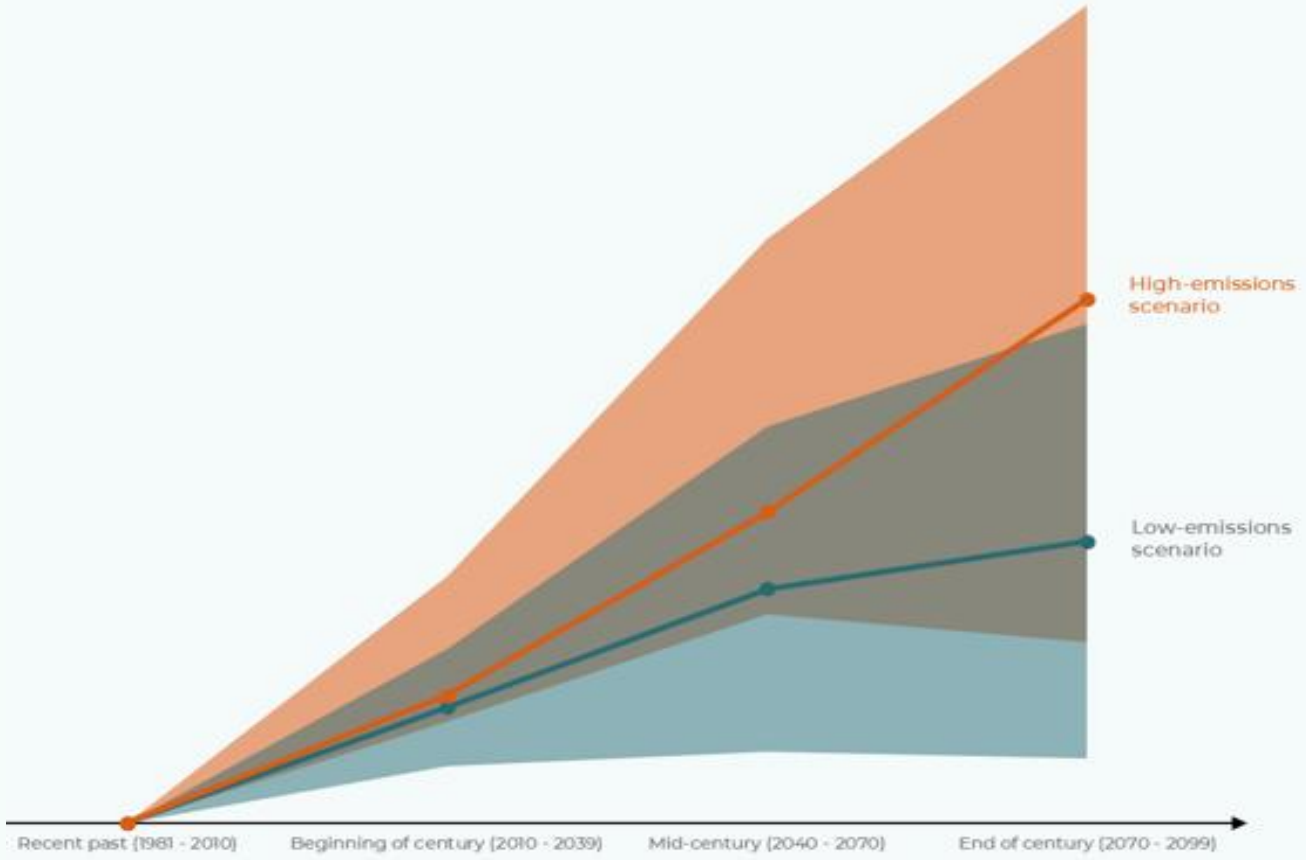
February 2022

CanNor, NWT & Yukon Chamber of Mines

Our approach

1 Model costs of future repair and replacement

- → Select key **climate infrastructure impacts**
- → Develop future **climate scenarios**
- → **Project changes** in infrastructure damage and deterioration
- → **Estimate repair and replacement costs**



Source: Data was obtained from Pacific Climate Impacts Consortium, provided by Canadian Centre for Climate Services.

Our approach

2 Gather stories about climate change impacts on infrastructure

- → Collaboration with **Firelight Group**
- → Interviews with people that are **First Nations and Inuit** living across the North
- → Focus on **experiences of climate change impacts** on infrastructure

Existing infrastructure across the North is consistently failing to serve the most basic needs of Northerners

Northerners **do not have the same quality** of infrastructure or **the same access** to essential services as other Canadians

The Northern infrastructure gap impacts the lives, livelihoods, health, and well-being of Northerners

Climate change in the North is happening faster and having a greater impact than in the rest of Canada

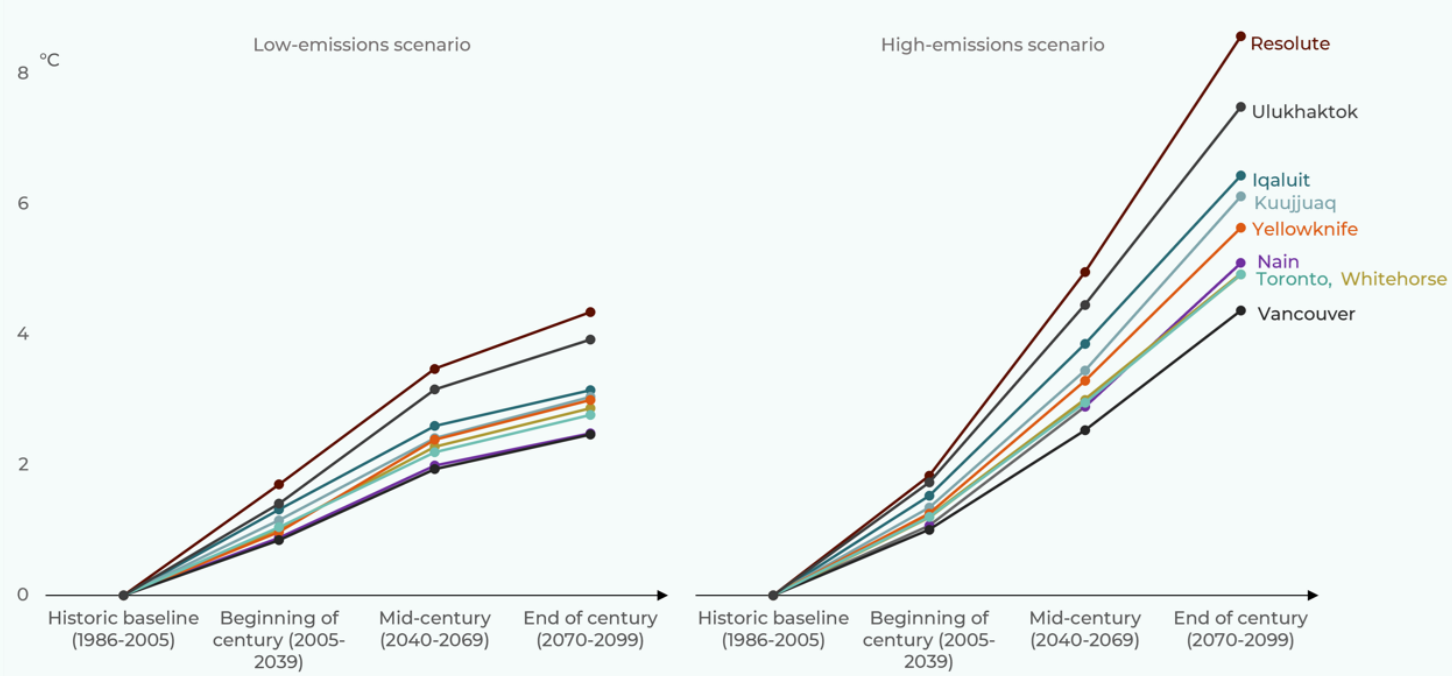
Temperatures across Northern Canada are projected to **increase even faster than in southern Canada**

The North faces unique climate-related hazards such as **permafrost thaw and changes to sea ice conditions**

Adapting to current and future climate-related hazards is essential in order to protect Northern people, communities, and livelihoods

Temperatures are rising faster across Northern Canada

Projected average annual temperature increases for cities in southern and Northern Canada



Climate impacts on airports

Examined over **150 airport runways** across the North

Analyzed **impacts of permafrost thaw** and **temperature impacts** on runway surface and strength

Adaptation scenario
Base layer reinforcement and air-cooled embankments

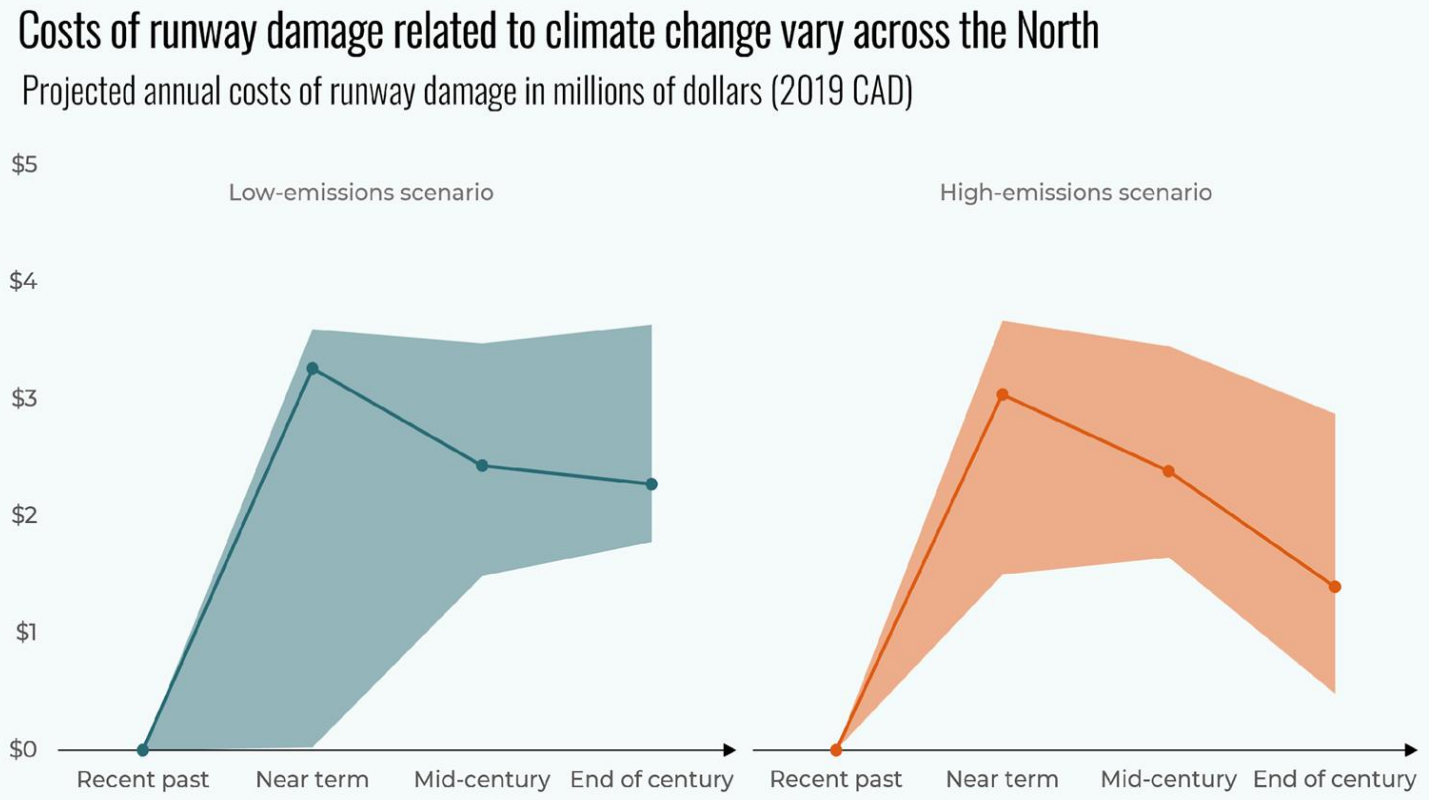
Permafrost thaw impacts on airports are going to persist

For many communities, airports are **the only way in or out**

Airport funding structures are a barrier in adapting and addressing existing gaps

Airport impact costs are likely **to rise rapidly** in the mid and late century

Warmer temperatures will result in **damages happening more quickly**



Climate impacts on roads

Examined about **25,000 km** of paved roads, **35,000 km** of gravel roads, and **6,000 km** of winter roads

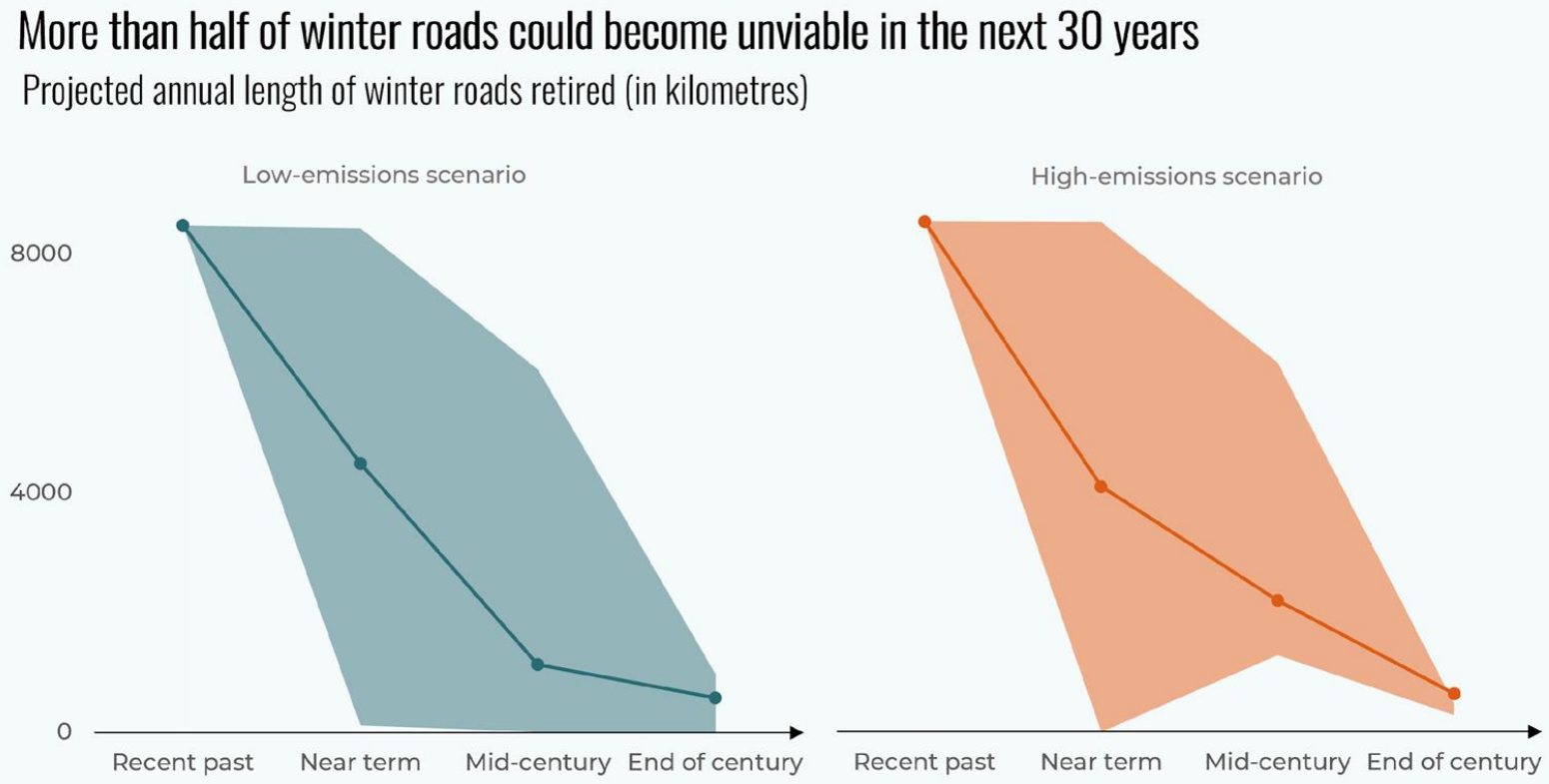
Analyzed **impacts of permafrost thaw** on road surfaces

Adaptation scenario
Base layer reinforcement and air-cooled embankments

Winter roads will increasingly becoming inoperable

"The ice gets thinner and thinner. Last year, it barely brought in the fuel. ***The ice was not thick enough."***

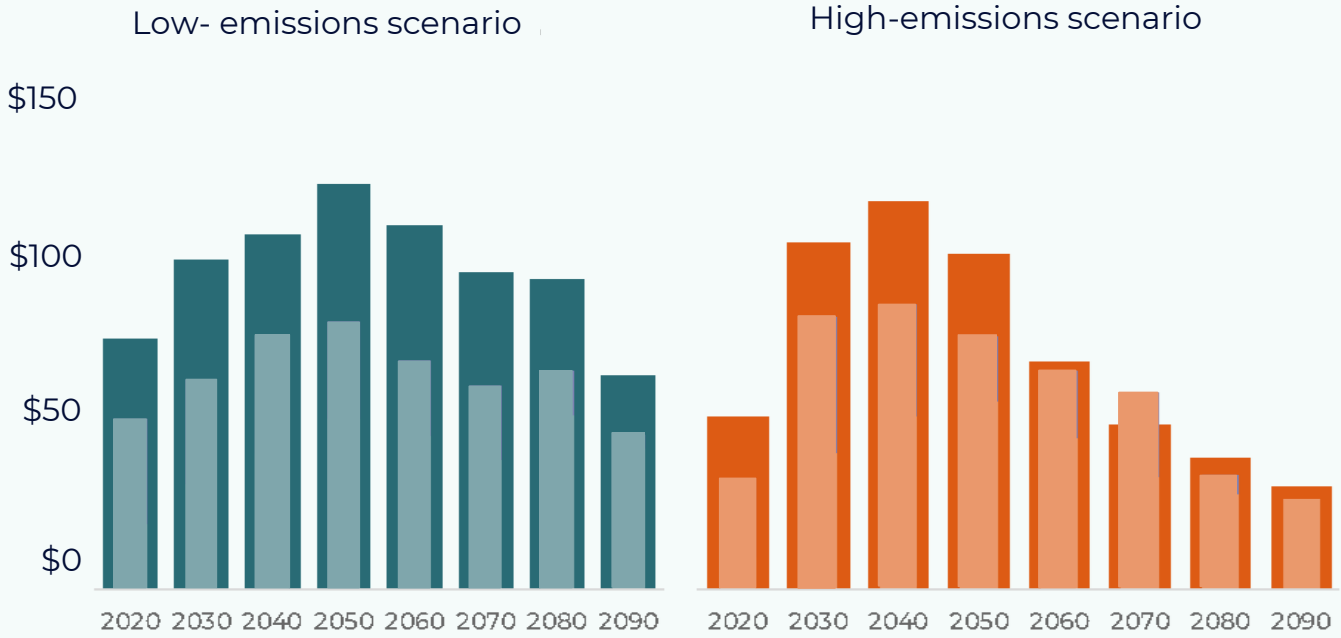
(Firelight 2022)

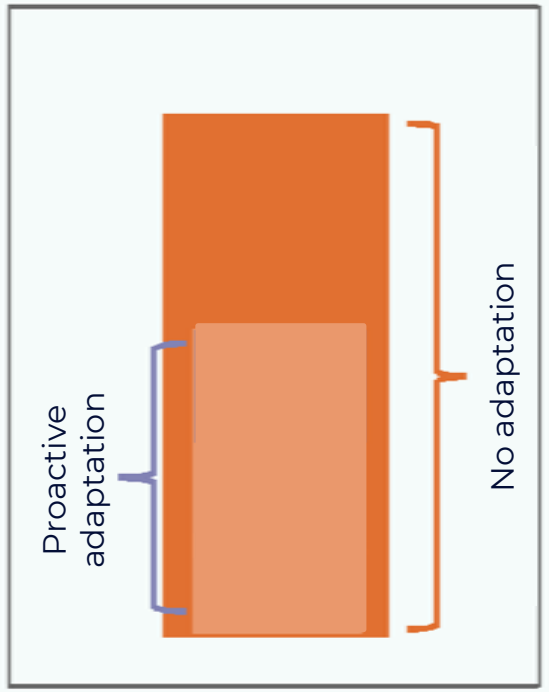


Adaptation can reduce costs of road repair and replacement

Proactive adaptation can reduce road damage from permafrost thaw

Yukon costs per year from permafrost thaw impacts in millions of dollars (2019 CAD)





Climate impacts on buildings

Analyzed permafrost impact costs for about **90,000 buildings**

Examined **impacts of permafrost thaw** on foundation stability

Adaptation scenario
Foundation reconstruction and thermosyphons

Permafrost impacts could exacerbate housing insecurity

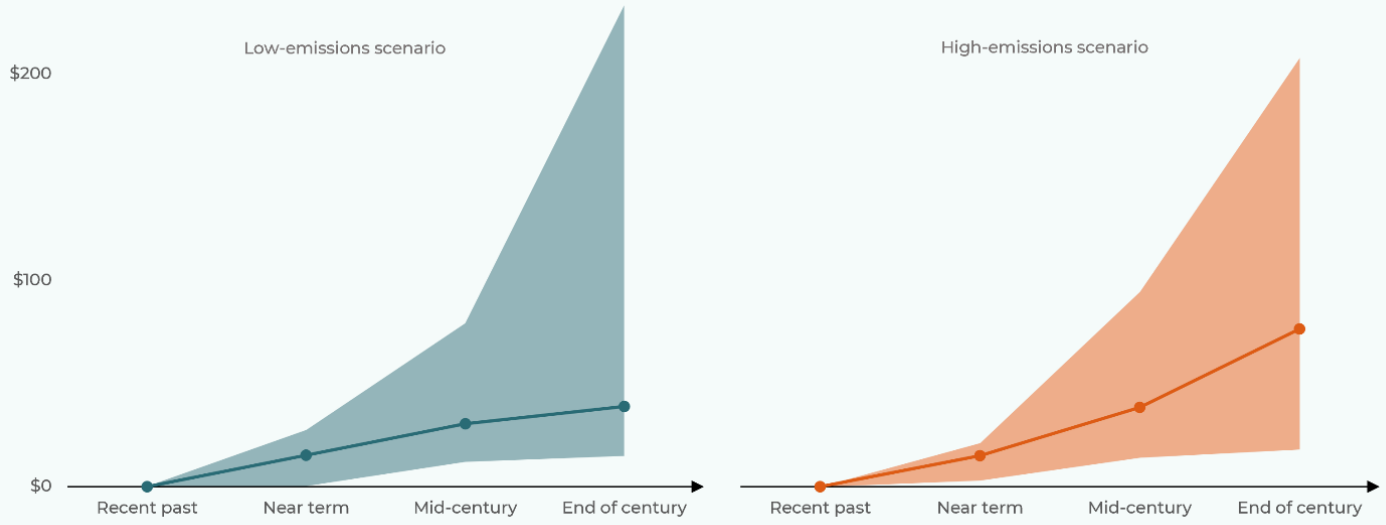
Climate impacts can **increase** construction, maintenance, and insurance **costs**

These costs can **contribute to housing shortages** and **insecurity**

"We've seen a lot of shifting on our buildings … I think ***every year*** *we have to level some of the buildings."*

(Firelight 2022)

Costs from damage to buildings could rise across the North through the end of the century



Northern perspectives on climate impacts

FOUR THEMES that emerged from our research and engagement:

1. Northern Indigenous and municipal leaders are concerned about the **cascading impacts** of climate change on more than just infrastructure

2. Northern governments are having trouble **accessing the funding, resources, and capacity** needed to improve and adapt infrastructure

3. **Northern innovation** is already driving new approaches

4. Successful adaptation requires **transformative shifts that address the root causes** of infrastructure vulnerability

Conclusions

Without specific and targeted interventions, **climate change will further widen the existing gaps** in basic infrastructure service across the North

Northern infrastructure failures due to climate change **will put critical services at risk and prove incredibly costly**

Incremental adaptations are insufficient on their own to safeguard infrastructure services against climate change

Northern Indigenous Peoples **face unique and elevated threats** from impacts of failing infrastructure

A lack of co-ordination among multiple orders of government is undermining infrastructure resilience

Recommendation 1

Funding

The federal government should dedicate **new financial resources** for Northern infrastructure and restructure **existing infrastructure funding programs** to increase accessibility and usefulness to Northern governments.

Recommendation 2

Information

The federal government should support provincial and territorial governments in developing and maintaining **accurate and practical information** about Northern-relevant climate risks to infrastructure. This data should **prioritize information** that is important to Northern decision makers and Indigenous communities.

Recommendation 3

Innovation

All orders of government should prioritize **infrastructure replacement and transformative leapfrogging** over repair and protection where this is a more effective way to safeguard services most efficiently in the long term.

Recommendation 4

Regulation

The federal, provincial, and territorial governments should **update infrastructure policies, regulations, standards, and codes** to explicitly account for the more complex and severe impacts of climate change in the North and to ensure that new infrastructure is resilient.

Guiding principle

It is critical that all infrastructure development and adaptation policies are implemented in a manner that is consistent with the principles outlined in Canada's Truth and Reconciliation Report.

Thanks to

Adaptation Expert Panel Report Working Group:

- Ashlee Cunsolo, Labrador Campus of Memorial University
- Brian Horton, Yukon University
- Ian Mauro, Prairie Climate Centre
- Deborah McGregor, York University
- Enooyaq Sudlovenick, University of Manitoba

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- Antoni Lewkowicz, University of Ottawa
- Steve Roddick, Resilient North Consulting

Consultant Research Teams:

- Firelight Group research team
- Industrial Economics Inc.

Advice and Insight:

- Tosh Southwick, IRP Consulting, Canadian Climate Institute Board Member

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