

Economic implications of climate change on the Tibbitt to Contwoyto Winter Road



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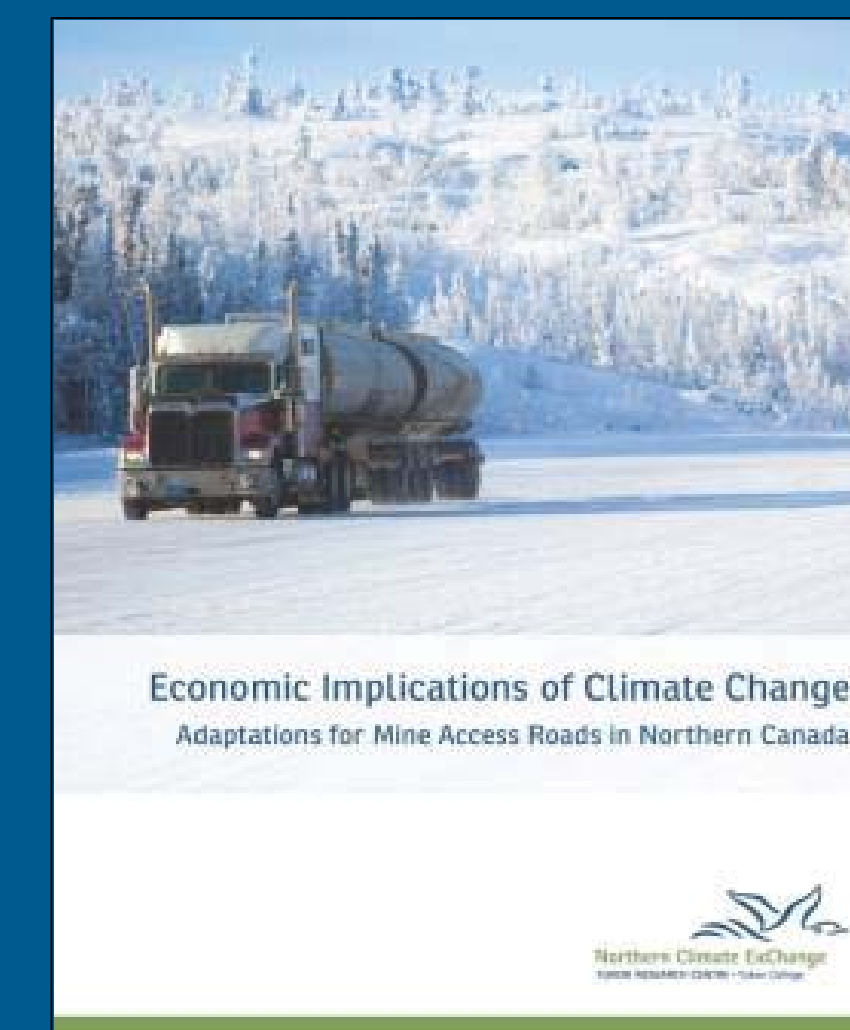
Tibbitt to Contwoyto Winter Road (TCWR)

Case study characteristics of the TCWR:

- Sensitive to climate
- Regional economic importance
- Availability of research and climate data

Background information:

- Approximately 400-600 km long
- Supplies 4 active diamond mines
- Built over frozen lakes with portages between
- Operates on average 67 days/year
- Up to 11,000 truckloads/year
- Sole overland route to mines
- Diesel is the main good transported on the road



Methodology and Deliverables

Project goal:

- To develop a cost-benefit analysis for a range of adaptation options for a major northern mine access road

Methodology:

- Historical and future climate analyses
- Vulnerability assessment (PIEVC Protocol)
- Identified climate variables and thresholds
- Identified adaptation options
- Conducted cost-benefit analysis comparing adaptation scenario to critical conditions scenario

Deliverables:

- Historical and future climate analyses
- Guide to conducting economic analysis of climate change impacts on transportation infrastructure
- Final report compiling case study information, vulnerability analysis, and cost-benefit analysis



Vulnerability Assessment & Climate Analyses



Key climate variable = operational season length (interaction of freezing-degree days and melting degree days)

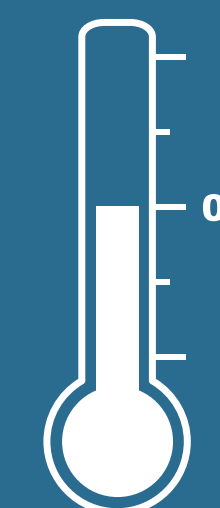
Operational season length

1981-2010	65 days (47-78)
2020s	58 days (44-72)
2050s	49 days (37-61)

Future scenarios

Adaptation scenario	45-50 days
Critical conditions scenario	<45 days

Adaptation scenario based on shorter road season and increasing maintenance. Road operations remain functional through adaptive measures including flexible scheduling and careful planning. Critical conditions scenario based on late opening and/or early closure or non-opening of the TCWR. Companies would need to shift to other forms of transportation and would suffer production losses.



Cost-benefit analysis



Adaptation scenario

Key cost types:

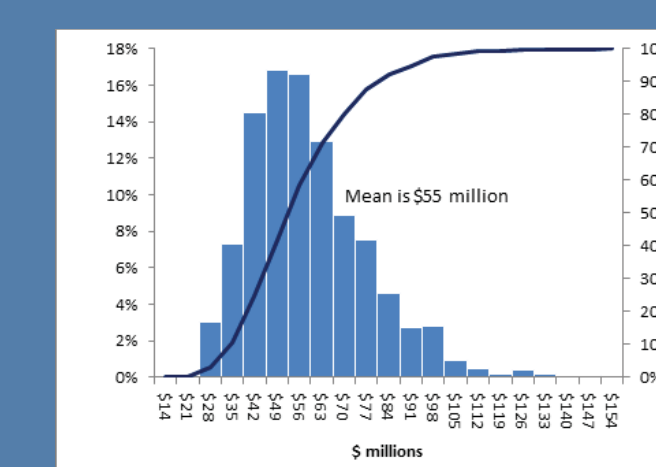
- Flexible scheduling (carriers)
- Increased construction and maintenance (road owners)

Critical conditions scenario

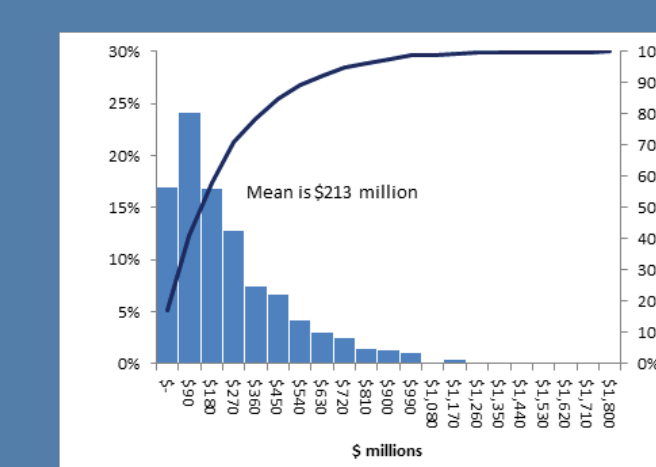
Key cost types:

- Alternative forms of transportation (mining operations)
- Production loss (mining operations)

Increased users will impact costs incurred during adaptation and critical condition seasons.



Adaptation scenario costs



Critical conditions scenario costs

Implications for Decision-makers

Inform future decisions for the TCWR and other winter roads:

- Whether to focus on repair and maintenance or build a partial all-season road
- Identifies need for companies to prepare for flexible scheduling and maximizing good winter seasons
- Provides valuable information on climate vulnerabilities and thresholds, and related cost increases

Filling data and information gaps:

- Historical and projected climate analyses are being used for other research and project development in the region
- Increases the body of knowledge around the costs of adaptation in the North
- Provides guidance on conducting cost-benefit analyses in particular with transportation infrastructure
- Developed a cost-benefit methodology that can be applied to other sectors or case studies
- Builds the business case for addressing climate change in infrastructure planning and design

Impacts on decision-making for the Government of the Northwest Territories:

- Confirmed the need for improved winter road construction guidelines, which GNWT has now completed
- Considering strategically placed all-weather roads to extend the seasons for the northern-most winter road sections
- Considering an all-weather road into the Slave Geological Province
- Considering replacing the most vulnerable sections of the TCWR - NWT Highway system to Lockhart Lake



- Provides results to compare with other roads (e.g. Tlicho Winter Road system)
- Provides an example of the effectiveness of the PIEVC assessment, complementing similar work done on other GNWT transportation assets

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Natural Resources Canada

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