

Enhancing the Resilience of Manitoba's Winter Roads System

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The northern part of the Province of Manitoba in central Canada is a vast and sparsely populated region with a highly variable subarctic climate; average annual temperatures in central northern Manitoba range from -25°C in January to $+16^{\circ}\text{C}$ in July (Environment Canada, 2011). Of the approximately 81,000 people living in this 560,000 square kilometre area (Manitoba Aboriginal and Northern Affairs, 2011), about 30,000 people live in 28 remote communities that are inaccessible by permanent conventional roads or railways, as the land is covered primarily by lakes, rivers and low-lying bogs called muskeg (Blair, 2010). Essential goods such as medicine and food are flown into these communities during the warmer months of the year; however, this is very costly and does not allow for the transportation of larger and heavier goods such as vehicles, equipment and building materials. A traditional solution has been the use of “winter roads,” or roadways that are built out of ice and snow in the cold winter months when the land and water is frozen solid. The 2,178 kilometre winter road network is typically viable from mid-January to mid-March, a period of about eight weeks when the ice is thickest on lakes and rivers (Blair & Sauchyn, 2010; Kuryk, 2003; Manitoba Infrastructure and Transportation, 2011).

The winter road system is of significant socioeconomic importance to Manitoba's remote communities. In addition to allowing goods to be moved at a cost that is two to three times lower than air transport, winter roads allow people to visit friends and relatives in nearby settlements, export resources like furs and fish for sale in more populated areas and gain income by working on road construction and maintenance projects (Blair & Sauchyn, 2010). The latter two are particularly important benefits as unemployment rates in northern Manitoba communities are as high as 80 to 90 per cent (Blair & Sauchyn, 2010; Kuryk, 2003). As winter roads support social networks, economic development, and the provision of infrastructure and essential goods, they are of fundamental importance to remote northern Manitoba communities.

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Manitoba’s changing climate threatens the integrity and safety of its winter roads. Milder winter temperatures and fluctuating ice and water levels in rivers have decreased the number of days that winter roads are usable, from a previous average of 50 or 55 days per year to as low as 20 days in 1999/2000 (Abdel-Hay, Harrison, Turriff, & Rosmalen, 2003, p. ii). In 1998, during a particularly warm winter, roads to 12 communities could not be built. This necessitated air transport of approximately 10 million litres of fuel and one million kilograms of foodstuffs, at a cost of \$15 million to \$18 million to the governments of Manitoba and Canada (Centre for Indigenous Environmental Resources, 2006; Kuryk, 2003). The safety of winter roads continued to be a concern in the early 2000s, when poor road conditions frequently led to drivers becoming stranded and the drowning of a road construction worker when the grader he was driving broke through the ice.

After the events of 1999/2000, the Deputy Minister of Manitoba Transportation and Government Services¹ supported efforts to examine the potential impact of a changing climate on the province’s winter road network. Department staff, led by the Manager of Technical Services, sought external expertise to analyze weather and operational data to inform adaptation efforts. As a first step, research was needed on the relationship between winter temperatures and winter road fitness. Coincidentally, the Prairie Adaptation Research Collaborative (PARC), a new partnership of the governments of Canada, Alberta, Saskatchewan and Manitoba, was initiating research on projected climate change impacts to inform adaptation efforts. Taking advantage of this opportunity, Manitoba partnered with PARC to fund a study of the impact of winter temperature variability on winter roads by researchers at the University of Winnipeg. Using regression models on the strength of the relationship between winter temperatures and winter road operations historically and temperature projections from General Circulation Models for a variety of scenarios, the researchers were able to make projections about future changes to the winter road season. Their projections suggested that the winter road season was likely to shorten as a result of Manitoba’s warming winters by approximately 5 days in the 2020s, 10 days in the 2050s and 14 days in the 2080s (Blair & Babb, 2008).

These findings were presented at a 2003 workshop attended by policy-makers, transportation service providers and users, researchers and other stakeholders that aimed to develop strategies for climate change mitigation and adaptation in the transport sector. Winter roads were identified as a high priority for adaptation during this workshop because of the strong likelihood that they would be affected by climate change, their socioeconomic importance in northern Manitoba and the prohibitively high cost of other methods of transportation (Kuryk, 2003). The decision to improve the winter road network was, as such, instigated by safety concerns and an informal cost assessment, and supported by scientific research and risk management planning.

The Government of Manitoba responded by dramatically increasing spending on the winter road network in an attempt to improve adaptive capacity. Between 2007 and 2011, the average cost of the winter road network rose to \$13 million annually; funding for winter roads has tripled since the first crisis year of 1998 (Rabson, 2012; Manitoba Infrastructure and Transportation, 2011). This funding has gone towards upgrading existing winter roads, as well as relocating roads away from water bodies and constructing new roads on overland routes. This has improved safety, allowed the roads to stay open longer each season (thus saving money on air transport) and reduced construction difficulties (Manitoba Infrastructure and Transportation, 2011).

¹ The Deputy Minister is the most senior bureaucratic position within the Ministry, and reports directly to the Minister of Manitoba Transportation and Government Services (who is an elected official).

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Several factors enabled the Government of Manitoba to successfully make changes to the winter road system:

- *Policy coherence*: The initiative fit into the provincial government’s broad northern development strategy because of the positive socioeconomic impact of the winter road system on northern communities.
- *Opportunities management*: Manitoba was able to take advantage of an ongoing research initiative to share the cost of developing the temperature projections and regression models that informed decision-makers about likely changes in the winter road season.
- *Stakeholder engagement*: The initiative was spearheaded by two provincial government officials who brought scientists and key decision-makers together and advocated for the project.
- *Policy flexibility*: The initiative was a success in part because the winter road network is already a responsive and adaptable system, as it is rebuilt on an annual basis. Community consultations about the relocation of the road network, for example, could be easily incorporated into routine annual road-planning processes.

Finally, a key “lesson learned” from the Manitoba winter roads case is that framing adaptation initiatives in a risk management context is an effective way to appeal to policy-makers. The proponents of adaptation were able to make a compelling argument by presenting scientific projections that emphasized the likelihood of the existing winter road system becoming increasingly unreliable, and by highlighting the high costs, potential safety risks and negative socioeconomic effects of “business-as-usual” transportation policies.

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