

ABOVE THE PERMAFROST LINE

Winter Roads

WHAT ARE WINTER ROADS?

Winter roads are roads that run over frozen land (seasonal or year-round) or frozen water, including frozen rivers, lakes, and sea expenses.¹

Winter roads support remote communities and boost local economies as they allow for the delivery of building materials, food, and fuel.²

Suppliers drive on winter roads from **January to April** to supply **a full year's supply** of goods and services to communities.³

Countries that use winter roads: Canada, the United States, Estonia, Finland, Russia, China, Norway, and Sweden.⁴

HOW DO WINTER ROADS WORK?

Snow acts as a warming insulator on lake and river ice. To keep winter roads cold frozen, **snowplow drivers remove snow from roads and ice to** release any trapped heat.⁵

Truck speed and weight can cause depressions in winter roads and ice cracks. Drivers must slow loaded trucks to **24 kilometers per hour** on winter roads.⁶



Ice 60 cm thick: trucks can carry 50% of trailer load capacity.

Ice 100+ cm thick : trucks can carry maximum trailer load capacity.⁷



Frozen year-round for at least 2 years, **permafrost** is a combination of soil, rocks and sand that is held together by ice.⁸

Sources:

1. National Research Council Canada, 2015.
2. *The New York Times*, 2017.
3. Ibid.
4. World Atlas, 2018.
5. U-Haul International, 2019.
6. Ibid.
7. Canadian Geographic, 2019.
8. NASA Climate Kids, 2019.
10. Union of Concerned Scientists, 2016.

WINTER ROAD USAGE IN CANADA

10

provinces and territories
rely on winter roads for transportation
(all above the permafrost line).

70+

communities are only accessible year-round
by air or seasonally by winter roads and water. ¹¹

5,310

kilometers of winter roads across
Northern and Arctic Canada. ¹²

THAWING WINTER ROADS



Northern and Arctic Canada is **warming** at about **2^{TO}3 TIMES** the global average. ¹³



Melting Ice



Melting Permafrost

- The duration of seasonal lake **ice cover has declined** across Canada **in the past five decades.** ¹⁴
- Approximately **80%** of Arctic lakes experienced declines in the duration of ice cover from 2002 to 2015. ¹⁵
- **Ward Hunt Lake** (NT) had maintained stable, continuous year-round ice cover for decades until 2011 and 2012, when the ice cover fully melted. ¹⁶

- In the last 30 years, permafrost in Canada has **warmed by 2 degrees Celsius.** ¹⁷
- **Between 1984 and 2013, the abrupt thaw** of permafrost in Banks Island, NWT increased the number of **massive ground slumps a 60-fold.** ¹⁸

11. Canada, "Canada's Arctic and Northern Policy Framework," 2019.

12. *The New York Times*, 2017.

13. Canada, "Canada's Arctic and Northern Policy Framework," 2019.

14. Canada, "Canada's Changing Climate Report," 2019 (230).

15. *Ibid*, (201).

16. *Ibid*, (228).

17. *Canadian Geographic*, 2018.

18. *National Geographic*, 2019.

THAWED ROADS: CASE STUDIES

NISHNAWB ASKI NATION (ON)

32 of the 49 Nishnawb Aski Nation communities in northern Ontario are isolated communities that depend on the winter roads for supplies.¹⁹

- Imported diesel fuel provides electricity (for **heat, light, food storing capabilities, etc.**).²⁰

In 2017, a winter road opened several weeks late, almost leading to blackouts in several communities.

- To fly in additional fuel, it would have cost **CA\$700,000 per community**.²¹

TIBBITT TO CONTWOYTO ROAD (TCWR)

The TCWR is the world's busiest long haul ice road and critical for the Northwest Territories' economy.²²

- Over **CA\$500 million in goods** is transported every year by the TCWR²³ for diamond mines, local tourism services, and construction firms.²⁴
- **85% of the TCWR runs over rivers and lakes**.²⁵
- The TCWR is highly susceptible to temperature change and was open **80 days in 2002** and **58 days in 2012**.²⁶



WINTER ROAD ALTERNATIVES



AIR

In 2006, mining company Tahera Diamonds found it would cost an extra **CA\$3 million that year, or CA\$0.75 per kilogram**, to airlift supplies compared to trucking rates.²⁷



ALL WEATHER ROADS

Canada has **5,310+ km** of winter roads. All-weather winter roads cost **CA\$370,000/km**. New routes would also need to avoid seasonally frozen bodies of water.²⁸



RAIL

Restoration of the Hudson Bay Railway (MB) would provide remote towns with reliable transportation. **Melting permafrost and road slumps could disrupt lines**.²⁹

19. The New York Times, 2017. 22. Theoretical and Applied Climatology, 2017. 25. Theoretical and Applied Climatology. 28. The New York Times, 2017.
20. CBC, 2019. 23. Ibid. 26. Ibid. 29. The Globe and Mail, 2018.
21. The New York Times, 2017. 27. The International Institute for Sustainable Development, 2014.