

Climate Change and Transportation



Vancouver Port
(credit: Transport Institute)

What is going on?

A changing climate will have a direct effect on both transportation infrastructure and operations, but the impacts do not stop there. It will also affect the demand for transportation, particularly in western Canada where grain forms such a large proportion of freight moved. For example, the Canadian Wheat Board predicts that as a result of climate change, more soybeans and corn will be grown in Western Canada as the weather begins to look more like the South Dakota¹. Yields of current crops are likely to increase because of the lengthening of the growing season. Acreage of wheat and pulse crops will expand, while barley and canola acres likely contract. These changes in production patterns in turn will change the transportation needs of the industry.

What is coming up?

The impact of these changes on transportation infrastructure and operations could be significant for road, rail and marine – all of which are essential for the movement of agricultural goods in western Canada. Some of the implications, which are mentioned in the literature and attested to by practitioners, are as follows:

- Greater variability in temperature and precipitation could cause more rapid deterioration in road and rail infrastructure. More frequent and wider freeze-thaw cycles could cause road surfaces and bridges to fail, with associated increases in renewal and replacement costs. In the 2013 flooding in Calgary and western Alberta, one bridge was lost, and tracks were flooded through the foothills.
- Greater variability and more frequent extremes also generate more mudslides, snowslides, washouts, tornadoes



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and blizzards, any of which can result in short term costly interruptions, and long-term cumulative damage. Extreme heat can cause the buckling of road pavements and both buckling and breakage of rails. Weather disruptions in the winter of 1996/97 were so severe that the Canadian Wheat Board lodged a level of service complaint with the Canadian Transportation Agency – a complaint that was, in part, substantiated by the Agency.

- The 2013 grain crop was a record but the railways have not had the available capacity to move all the grain. This year's experience raises the question of what level of peak movement should be provided for. Moreover, there is insufficient storage on farms and country elevators to accommodate record crops when transportation capacity is constrained.
- The oceans have already risen 30 cm in the past 100 years. It has been estimated that the sea level at Vancouver could rise by 28 to 98 centimeters by 2100. The Port is working on a plan to deal with future increases in the sea levels, but the problems are not confined to Canadian shores. Both long-term rises in ocean levels, and short-term effects of severe storms anywhere can affect our destination ports, and cause delays to shipping of Canadian grain.
- The Port at Churchill, Manitoba, might benefit from a longer season, but higher temperatures that melt the permafrost will threaten the rail line that serves it.
- The Great Lakes have already lost about 30 cm of their navigation depths because of evaporation. This is attributed to milder winters with less ice cover, a long-term trend that reduces the usefulness, and increases the cost, of this route.
- Road infrastructure and operations are also negatively affected by extreme weather. Road access from Winnipeg to the U.S. is regularly interrupted by spring flooding, causing costly detours and deterioration of the road itself due to frequent submersion.

Why is this important?

Added costs to repair, replace and upgrade infrastructure to accommodate greater climate variability and more severe weather events erode Canada's competitive position, and have a negative effect on farm incomes. These effects ripple through the entire economy of western Canada, and, indeed, in the nation as a whole. This raises the last question:

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What is being, or should be, done about it?

Transportation companies all over the world are taking the effects of climate change seriously, and public pressure continues to grow to address the deterioration of publicly provided infrastructure in roads and bridges. The following are among the many approaches to the issue adopted by industry and government:

- CP Rail claims to have a comprehensive program that entails (1) preparation and planning, (2) detection and prevention, (3) response and resiliency, and (4) restoration and recovery. It engages in continuous monitoring of weather, and works with other members of its various supply chains to deal with contingencies.
- BNSF reports that it is “hardening” its system against weather events with wind fences and snow sheds, and engages in continuous monitoring to deal with weather extremes.
- Omnitrac, which operates Canada's most northerly rail line, is taking steps to deal with melting permafrost, and have two studies underway to determine the effects of weather on its rail line and on sea ice in Hudson's Bay.
- The Province of Manitoba has a long-term plan in place to upgrade its highway link to the U.S. This involves raising sections of the highway to reduce the impact of annual flooding of the Red River. Regulations are also changing to make spring and winter loading restrictions more flexible.
- Port Metro Vancouver is planning for the sea level rises cited above, and for more severe storms. The impacts on the delta and the airport are significant, but the port has already made provision to build higher than anticipated high water levels.

Are current activities sufficient? The current disputes over the movement of the 2013 grain crop are indicative of the extreme difficulty of operating under the conditions of uncertainty that practitioners face in dealing with climate change. Unfortunately the past is no longer a reliable guide to the future and thus there are no data that tell us how climate changes will unfold. Governments and industry are faced with the exceedingly difficult problem of weighing the risks and associated costs

of negative climate change impacts against the costs and benefits of remedial action. If warmer weather makes crops like 2013 more common, what is the maximum production that the handling and transportation system should be designed to handle? To what elevation should highways be raised in order to maintain traffic flows? Too high, and scarce resources are wasted; too low, and shippers and carriers incur extra costs and lose market opportunities. These are the challenges that governments and the transportation industry face an increasingly uncertain future.