

Global Economic Policy Lab

High-Speed Rail: Toronto - Montreal Economic Analysis

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- The Canadian government should consider constructing a high-speed railway link between Toronto and Montreal as part of the country's Green Recovery.
- HSR between Toronto and Montreal would take six years and cost CAD\$11.9B to construct, and CAD\$291.5M annually to operate.
- At GEPL's projected ridership levels, tickets should be priced at CAD\$109.05 to break even over the 66-year project horizon.
- Due to potential time and cost savings, HSR will capture a substantial market share, resulting in wider economic and environmental benefits.

Background

Introduction to Canadian Highspeed Rail

Despite over fifty years of advocacy, [Canada remains the only G7 country](#) without high-speed rail ["HSR"]. The [Ontario Liberal government committed CAD\\$11B](#) to HSR development in 2014, however the Progressive Conservatives [cancelled this plan in the 2019 provincial budget](#). Canada's intercity passenger railway infrastructure is archaic compared to other developed countries. Travellers [face ageing infrastructure, lengthy delays, and longer than necessary travel times](#). It's time for an upgrade.

Previously failed calls for HSR construction centred on a lack of both political willingness and affordability. However, the Canadian Government's recent pledge to a [Green Recovery](#), and [historically low borrowing costs](#), creates an opportunity to revisit crucial green infrastructure such as electrified HSR. Progress towards this pledge is slow. Since the beginning of the pandemic, [France and Germany committed US\\$36.7B and US\\$27.1B](#), respectively. In comparison, Canada has promised just [US\\$2.4B for clean initiatives](#).

We investigate the economic viability of constructing and operating HSR in Canada and the affordability of ticket prices for the average Canadian traveller in the Toronto - Montreal Corridor.

Understanding the Value of High-speed Rail in Canada

Large capital projects such as HSR must generate significant value for Canadians to be feasible. According to the most recent feasibility study of HSR between Toronto and Windsor, HSR promises substantial [time savings, environmental benefits, and wider economic benefits](#). Overall, HSR can yield [over CAD\\$20B](#) in implicit and explicit benefits. These benefits include but are not limited to: reduction in journey times by over 50%, the mitigation of 7 million tonnes of CO2 emissions, and "cluster benefits" such as knowledge sharing and labour mobility.

Toronto - Montreal HSR link



Previous studies centred on either the [Toronto - Windsor segment](#) of the Quebec - Windsor Corridor or the [Calgary - Edmonton Corridor](#). This analysis takes another direction, focusing on a high-speed link between Toronto and Montreal with station stops at Kingston and Ottawa Tremblay. This 540km interprovincial route presents a [combined population of over 12.2 million inhabitants](#). We base our cost and revenue projection on a technology assumption of electrified HSR operating primarily on a dedicated right-of-way track with trains capable of reaching a maximum speed of 300kph.

Cost and Revenue Analysis

We build on [previous cost projection studies](#) to extrapolate construction and operating costs for the Toronto - Montreal HSR route. Our analysis concludes that total construction cost will be **CAD\$11.94B** (2021\$). Operating & maintenance costs would account for **CAD\$291.5M annually** (2021\$) starting in the first year of operation. We determine the construction time to last **six years**, with full service beginning in year 7.

Construction Costs

Our projection for construction costs includes both base direct costs and uplifted capital costs to reflect the total gross cost of implementing HSR. The latter presents a **66% contingency** to incorporate unknown expenditures. The contingency level exceeds the [typical range of 10-50%](#) used in previous Ontario transportation projects.

In line with previous studies, GEPL's holistic costing approach includes several cost drivers, including infrastructure and civil works, rolling stock, rail systems, stations, professional fees, and

contingencies. Approximately 40% would be dealing with topography-related issues such as constructing bridges and land acquisition costs. The Toronto - Montreal route includes some tunnelling requirements through the Gatineau Hills but is otherwise geographically unobstructed, making costs comparatively lower than other international HSR routes.

We adjust dated cost projections for the Quebec - Windsor corridor for inflation and apply a discount of 46% to account for reduced distance. These adjustments lower an [initial estimate of CAD\\$21.5B \(2011\\$\)](#) to a construction projection cost of CAD\$11.94B (2021\$). Similarly, we apply a distance and construction complexity discount on the study’s estimated build time of 14 years to an outcome of six years.

Operating & Maintenance costs

In line with the federal government’s Quebec - Windsor study, the operations & maintenance [“O&M”] cost drivers are train operations, customer service, equipment and infrastructure maintenance, and management costs. GEPL adjusts the cost estimate for inflation and applies the distance discount. This results in an annual O&M figure of CAD\$291.5M (2021\$) for the 300kph HSR technology.

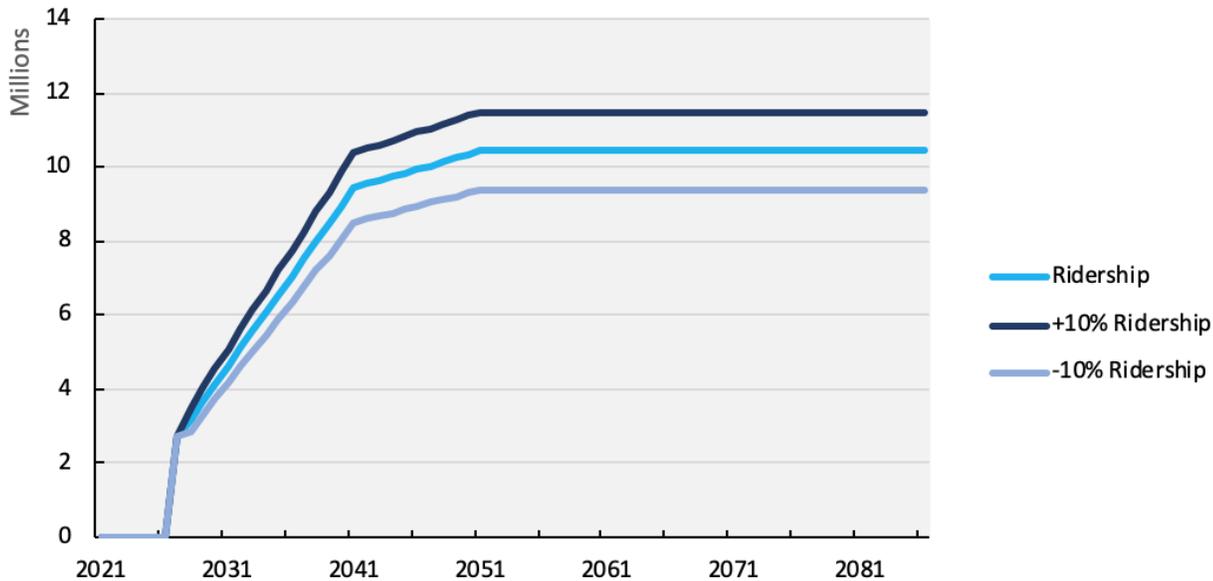
Table 1. Total O&M Costs (millions CAD/year 2009)	
Train Operations	86
Customer Services	134.2
Equipment Maintenance	87
Infrastructure Maintenance	92.4
Management and Other Costs	120.5
Total per Year	520.2

Source : Transport Canada

Ridership Analysis

We predict substantial uptake of HSR service between Toronto and Montreal. In line with [government research](#), we expect HSR to increase annual ridership from existing levels of **2.7 million** to **9.44 million** passengers in year 20 and **10.45 million riders** by year 30. GEPL incorporates both newly induced passengers and the dynamic demand effects, including market capture from other transportation modes.

Figure 1. Projected Ridership



Source: Transport Canada 2011 Feasibility Report, GEPL calculations

GEPL extrapolated these growth forecasts for the Toronto - Montreal route by amalgamating sector-specific [Via Rail Ridership Data](#) with aggregated data from [Quebec - Windsor Corridor Feasibility Study](#). We concluded that this segment generated 57% of corridor ridership on average. Further, GEPL determined that ridership will grow by 350% by year 20 and 387% by year 30. For simplicity, we assume linear growth in ridership. Given that we cannot credibly forecast ridership beyond year 30, we assume constant ridership beyond this point.

Ticket Price Projections

Net Present Value Model

Taking the GEPL cost and revenue analysis, we constructed a net present value model to determine the ticket price necessary for the Toronto - Montreal HSR route to breakeven. We use a 60-year operational horizon for this model in line with similar [MetroLinx projects](#) and the [Government of Ontario's 2014 Feasibility Study](#). Furthermore, we use a 4% discount rate - a composite of the [3.5% rate used by MetroLinx](#) and the [4% and 5% rates used by the Ontario and Quebec Governments](#), respectively.

In constructing the NPV model, we distribute the CAD\$11.94B construction costs evenly across the six-year construction period, represented by cash outflows. Combined with the operational horizon, this gives our model a time horizon of 66 years. 2021 represents year 0.

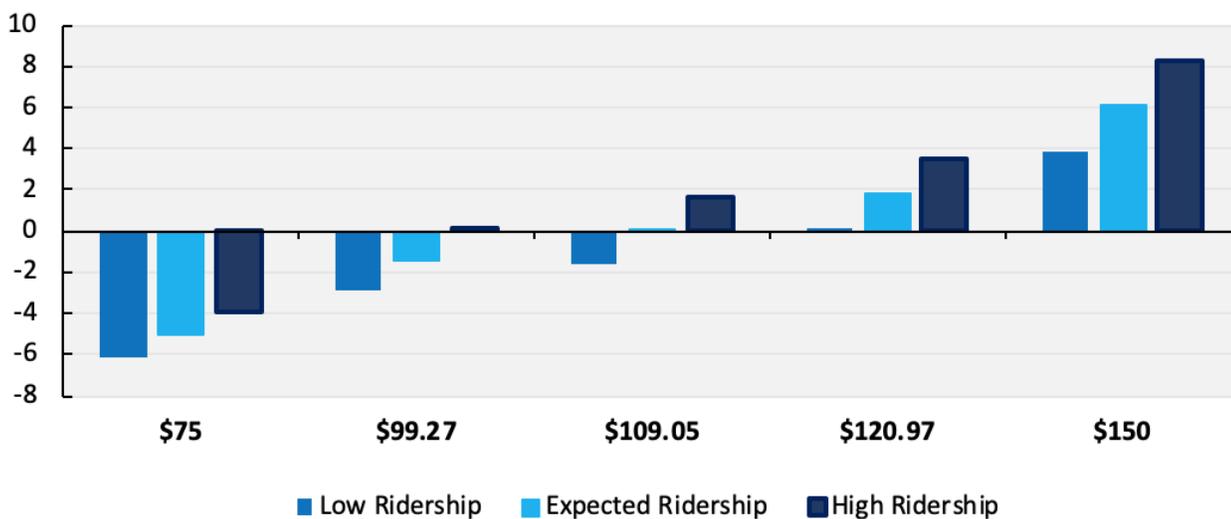
We estimate annual operating cash flows by subtracting operating expenses from ticket revenue, measured as the expected ridership per year multiplied by ticket price.

Results

Based on the NPV model, we conclude that for HSR between Toronto and Montreal to breakeven over a 66-year time horizon, the Government of Canada should price tickets at an average price of **CAD\$109.05**.

For comparison, a ticket price of CAD\$150 would yield profits of CAD\$6.1B over the project horizon. In contrast, if the government wanted to make HSR more accessible, a CAD\$75 average ticket price would necessitate a CAD\$5.08B subsidy over the project life.

Figure 2. NPV (Billions CAD\$) Riderships against Pricing Scenarios



Source: Transport Canada Feasibility Report 2011, GEPL calculations

	Expected Ridership	+10% Ridership	-10% Ridership
Breakeven Price	\$109.05	\$99.26	\$120.97

For completeness, we considered the sensitivity of ticket price projections and NPV to different ridership scenarios. For instance, If ridership is 10% higher than expected over the project horizon, the breakeven ticket price falls to CAD\$99.26. If we maintain HSR ticket price as CAD\$109.06, the NPV rises to CAD\$1.6B.

On the other hand, if ridership is 10% lower than expected, the breakeven ticket price rises to CAD\$120.97. NPV would fall to -CAD\$1.6B under the expected ridership pricing scenario.

Analysis: Is a Toronto – Montreal High-Speed Rail Worth It?

Our NPV analysis shows that HSR between Toronto and Montreal is at the least financially viable, and at best, capable of disrupting the region’s transport infrastructure. Determining the commercial

success of HSR over competitors such as road transport and air transport necessitates further analysis.

Route Viability

GEPL proposed the Toronto - Montreal, via Ottawa and Kingston HSR route based on [research by LEK Consulting](#). The multinational firm forwards common characteristics of profitable global HSR routes. They believe that routes that connect large cities, approximately 200-700 kilometres apart, are most likely to disrupt transport markets. Most importantly, they determine that reducing journey times between 90 minutes and 3.5 hours makes HSR more competitive over road and air travel. Journey time is the most significant determinant of ridership. We believe that the Toronto - Montreal route fulfils these criteria.

The [165-minute route](#) connects three of Canada's most important cities, covering a total population of over 12 million inhabitants across 540km of track. Several of the world's most competitive HSR routes are comparable using these measures. The Madrid - Barcelona [163 minute](#) HSR link covers [650km and connects the 11 million inhabitants](#) of Spain's two most important cultural and financial cities. Annual ridership on this route [exceeds 4 million passengers](#). Similarly, the Milan - Rome HSR route has a journey time of [2 hours 56 minutes](#), covering 475km, and connecting [7.5 million passengers](#). Italy's high-speed rail had a ridership of [9.1 million in 2015](#).

Route Competition

HSR's main competitors in Canada are existing rail options, short-haul intercity flights, and road transport. To assess potential market share, we compare average journey times, ticket prices, and environmental benefits between Toronto and Montreal.

GEPL finds that HSR is more attractive than existing transport options at nearly every point of comparison. HSR offers a timesaving premium over Via Rail (46.4%), air travel (15.4%), and cars (50%). HSR is more competitive than both Via Rail and air travel from a cost perspective but significantly more expensive than road travel. Affordability may explain why cars are the dominant mode of intercity transport in Canada. Finally, air travel is by far the most polluting of all transport modes when comparing environmental benefits.

	Journey Time	Approx. Journey Price	GHG Emissions (KG/seat)
High-speed Rail	2 hours 45 minutes	\$109.05	N/A
Existing Via Rail	5 hours 8 minutes	\$135.00	14.76
Air Travel	3 hours 15 minutes*	\$148.54	83
Car	5 hours 30 minutes	\$45.34**	33.88

*Includes travel time to airports, check-in, and deboarding times.

** At current gas prices

Source: Fare Detective, Wanderu, Travel Math, Via Rail, GEPL calculations

Given [Ontario and Quebec's fuel generation methods](#), a fully electric HSR line on this route would generate zero GHG emissions. Beyond the economic and financial benefits of HSR, environmental considerations alone warrant the modernisation of Canada's transport infrastructure.

Conclusion

Overall, GEPL believes that an HSR link between Toronto and Montreal has all the attributes to be commercially viable and meet expected ridership projections. Most significantly, break-even ticket prices are competitive compared to other transport options and affordable for Canadians. The government can strengthen its commitment to modernising Canada's intercity transport infrastructure by subsidising ticket prices further. HSR is a concrete proposal towards Canada's green recovery, and an essential step towards net-zero.

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