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Canada's Eastern Corridor High-Speed Rail: A Cost Analysis using Global Data



OFFICE OF THE PARLIAMENTARY BUDGET OFFICER
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The Parliamentary Budget Officer supports Parliament by providing economic and financial analysis for the purposes of raising the quality of parliamentary debate and promoting greater budget transparency and accountability.

This report responds to a request from the Standing Senate Committee on National Finance to provide an analysis of the Government's proposed high-speed rail line between Toronto and Quebec City.

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Highlights

PBO estimates place the construction costs for the baseline route for Alto's Eastern Corridor high-speed rail (HSR) project, excluding a potential Kingston amendment, to be between \$75 billion and \$113 billion.

PBO baseline estimates further assume that planning and regulatory approvals for the Alto HSR route follow past European project experience. In contrast, HSR projects in the U.K. and U.S. displayed significantly higher construction costs – likely reflecting difficulties with land acquisition, permitting, litigation, design changes and project-management weaknesses. Recent federal legislation has been adopted to mitigate these risks in Canada. The robustness of these provisions before Canadian courts, as well as their inherent effectiveness in targeting sources of cost escalation, will be a key success factor in mitigating significant project risks of the baseline estimate.

PBO further estimates that construction would provide a modest economic stimulus; for the initial Ottawa–Montréal segment, construction is estimated to increase real GDP annually by about \$1.8 billion in 2029 and \$2.0 billion by 2033, with employment gains rising from approximately 4,300 to 9,000 jobs during the construction period.

Summary

The Government of Canada has proposed to build a high-speed rail (HSR) line along the Toronto-Quebec City corridor. The project has been mandated to Alto, a Crown corporation, in partnership with Cadence, a consortium that was chosen to design, build and operate the line.

The Government estimates that it will cost \$60–\$90 billion (2024 dollars).

Based on analysis of international construction experience and assumed characteristics of the proposed Canadian route, PBO estimates that the baseline route (excluding Kingston) could cost between approximately \$75 billion and \$113 billion to construct. This range reflects the considerable uncertainty inherent in large-scale rail infrastructure projects.

This analysis does not scope in the Government's announcement on June 22, 2026, that it may amend its preferred route to pass through Kingston. Such a route change is expected to increase uncertainty beyond the baseline route due to the counter-balancing effects of easier geography for construction but higher density of regional populations and greater ecological sensitivity, which are discussed in general terms in this report.

Tunnels and elevated structures are major construction cost drivers. International evidence indicates that each additional kilometre of tunnel will add \$169 million to the total cost of this project, with a range of \$142 to \$196 million, while an additional kilometre of elevated structures will add \$153 million to this project, with a range of \$132 to \$175 million.

The Canadian Shield represents an important engineering challenge. Approximately 130 km between Ottawa and Peterborough could encounter Shield terrain. The report assumes extensive rock cutting, grading and filling would be required to accommodate 300 km/h trains – making the cost comparable to, though lower than, that of elevated structures.

Construction to the Island of Montréal is expected to require significant tunnelling. This analysis assumes approximately 15 km of tunnel would be needed to connect Laval and Montréal, while the Montréal–Ottawa and Montréal–Quebec City sections are expected to encounter comparatively less difficult terrain.

Real HSR construction costs have risen internationally over time. Each additional year in this project's start date is associated with construction costs approximately \$1.5 billion more, with a range of \$1.1 to \$2.0 billion, even after accounting for tunnels and elevated structures.

Institutional and project-management risks have been assessed to be more important than engineering risks. After controlling for observable project characteristics, U.K. and U.S. projects have cost roughly 4.5 times as much as European projects, although the estimate is based on only three observations. Factors associated with cost escalation can include land acquisition and permitting problems, litigation, design changes, non-standardised designs and weaknesses in project-management capacity.

Recent federal legislation may reduce these risks for Canada. Bills C-5 and C-15 are intended to streamline approvals, impact assessment and land acquisition. The report concludes that these measures may reduce—but do not eliminate—legal, permitting and schedule risks.

Construction would provide a modest near-term economic stimulus. For the Ottawa–Montréal segment, PBO estimates construction would raise real GDP by approximately \$1.8 billion in 2029, increasing to \$2.0 billion by 2033, while employment gains would rise from about 4,300 to 9,000 jobs. These are annual level effects, not cumulative gains, and exclude potential productivity benefits once HSR becomes operational.

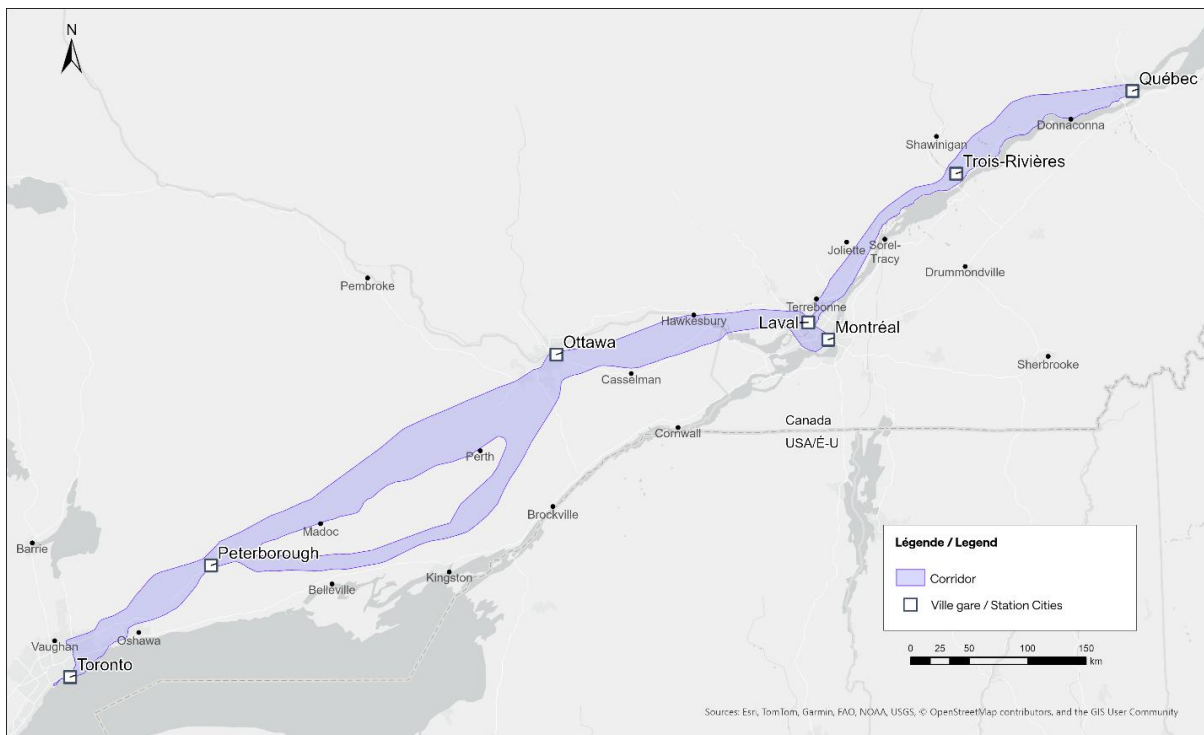
This report is the first of a two-part assessment of the viability of the proposed HSR line; a subsequent report will examine whether projected ridership is sufficient to support the system's operations.¹

Background

The Government of Canada has proposed to build a high-speed rail (HSR) line along the Toronto-Quebec City corridor. The project has been mandated to Alto, a crown corporation, in partnership with Cadence, a consortium that was chosen to design, build and operate the line.

The Government has indicated that the project is expected to cost between \$60 billion and \$90 billion (2024 dollars²). That cost is highly dependent on the specifics of the route since HSR lines have constraints regarding the rate of curvature – both horizontal and vertical – of the tracks that the train can safely and comfortably traverse. Although the details of the proposed route have not been made public, a generalised view from Alto (Figure 1) nonetheless shows that it goes through some difficult terrain. In particular, the Canadian Shield covers a significant part of the area between Ottawa and Peterborough.

Figure 1
Alto proposed HSR route



Source:
Reproduced with permission (September 11, 2026).

Also challenging are the dense urban areas around major cities. For example, as illustrated, the connection between Montreal and Laval will require a new track since there is nothing available that could be utilised by high-speed trains. Public comments suggest that a tunnel of significant length is under consideration.

This report examines the physical construction challenges of the baseline proposed route and attempts to account for the cost of building a HSR over such terrain. It does so primarily by drawing from cost profiles of high-speed rail projects previously undertaken around the world. Specifically, PBO analysed a database that includes physical and cost information from 94 HSR lines that are either completed, or nearing completion. Data on 57 of them are sufficiently detailed to allow closer analysis of specific components relevant to the Alto project, such as tunnels, elevated tracks and the date at which construction began.³

While there has been a wide variation in overall construction cost of past HSR projects, common geographic realities provide strong indicators of final cost.

Those results make it possible to develop an indicative estimate of Alto's baseline route construction cost based on inferred characteristics of the proposed route.

This analysis does not scope in the Government's announcement on June 22, 2026, that it had directed Alto to develop a plan to assess a Southern route option between Peterborough and Ottawa that includes a potential stop in Kingston (illustrated in Figure 1; Box 1; herein referred to as the Kingston amendment or route). The government has not yet released a revised construction cost estimate for this route. Such a route change would increase uncertainty regarding the final cost beyond the baseline route costing per our findings below. Below we also provide a descriptive summary of potential cost challenges of amending the baseline route to include Kingston.

This report also discusses key uncertainties and risks that could affect both the Government's estimated cost and the estimates presented herein.

While many, if not most, HSR systems around the world do not achieve operational profitability, a few that do are very profitable.⁴ The motivation for HSR projects typically includes the economic benefits to business and pleasure travellers of shorter, more predictable, and ideally cost-effective, travel as compared to travelling by road or air – as well as the environmental benefit of reducing fuel consumption and infrastructure depreciation accordingly. PBO is currently compiling information about regional travel volumes across these different modes of transport as the basis for this subsequent study.

Project costs

Previous cost estimates for an HSR line in the Toronto-Quebec City corridor have varied widely, ranging from \$14 billion to \$80 billion, as shown in Table 1. The breadth of this range reflects substantial differences in the scope and design of the projects being assessed. Factors have included the geographic obstacles within the line, the distance and population density of the route, operating and design speeds, the use of existing infrastructure, and the amount of tunnelling, bridging and elevated construction required. The estimates have also reflected different completion dates, making comparisons sensitive to assumptions about cost of materials and duration of the project.

For example, the GEPL estimate applied only to the Toronto–Montréal segment, while other estimates cover a larger portion of the Toronto–Quebec City corridor. EcoTrain assumed that high-speed trains would share some existing tracks with commuter services, thereby limiting the amount of new infrastructure required. By contrast, Cadence contemplated a new tunnel between Laval and Montréal, contributing to a difference of more than a factor of two between the two estimates.

Consequently, the estimates shown in Table 1 should not be interpreted as alternative cost assessments of an identical project. Rather, they illustrate how route selection and design choices can materially affect total capital costs. The international analysis that follows better addresses this comparability issue by expressing project costs on a common per-kilometre basis and examining several observable cost drivers.

Table 1
Estimated HSR capital costs from recent studies

Report	Cost (\$ billion)*	Publication date	Operation date
QOHSRPS (Windsor-Quebec)	21	1995	2031
EcoTrain (Windsor-Quebec)	37	2011	2031
GEPL (Toronto-Montréal)	14	2021	2050
Cadence	60-90	2025	2050
Schabas	61	2026	2050
Zhang	80	2026	2035

Source:

GEPL (2021), [Munk School of Global Affairs & Public Policy. University of Toronto](#); EcoTrain (2011), *Updated Feasibility Study of a High Speed Rail Service in the Quebec City – Windsor Corridor: Final Report*, Ministère des Transports du Québec, Ministry of Transportation of Ontario, Transport Canada; QOHSRPS (1995), *Quebec-Ontario High Speed Rail Project Preliminary Routing Assessment and Costing Study: Final Report*, Government of Canada, Province of Quebec, Province of Ontario; Schabas, M. (2026), "Alto High-Speed Rail: Conceptual Design and Business Case", Submission to the Senate Standing Committee on Transport and Communications, Ottawa; Zhang, B., Negm, H., & El-Geneidy, A. (2025). High-Speed Rail in Canada: Insights from a corridor-wide survey and a financial analysis. Transportation Research at McGill, McGill University, Canada; [Government of Canada, Minister's appearance at the Committee of the Whole \(CoW\) House of Commons, June 05, 2025](#).

Note:

*CAD 2024

International Cost Comparison

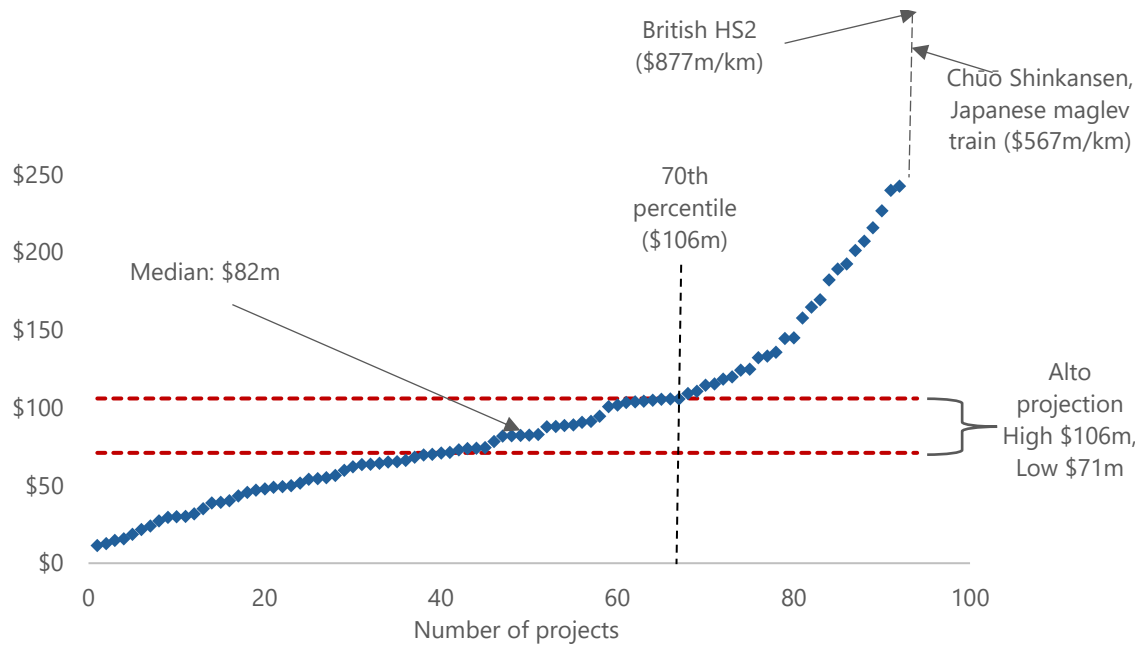
Comparing construction costs across international HSR projects requires a standardised measure. A commonly used metric is construction cost per kilometre of track.

Although the proposed HSR line has often been described publicly as a 1,000-kilometre route, its actual length may be shorter. The driving distance from Toronto to Quebec City via Montréal and Ottawa is less than 850 kilometres. Moreover, the analysis focuses on new HSR-capable track, whose alignment would generally be more direct than the existing road network because high-speed trains require fewer and broader curves. We therefore use 850 kilometres as an upper-bound assumption for the length of new track. On this basis, the Government's estimated total cost of \$60 billion to \$90 billion is equivalent to approximately \$71 million to \$106 million per kilometre, expressed in 2024 dollars.

This can then be compared to actual (ex-post) costs observed for 94 comparable systems (dedicated HSR lines) in other jurisdictions, as shown in Figure 2.⁵ The source of those data is the Transit Cost Project under New York University Marron Institute of Urban Management.⁶ That group built the database in an effort specifically to understand factors that contribute to varying project delivery costs across countries.

Construction costs vary considerably across projects in the international sample. Alto's estimated total falls near the middle of the international sample (Figure 2).⁷

Figure 2
Global costs of HSR track per kilometre (2024\$ millions, CAD)



Textual description:
The Alto upper cost of \$90 billion (\$106 million per km) would place construction at the 70th percentile of global experiences. The lower cost of \$60 billion would be at the 42nd percentile. This assumes that Canada’s project will have that percentile’s proportion of tunnels, bridges, and other factors that influence cost.

Source:
Transit Cost Project (NYU Marron Institute of Urban Management).

Note:
In 2024 Canadian dollars, converted from inflation-adjusted 2023 PPP in other countries.

Notably, the cost distribution exhibits a pronounced skew toward the upper end, with costs rising to \$187 million per kilometre at the 90th percentile (Table 2).

Table 2
Cost deciles for HSR projects (\$million per kilometre, CAD 2024)

Decile	10%	20%	30%	40%	Median	60%	70%	80%	90%	100%
Cost	\$30	\$47	\$59	\$70	\$82	\$91	\$106	\$128	\$187	\$877

Source:
Transit Cost Project.

Of the 94 HSR lines included in this initial survey, 57 projects had sufficiently detailed and consistent documentation to analyze the relationship between project

characteristics and construction costs. The characteristics examined included design features (the presence of tunnels or elevated structures), the year in which construction began, and geographical region (Table 3). Collectively, these factors accounted for just under 70 per cent of the variation in construction costs per kilometre. Details on results and methodology are presented in the Appendix.

Table 3
Summary characteristics of HSR database

	Cost per km (million*)	Distance (km)	Tunnels (% of route)	Elevated Structures (% of route)	Start Date
Mean	\$109	242	16.2%	25.7%	2002**
High	\$877	1,318	94%	87%	2024
Low	\$12	57	0%	0%	1976
Europe	\$72	209	12.8%	6.8%	1999**

Source:

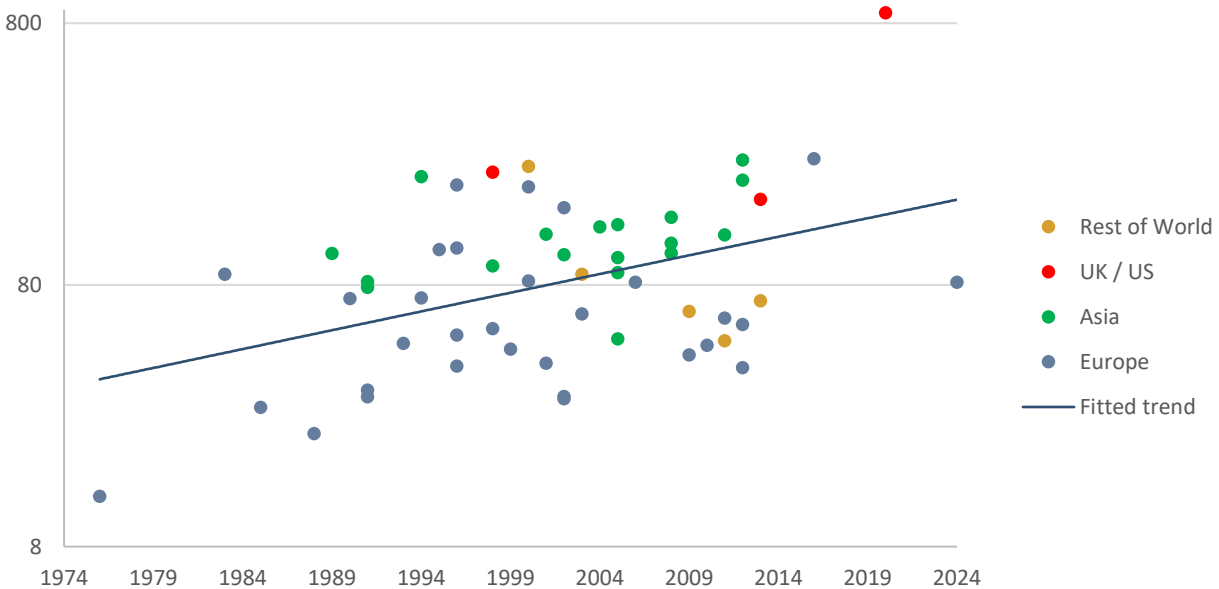
Transit Cost Project database.

Note:

*CAD 2024; **Median; 57 projects

The presence of tunnels or elevated structures was associated with substantially higher average construction costs per kilometre relative to at-grade construction. A 1 percentage-point increase in the share of tunnels was associated with costs that were 1.6 per cent to 2.2 per cent higher. For elevated structures, costs were 1.6 per cent to 2.0 per cent higher.⁸

More recent construction start dates were associated with significantly higher inflation-adjusted costs per kilometre (Appendix and Figure 3). Each additional year was associated with an estimated cost increase of 1.5 per cent to 2.7 per cent. This relationship persists after controlling for the presence of tunnels and elevated structures: the estimate in the Appendix accounts for tunnels and elevated structures, while the trend line in Figure 3 does not. The bottom line is that real construction costs have increased over time independently of these measures of project complexity.

Figure 3**Real construction costs per kilometre by construction start year**

Textual description:

The chart illustrates how construction cost has been increasing with project start date. A few observations stand out. Rest of World appears to have a downward trend, while other regions including Asia have been on an upward trend. The UK/US is always above the mean of other regions. The clustering of Asia observations above the mean imply that the region has had higher costs than Europe. This likely reflects China's heavy use of viaducts, and Japan's heavy use of tunnels.

Source:

Transit Cost Project (NYU Marron Institute of Urban Management).

Note:

Costs are measured at 2023 purchasing power parity and converted to 2024 CAD. They are represented on a logarithmic scale.

Train speed and the annual rate of construction (in kilometres per year) were not found to have a significant association with costs.⁹

However, costs were significantly higher for projects in the United States and the United Kingdom relative to those in other regions, mainly due to the very high costs reported for two observations: California's Initial Operating Segment between Merced and Bakersfield, which has suffered from problems in acquiring land rights and permits along the proposed route, and the High Speed 2 line between London and Birmingham in the United Kingdom, which has been affected by project design and project management shortcomings. After controlling for the other characteristics in the model, estimated costs in the U.K. and U.S. were roughly 4.5 times those in Europe. That said,

the range is wide, from about 3 to 7.3 times, reflecting how few U.K./U.S. observations are available to estimate this precisely.

Beyond these specific cases, some research has pointed to a more generalised set of factors contributing to higher construction costs in the U.K. and U.S., including project delivery issues related to procedural hurdles in land and permitting, litigation exposure, non-standardised designs, and limited technical capacity within owner agencies.¹⁰

Given the institutional similarities between the U.K., U.S. and Canada, an HSR project in Canada may be at risk of similar cost escalation pressures. Construction costs for certain infrastructure projects in Canada have been observed to rise at a faster rate than in comparator countries.¹¹

Both the fast-tracking of large projects through Bill C-5 (One Canadian Economy Act, June 26, 2025) and the High-Speed Rail Network Act, enacted through Bill C-15 on March 26, 2026, aim to mitigate some of these potential difficulties related to project delay. The legislation declared that the network is to work for the general advantage of Canada, deemed the required line-location approval as given, and consolidated review under a single Impact Assessment Act process. It also altered land acquisition, including a right of first refusal for Alto and amended the federal Expropriation Act.

While the passage of those bills can be expected to have diminished legal risks, the prospect of court challenges or other litigation remain risks to construction timelines. Moreover, even if the bills survive legal challenges, it cannot be assumed that they have correctly addressed the potential drivers of cost escalation.

While this report does not estimate the cost of a Kingston route as announced on June 22, 2026, it should be noted that the more sensitive nature of the Kingston ecology as well as its denser population and later planning start vs the baseline route are all significant risks that may place the Eastern HSR project at greater risk of U.K. and U.S. style cost escalation (Box 1).

Box 1 – Kingston route consideration

If the rail line is roughly equally direct within each corridor (Ottawa-Peterborough and Ottawa-Kingston-Peterborough), it could add approximately 50 km to the route. The Kingston route is more level and avoids more of the Canadian Shield.

The change may have important implications beyond adding distance. The Frontenac Arch Biosphere – one of Canada's UNESCO-designated Biosphere Regions – is south of the baseline route but could be traversed by a Kingston route. This would require greater mitigations (remedial actions such as wild-life corridors, environmental restoration, etc.) to avoid further degrading an area already described as stressed (Hyett, 2026)¹². Other areas close to the St Lawrence River along the potential Kingston route are also considered ecologically vulnerable.

Moreover, a change to include Kingston would route the line through more settled areas necessitating considerably more right-of-way and land acquisitions. It is also likely to pass through indigenous lands and traditional territories – requiring greater consultation and consideration.

Legal challenges related to environmental and stakeholder opposition were observed to cause significant planning and project delays in the Californian project, that made it notably higher cost than other global HSR projects. Regarding ridership, while the roughly 180,000 people in the Kingston Census Metropolitan Area would draw additional traffic onto the line, the increased travel time between major cities vs the baseline plan would likely offset potential ridership gains of a Kingston stop.

Cost estimate

The results of the preceding international analysis can be used to derive an indicative cost range for the proposed HSR line in Canada.

From the estimated results, PBO calculates a base cost for Canada's HSR of \$88 million to \$133 million per kilometre of track (\$75 to \$113 billion in total, \$2024). PBO also calculates that each additional 1 km of tunnelling would increase the estimated cost by \$169 million (\$142 to 196 million), while each additional 1 km of elevated structures adds \$153 million (\$132 to \$175 million).

In order to assess construction parameters of the baseline route, PBO issued a number of information requests to relevant government entities. PBO supplemented these requests with modest assumptions on project parameters as necessary for estimation, such as the length of new tunnels and elevated track, as well as the expected start date of construction.

Since elements of this planning information have not been made public, and remain subject to revision¹³, PBO also took steps to ensure that confidential information respecting route planning could not be surmised from the results of our analysis. As such, we describe general characteristics that we used to estimate the baseline route costs in Figure 1.

Between Montreal and Quebec, the path follows the St Lawrence lowlands and PBO assumed it to have little requirement for viaducts – though bridges will be needed in a number of places. In contrast, we assess that the connection between Laval and Montreal would require tunneling through roughly 15 kilometers under Mount Royal.

The Montréal–Ottawa segment is expected to be relatively straightforward because it would largely traverse the lowlands surrounding the Ottawa River. Except for the potential tunnel in Montréal, its terrain is broadly comparable to that encountered by European rail lines crossing relatively flat countryside.

The Ottawa–Toronto segment would likely be more challenging. Between Ottawa and Peterborough, excluding the proposed diversion toward Kingston shown in Figure 1, the route would cross a substantial portion of the Canadian Shield. Accommodating trains operating at 300 km/h would likely require significant rock excavation and grading to meet high-speed rail alignment requirements.

The model described in the Appendix does not explicitly include rocky terrain or frequent bedrock outcrops as project characteristics. Some of their effects may be reflected in the base cost per kilometre and the regional variables, which capture differences in construction conditions not explained by tunnels and elevated structures. However, given the length and potential complexity of this segment, its terrain can be gauged by reference to Highway 7. The portion of Highway 7 between Perth and

Marmora crosses approximately 130 kilometres of the Canadian Shield and is used here as indicative of the length of the proposed route that could encounter similar conditions.

Constructing the line through this terrain is assumed to involve cutting through bedrock outcrops and filling in small and medium-sized depressions rather than building elevated structures along the entire segment. To reflect these costs in the model, 1.3 kilometres of construction through the Canadian Shield is treated as equivalent to one kilometre of elevated structure. On this basis, the estimated 130 kilometres of Canadian Shield terrain is represented by 100 kilometres of elevated structures.

Using model parameters of 15 kilometres of tunnel, 100 kilometres of elevated structures, a start date of 2029, and assuming cost efficiency comparable to that typically observed in Europe¹⁴, PBO estimates a range of \$88 to \$133 million per kilometre. This is in the upper part of the international distribution, approximately between the 53rd and 76th percentiles (Figure 2).

The baseline factors described above do not consider: (a) prediction uncertainty of the model; and, (b) uncertainty in the estimated parameters. For (a), we use a confidence interval that is expected to capture the correct value 5 out of 6 times. But since this is a new build for Canada, we judge that the risk is more likely that the project will go over budget rather than under. As such, the upper end of the range from \$88 million is \$133 million per km (\$113 billion in total from a central estimate of \$75 billion). For (b), reflecting PBO's view that it is more likely that non-engineering issues will lead to budget overrun, we report a symmetric confidence interval around the estimated costs of \$169 million per km of tunnel (\$142 to \$196 million), \$153 million per km of elevated structure (\$132 to \$175 million), \$1.5 billion per year (\$1.1 to \$2.0 billion) for each later start year.

Indeed, in scenarios where Bills C-5 and C-15 are not sufficient to contain costs related to process issues (e.g., environmental or stakeholder challenges, etc.) as was observed in the United States, and/or management-related delays extended the project, as was observed in the United Kingdom, costs could rise significantly beyond the PBO-estimated range. The difference between this adverse scenario and the reference scenario primarily reflects institutional and cultural factors, more so than geographic and technical factors, as the cost overruns observed in the U.K. and U.S. are seen to be largely unrelated to engineering challenges.

Economic impacts

In addition to its direct costs, construction of the proposed HSR line is expected to have an economic impact during the project phase. To estimate this impact, PBO applied its infrastructure investment multiplier framework using the methodology developed in its latest report on investment multipliers.¹⁵ This analysis focuses exclusively on the Ottawa-Montréal segment of the line as it is the only segment scheduled for construction within PBO's medium-term assessment horizon, namely from 2029 to 2033.

The HSR project would increase aggregate demand in the economy during construction but would not add capacity until construction is completed and the line is in service. PBO's multipliers estimate that when the economy's productive capacity is held fixed for the duration of construction, each dollar of construction spending is estimated to raise real gross domestic product (GDP) by approximately 80 cents in the first year of construction, rising to 90 cents by the fifth year (assuming that the economy is not at full employment when construction commences).

Applying these multipliers to an assumed constant annual spending profile, PBO estimates (Table 4) that construction of the Ottawa-Montréal segment of the line would:

- Increase the level of real GDP by approximately \$1.8 billion (0.07 per cent) in the first year of construction (2029), rising to \$2.0 billion by the fifth year.
- Increase employment by approximately 4,300 persons in the first year and 9,000 persons by the fifth year.

These estimates represent impacts on the level of GDP and employment relative to PBO's June 2026 Economic and Fiscal Outlook baseline. The impacts are not cumulative (i.e., should not be added over the five years).

In addition, they do not account for how the construction spending is financed (through higher taxes, reduced spending elsewhere, or higher deficits) or potential spillover effects not captured in PBO's multiplier framework. They also do not reflect potential productivity gains or other impacts that may arise only once the line is operational.

These estimates should be seen as high level and directional, based on past infrastructure flow throughs and subject to uncertainty from several factors. For example, if the Canadian economy is operating close to its capacity, the HSR project could displace other construction activity rather than generating new activity, reducing

the net impact. A different spending profile could also shift the timing and size of the estimated impact.

Table 4

Estimated economic impact (construction of the Ottawa to Montréal segment, 2029 to 2033)

Indicators	Year 1 (2029)	Year 2 (2030)	Year 3 (2031)	Year 4 (2032)	Year 5 (2033)
Nominal construction spending (\$ billions)	3.3	3.4	3.5	3.5	3.6
Real construction spending (chained 2017 \$ billions)	2.3	2.3	2.3	2.3	2.3
Real GDP impact (chained 2017 \$ billions)	1.8	1.9	1.9	2.0	2.0
Employment impact (persons)	4,300	7,100	7,900	8,600	9,000

Source:

Parliamentary Budget Office.

Note:

* Values represent level impacts in each year relative to PBO's June 2026 Economic and Fiscal Outlook baseline. The project cost estimate, 20.9 billion, is stated in 2024 dollars; real spending and real GDP impacts are expressed in chained 2017 dollars, the base year of PBO's macroeconomic model. Construction continues beyond PBO's five-year horizon; the years shown represent the first five years of a seven-year construction period.

Appendix

To assess the impact of several potential cost drivers across an international sample of HSR projects (n=57), we estimated the following regression model:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 \overline{tunnels} + \hat{\beta}_2 \overline{bridges} + (\hat{\beta}_3, \hat{\beta}_4, \text{ or } \hat{\beta}_5) + \hat{\beta}_6 \overline{start\ date} + \hat{\varepsilon}$$

The dependent variable $\hat{y}$ represents the estimated cost per kilometre (in logarithms), $\overline{tunnels}$ and $\overline{bridges}$ represent the proportion of each rail line consisting of a tunnel or elevated structure, respectively, and $\overline{start\ date}$ represents the year in which construction began, relative to 2023. The model also included indicator variables to control for differences across geographical regions (Asia, United States/United Kingdom, and the rest of the world, with Europe as the reference region). $\hat{\varepsilon}$ represents variation in cost not explained by the variables included in the model.

Equation coefficients $\hat{\beta}$ were estimated as follows:

Table A1

Estimated effects of project characteristics on construction costs

	<i>Intercept</i> β_0	<i>Tunnel</i> β_1	<i>Elevation</i> β_2	<i>Asia</i> β_3	<i>RoW</i> β_4	<i>UKUS</i> β_5	<i>Start date</i> β_6
Coefficient	3.78**	1.92**	1.74**	-0.51*	0.13	1.51**	0.02**
Standard error	0.18	0.28	0.34	0.21	0.21	0.26	0.01
Country-clustered SE	0.15	0.31	0.25	0.25	0.13	0.29	0.01
t-statistic	21.34	6.84	5.16	-2.42	0.64	5.84	3.29
p-value	0.000	0.000	0.000	0.019	0.524	0.000	0.002

Textual description:

Dependent variable is the log of cost per km. Tunnel and Elevation represent the percentage of track in the category. Regions are represented by dummy variables. Start date represents the additional cost for each year from 2023.

Source:

Parliamentary Budget Office.

Notes:

Costs measured in real 2024 CAD dollars.

* denotes p-value less than 0.05, and ** less than 0.001.

R² is 0.72 (0.69 adjusted).

F-statistic significance is 2.1E-12.

To estimate the cost of the proposed HSR line in Canada, PBO selected values for *tunnels*, *bridges* and *start date* based on assumptions outlined earlier in the report: i.e., $\overline{tunnels} = 15/850$, $\overline{bridges} = 100/850$. The *start date* is set to 2029-2023 as per the current schedule for the Montreal to Ottawa segment.

To generate a reference estimate, regional indicators were set equal to zero so that the result reflected the level of cost efficiency typically observed for projects in Europe, controlling for project complexity and start date.

In the adverse scenario, the indicator variable for the United Kingdom/ United States region was set equal to 1 to incorporate the estimated cost premium in those jurisdictions.

Uncertainty in the estimation can be gauged by bootstrap replication.

Using a bootstrap methodology, an upper-bound cost with 16 per cent tail probability would give a total cost \$115 billion (versus \$113 billion using the parameters of Table A1). Moving to an upper-bound cost with 2.5 per cent tail probability gives \$243 billion. This implies that based on these international experiences, there is a 1 in 40 chance that costs would reach or surpass a total of \$243 billion. The residual distribution of that bootstrap is skewed to right. This underpins PBO's use of an asymmetric distribution of costs – including the observation that this project is a first for Canada, so more of the risk would be on the higher side.

The inclusion of a start date in the estimation also merits additional comment. For each later year that the project starts construction \$1.5 billion (\$1.1 to \$2.0 billion, in real 2024 CAD) is added to the overall cost. While productivity improvements tend to lower the cost of goods and services, some sectors of the economy (in most countries) do not benefit as much. Illustrative is the Highway, Street and Bridge Construction¹⁶ in the U.S. Productivity has been trending downward since 2009, and by 2024 was 25 per cent lower than in 2002.¹⁷ The construction industry in general has not been able to achieve productivity growth similar to that in the rest of the economy. This signals that the start

date of construction can be a factor in how much the project will reflect these competing pressures.¹⁸

Notes

¹ According to public documents and statements from Alto, the line has a projected ridership of between 17 and 24 million people annually by 2055.

² For this report it is assumed that the initial budget is in real 2024 dollars, as per the [Transport Minister's report to the Committee of the Whole \(CoW\) House of Commons](#), June 05, 2025. Given increases in the Fixed Capital Formation deflator over 2010 to 2025, if they continue into the future and the project spends real 2024 dollars evenly between 2029 and 2045, then the nominal project outlays of \$60 to \$90 billion will increase to between \$93 and \$124 billion purely due to inflation. On the other hand, since government revenues grow with nominal GDP, the share of government expenditures taken up by the project would fall over time – potentially by a third if real GDP growth averaged 1.5 per cent.

³ Downloaded from [Transit Costs Project / High Speed Rail](#) on August 25, 2026. We use their definition of an elevated track, which is most simply defined as above-grade, but not resting on an embankment. So, it explicitly includes viaducts, bridges, and reinforced built-up support structures.

⁴ Profitable lines include Paris-Lyon, Tokyo-Osaka, Beijing-Shanghai. In each case, high-speed train departures are under 5 minutes apart during busy periods.

⁵ Several projects included in this comparison, including High Speed 2 in the United Kingdom and the Initial Operating Segment in California, are not yet complete, and as such their final costs may exceed the reported figures.

⁶ [Transit Cost Project under New York University Marron Institute of Urban Management](#).

⁷ The lower and upper bounds correspond approximately to the 42nd and 70th percentiles, respectively.

⁸ The range is given by 1 standard deviation in a country-clustered standard error estimation. It encompasses a 68 per cent confidence interval – meaning a 1 in 6 chance that the cost could be higher than the upper bound given in the report. A 2 standard

error range for tunnels is 1.3 per cent to 2.5 per cent, for elevated structures is 1.3 per cent to 2.2 per cent, and for the start date is 0.8 per cent to 3.3 per cent.

⁹ While there is some variability in the speed of the HSR lines, there is likely to be an interaction between the speed and the amount of tunnelling or elevation that is necessary. Moreover, the greater speeds are being achieved with new technologies, so the start-date of construction might be picking up what would otherwise be a speed effect. We considered the new Japanese Maglev train (Chuo Shinkansen) to be in a different category at 505 km/h, so it was left out of the empirical analysis for this report.

¹⁰ Goldwyn, E., Levy, A., Chitti, M., and E. Ensari (2024), "How to improve domestic high-speed rail project delivery: High Speed Rail Final Report." Transit Costs Project.

Goldwyn, E., Levy, A., Chitti, M., and E. Ensari (2023), "Transit Costs Project: Understanding Transit Infrastructure Costs in American Cities." Transit Costs Project.

¹¹ Mok, J., Crane, B., Chitti, M., and A. Shalaby (2025), "Understanding the drivers of transit construction costs in Canada: A comparative study." University of Toronto School of Cities.

¹² Hyett, A. (2026), "[Alto High-Speed Rail Project: Northern and Southern Route Options, Potential Impacts of the Salmon River Watershed](#)", Friends of the Salmon River, February.

¹³ On June 22, 2026, [the government signaled](#) a potentially important new objective of the line that would alter its existing trajectory.

¹⁴ For the base case, this is consistent with an assumption that Bills C-5 and C-15 have moved Canada closer to the European model of HSR construction – both in terms of engineering capacity and administrative burden.

¹⁵ PBO (2026), "Investment Multipliers", Ottawa, September.

¹⁶ BLS (2025), [Labor productivity and costs measures for selected construction industries, database](#) accessed Aug 25, 2026.

¹⁷ Since productivity is measured on the basis of the value of output or value-added, it can trend downward if labor income or the value of capital inputs are trending upwards more rapidly than the value of outputs. Since highways, roads and bridges are not

valued using market prices, their construction value for the national accounts is imputed rather than measured.

¹⁸ For building new highways this has been documented in the U.S.; e.g., Brooks, L., and Z. Liscow (2023), "Infrastructure Costs." *American Economic Journal: Applied Economics*, vol. 15, no. 2, pp. 1–30.

