



MOVING CANADA'S ECONOMIC INFRASTRUCTURE FORWARD:

ADDRESSING SIX RISKS TO TIMELY, ECONOMICAL, AND PRUDENT PROJECT SELECTION AND DELIVERY

Discussion Paper

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ABOUT THE LAWRENCE CENTRE

The Lawrence National Centre for Policy and Management is an independent public policy centre that focuses on bridging the gap between business strategy and government policy.

The Centre was established thanks to a generous gift from the late Jack Lawrence, a Canadian businessman who believed that “if we could achieve better cooperation between government and business, we would see a quantum leap in economic performance and productivity.” Since its establishment in 2002, the Lawrence Centre has contributed significantly to policy dialogue and development across several policy areas—including advanced manufacturing, trade, environment, competition, taxation, and fiscal issues—by hosting various forums, preparing papers and reports, and leading educational programs.

Presently, the Centre’s research is focused on infrastructure issues, as this represents one of the most important policy areas for business leaders and government policymakers seeking to enhance Canada’s economic competitiveness. Infrastructure is also a key enabler to economic growth and prosperity and the quality of life enjoyed by Canadians.

FOREWORD AND ACKNOWLEDGEMENTS

Policy think tanks, institutes, and other research organizations play an important role in the public policy development process by conducting research and analysis, identifying options, and offering advice. In today’s rapidly changing world, the challenges faced by governments and businesses are enormously complex, with far-reaching implications, and are often referred to as “wicked problems.” Building on its strong foundation, the Lawrence Centre remains committed to conducting independent, high-quality research and analysis with a view to assisting business and government leaders in making evidence-based decisions.

The Centre is focusing on infrastructure due to the growing importance of this policy area, the complexity of infrastructure-related issues, and the wide range of stakeholders involved and impacted. This discussion paper aims to inform a broad audience about the state of economic infrastructure in Canada, including pertinent opportunities, challenges, and risks.

This paper has been developed by staff at the Centre and has benefited immensely from the valuable feedback and comments provided by practitioners and experts in industry, government, and academia. Further, the authors wish to acknowledge the important contributions made by the members of the Lawrence Centre Advisory Council. Any errors or omissions are solely the responsibility of the authors.

TECHNICAL NOTES

All currency figures in the paper are in CAD unless otherwise noted. Additionally, while the paper’s primary focus is economic infrastructure, the authors recognize the importance of social infrastructure and the substantial level of public investment made in this area.

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EXECUTIVE SUMMARY

Building and renewing Canada's public and private economic infrastructure has gained widespread support and significant fiscal and financial commitments, but the pace of actual investment and delivery continues to lag. Furthermore, the process for selecting, procuring, and building strategic transformational infrastructure seems to be plagued by delays, questionable decisions, and cost overruns. In the context of today's infrastructure challenges and economic realities, it is imperative that government and business leaders support the right projects, at the right time, for the right price, with the right partners, and paid for by the right users.

Taking a risk-based approach and relying on carefully reasoned analysis, the Lawrence Centre has identified six categories of risk that must be addressed in order to meet the infrastructure requirements of Canada's 21st-century economy. These six types of risks are just as important as any project-specific risks inherent in complex infrastructure initiatives, and as such, require decision-makers' attention:

- **Political and regulatory risk** relates to the political and regulatory processes that can potentially increase the project cost and unpredictability of infrastructure projects, causing concern for investors, construction firms, and others in the infrastructure supply chain. Stability in government decision-making and leadership, combined with a predictable regulatory framework, is of paramount importance in mitigating this risk.
- **Governance risk** arises from the multiple public and private sector players involved in complex infrastructure projects. Competing priorities among levels of government and the lack of transparency about project-selection criteria among the various funding programs results in suboptimal project decisions. In the case of the private sector, failure to deliver on commitments presents enormous challenges.
- **Funding and financing risk** relates to the source of funds during procurement and the optimal use of financial instruments. Governments need a more balanced approach to funding infrastructure from the tax base and through user-pay mechanisms. There are numerous approaches to financing, including public-private partnership (P3) models, which can transfer or share the risks related to cost escalation, delay, and revenue generation.
- **Industry capacity risk** encompasses the timely availability of critical inputs such as construction firms, engineering and design firms, equipment and materials supply chains, project management capacity, and general labour supply. Depending on the scope and scale of projects, the demand for highly skilled labour may vary considerably.
- **Innovation and technology risk** refers to risks associated with the adoption of new technologies and methods. These risks include leveraging emerging technologies, improving asset management practices, and incorporating innovative design and adaptability into new and existing infrastructure assets.
- **Environmental sustainability and climate change risk** relates to the need for broader consideration of the impact of climate change on infrastructure assets and how to incorporate environmental sustainability through a design and building process that is "climate smart." Achieving long-term resiliency of infrastructure in the face of climate change will become increasingly important.

Against this background, the Lawrence Centre hopes to engage a range of stakeholders to find ways to advance Canada's economic infrastructure agenda. We hope this paper will stimulate discussion and generate innovative and practical ideas and advice on overcoming the six major risks to building the infrastructure that Canada's economy and communities will need going forward.

INTRODUCTION

Canada's vast geography and trade-dependent economy requires robust public and private infrastructure. Indeed, the state of Canada's infrastructure is critical to the country's economic competitiveness as it impacts productivity, investment attraction, growth, and quality of life. In its 2016 report, the Prime Minister's Advisory Council on Economic Growth highlighted that investment in infrastructure has become both an imperative investment need and an opportunity to create the short- and long-term productivity stimulus that Canada will need in the coming decade.¹

Given the importance of infrastructure to economic competitiveness, how well is Canada performing? How does Canada compare to other leading nations? What roles are governments and the private sector playing in supporting economic infrastructure investment? How do technological innovation, climate change, and demographic changes affect infrastructure? What are the future opportunities, challenges, and risks involved in infrastructure? All of these questions beg a broader strategic question: *Is Canada's current approach to economic infrastructure development and investment on the right track?*

The unprecedented infrastructure commitments made by governments in recent years, the establishment of new infrastructure mandated institutions, and the increasing acceptance of P3 models demonstrate Canada's growing commitment to infrastructure development. However, other developments—including the recent difficulties with the Trans Mountain Pipeline project, the abrupt cancellation of the review of airports and seaports, and policy changes by new governments—demonstrate some of the unaddressed risks in Canadian infrastructure investment and development. The magnitude of these challenges is significant and cannot be addressed by government alone. The private sector has a vital role to play in all aspects of infrastructure development, from strategy and project initiation, through financing and innovation, to effective project delivery.

The increased profile of the infrastructure gap and the need to stimulate the economy following the 2008 financial crisis have prompted governments to make record infrastructure spending commitments. However, it is generally acknowledged that not all infrastructure investment results in long-term economic benefits. In fact, some deficit-financed investment only produces short-term economic impact and potentially “crowds out” private investment.² As economic and fiscal environments change, there will be increasing pressure on governments to shift to a more evidence-based approach to identifying economically viable infrastructure investments.

Despite consensus on the need for action on infrastructure investment, the results have been disappointing so far. Why? Our analysis suggests that the role of risk has not been appropriately examined. The primary purpose of this paper is to examine the risks associated with the development of critical public and private infrastructure projects in Canada. Although risks are inherent in complex infrastructure projects, our analysis reveals that more attention will need to be paid to various risks to ensure that Canada's ambitious infrastructure priorities are achieved. Notably, this paper does not focus on project-related risks (e.g., operational risk) as these are generally well documented and explored. Rather, this paper is exclusively concerned with what might be considered the “macro” risks to infrastructure investment—namely, those influenced by broader political, economic and financial, environmental, and technological factors.

1 Advisory Council on Economic Growth, “Unleashing Productivity Through Infrastructure,” 2016, 2, <https://www.budget.gc.ca/aceg-ccce/pdf/infrastructure-eng.pdf>.

2 Jeffrey M Stupak, “Economic Impact of Infrastructure Investment” (Congressional Research Service, 2017), <http://www.ourenergypolicy.org/wp-content/uploads/2017/07/R44896.pdf>.

This paper has been intentionally framed to identify issues and pose questions rather than prescribe solutions or propose recommendations. Our hope is to present some options for consideration and engage business and government leaders in a discussion of these issues. To this end, the Lawrence Centre plans to organize an economic infrastructure forum in early 2019 and, following that event, to convert the discussion paper into a report with recommendations for decision-makers and opinion leaders.

DEFINING ECONOMIC INFRASTRUCTURE

“Infrastructure” means different things to different audiences and the term is not used with any precision or consistency. A general definition of infrastructure includes “a set of assets that possess certain characteristics, such as fixed physical structures that have long useful lives, take a considerable time to create, and have no good short-to medium-term substitutes.”³ Broader classes of infrastructure include transportation, energy, and health care. Contemporary subsets of infrastructure include digital and sustainable/green infrastructure.

This paper adopts a broad and evolving definition of infrastructure that focuses primarily on economic infrastructure, regardless of whether it is publicly, privately, or jointly owned. (The World Bank and the Organisation for Economic Co-operation and Development (OECD) definitions of infrastructure include similar categories.) This definition covers four key sub-sectors that are vital to economic growth:

- **Energy:** Electricity generation and transmission, oil, and natural gas.
- **Transport:** Roads and bridges, rail, transit, airports, and seaports.
- **Digital telecommunications:** Broadband Internet, mobile networks, and 5G networks.
- **Water:** Water and wastewater facilities, and storm water management.

Within this definition, it is important to make three key distinctions. First, “strategic” infrastructure investment can drive productivity and enhance overall economic competitiveness. Second, “stimulus” investment, in contrast, is usually aimed at short-term considerations, such as creating employment or boosting economic activity in periods of economic downturn (or, in recent parlance, projects that are merely “shovel ready” rather than “shovel worthy”). Third, there is also “maintenance” infrastructure investment which can be used to refurbish, rebuild, expand, or extend the life of existing infrastructure in order to maintain quality of life and public safety, and to reduce impediments to economic activity.

Strategic infrastructure investment is transformational: it vaults Canada and its communities ahead in terms of economic performance and innovation. Both maintenance and strategic infrastructure are important; however, they should be judged by different criteria and neither should be sacrificed at the expense of the other.

³ The Institute for Competitiveness & Prosperity, “Better Foundations: The Returns on Infrastructure Investment in Ontario,” 2015, 15, https://www.competeprosper.ca/uploads/2015_WP22_FINAL.pdf.

HISTORICAL CONTEXT OF INFRASTRUCTURE IN CANADA

In a country as large as Canada, sound infrastructure has always been essential for delivering Canadian goods to market and connecting individuals and businesses across the country. Major nation-building projects completed in the early era of infrastructure development were characterized by cooperation between the federal or provincial governments with private sector stakeholders. From Confederation to the modern era, these iconic economy-building projects included transcontinental railways, the Trans-Canada Highway, a network of energy pipelines, the telephone and electricity grids, and the St. Lawrence Seaway, among others.

THE GOLDEN AGE OF INFRASTRUCTURE

Government infrastructure spending reached its peak in Canada after the Second World War, as the economy experienced an upturn when Canadians returning home from military service needed jobs and post-war immigration boomed. As Canada enjoyed a natural resources boom and manufacturing growth, investment in housing, transportation, education, and health care increased. The period from 1945 to 1960 is generally considered to be the “golden age” of public and private infrastructure investment in Canada. As illustrated in Figure 1, infrastructure investment peaked just shy of 6% of the country’s gross domestic product (GDP) in the early 1960s.⁴

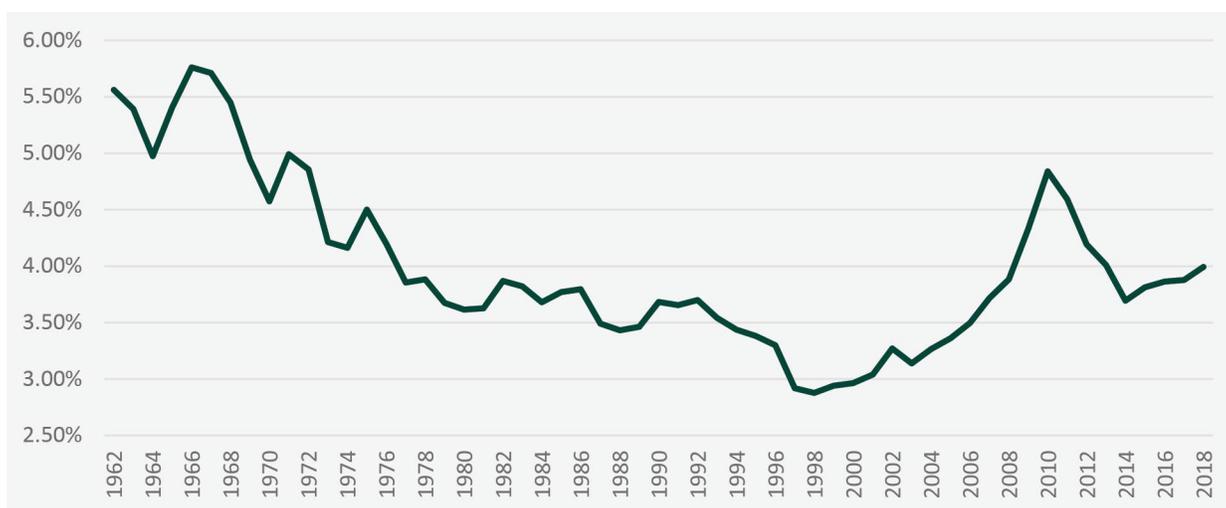


Figure 1: Historical Canadian Spending as a Percentage of GDP

Source: Statistics Canada. Table 36-10-0104-01 Gross domestic product, expenditure-based, Canada.

Infrastructure investment slowed as economic policy shifted in the late 1960s from construction and development to maintenance and operation. This decline continued through the 1970s and 1980s, and was exacerbated by broader economic turmoil in the early 1990s. This period is generally considered to be the “lost” or neglected era of infrastructure, as government spending on projects declined due to competing priorities and fiscal uncertainty. Governments made minimal commitments, with any funding going mainly towards the maintenance of existing transportation infrastructure, such as roads and bridges. While local infrastructure was built to support suburbanization, the era of national infrastructure projects was largely at an end. Deregulation, lower tax rates, and poor economic growth left the public purse too financially constrained for major infrastructure projects. As interest

⁴ Livio Di Matteo, “A Federal Fiscal History: Canada, 1867–2017” (Fraser Institute, 2017), <https://www.fraserinstitute.org/sites/default/files/federal-fiscal-history-canada-1867-2017.pdf>.

rates gradually lowered, fixed capital investment became a more attractive form of economic stimulus. Although the economy slowly recovered, infrastructure spending still lagged relative to what was necessary for continued growth and productivity gains. It was not until the mid-1990s that the declining state of existing public infrastructure—and how to modernize it—became a crucial topic of debate.⁵ This focus resulted in increased investment in infrastructure, but that investment was still well short of the golden age peak.

Despite the increased recognition for infrastructure investment, Canada still lacked a long-term solution, in large part due to the fiscal imbalance. While the federal and provincial governments had the largest fiscal capacity, it was the municipalities who faced the greatest fiscal burden by virtue of owning the assets. Municipalities owned almost 60% of infrastructure assets,⁶ but only collected, on average, eight cents of every tax dollar paid, making it difficult to pay for required regular maintenance and refurbishments or the development of new assets.⁷ This trend has continued until today, as shown in Figure 2. The inevitable result was a growing infrastructure gap. While the variety of risks posed by infrastructure's decline was more generally recognized, little progress was made towards developing and implementing a long-term solution. Even when some federal infrastructure funding was advanced during the Paul Martin government, much of that popular program was allocated to long-deferred refurbishment of often-obsolescent infrastructure and local amenities with little lasting impact on improved productivity or expanded economic capacity.

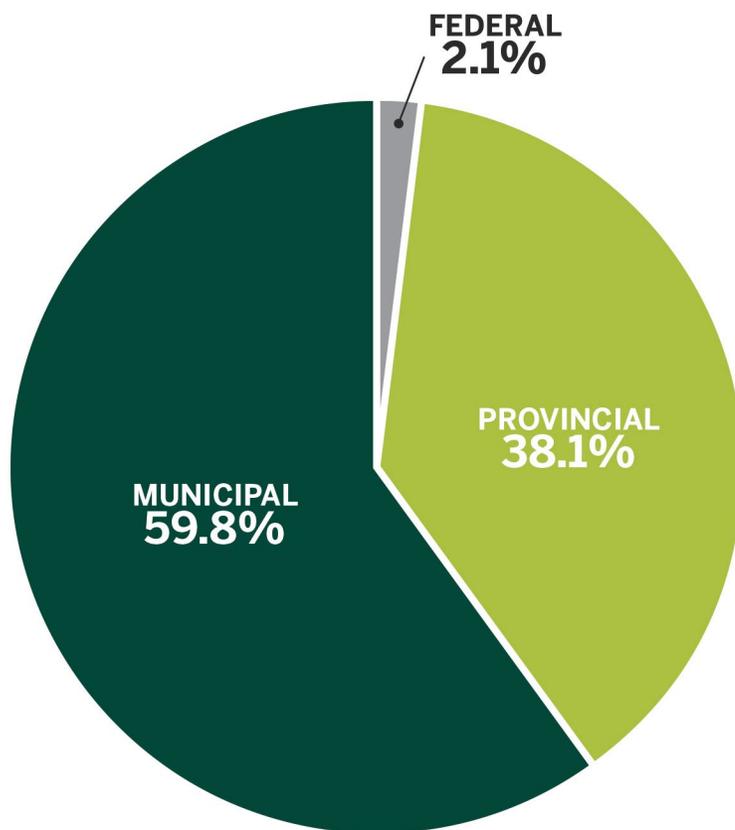


Figure 2: Percentage of Infrastructure Ownership by Entity
Source/Adapted From: Infrastructure Canada. "Investing in Canada - Canada's Long-Term Infrastructure Plan." Government of Canada, 2018. <http://www.infrastructure.gc.ca/alt-format/pdf/plan/icp-pic/IC-InvestingInCanadaPlan-ENG.pdf>.

5 Ibid.

6 Canadian Construction Association et al., "Canadian Infrastructure Report Card: Informing the Future," 2016, fig. 1, http://canadianinfrastructure.ca/downloads/Canadian_Infrastructure_Report_2016.pdf

7 Guy Félio, "Volume 1: 2012 Municipal Roads and Water Systems," *Canadian Infrastructure Report Card*, 2012, http://canadianinfrastructure.ca/downloads/Canadian_Infrastructure_Report_Card_EN.pdf

TRENDS IN CANADIAN ECONOMIC INFRASTRUCTURE INVESTMENT

Investment in economic infrastructure by the public and private sectors accounts for most of Canada's total infrastructure spending in recent years. As Figure 3 illustrates, public and private sector investment in economic infrastructure projects accounts for over 70% of total infrastructure investment from 2009 to 2017. Furthermore, most economic infrastructure investment is done by the public sector—63% in 2017. Another important trend is that while public sector investment in economic infrastructure in Canada has been growing in recent years (averaging 11% from 2015 to 2017), investment has declined 18% over the same period in the private sector, as Canadian firms and pension funds looked elsewhere for investment opportunities, or simply retained their earnings or paid-out dividends. Figure 4 shows that over 75% of total investment in economic infrastructure has been concentrated in transportation infrastructure (e.g., highways, roads, bridges, etc.) and electric power infrastructure (e.g., wind and solar power plants, power distribution networks, etc.).

Total Investment in Infrastructure Development

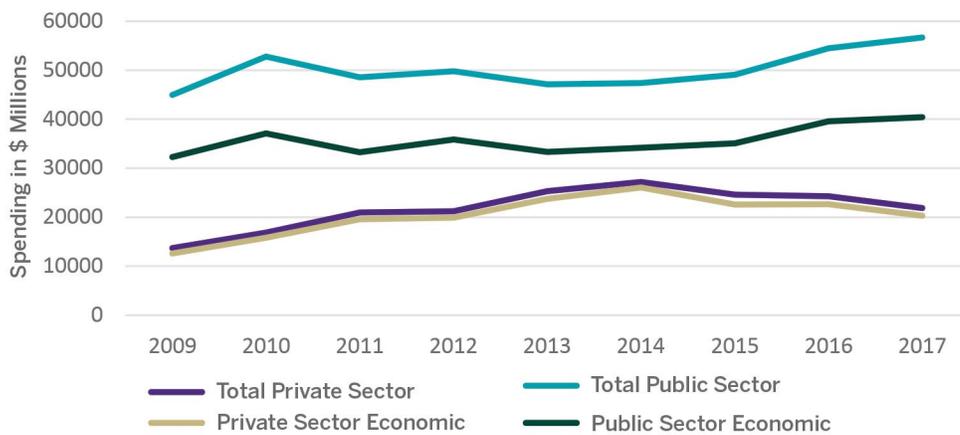


Figure 3: Total Investment in Infrastructure Development
 Source: Statistics Canada. Table 36-26-0002 Infrastructure economic Accounts – Data Tables.

Total Investment in Economic Infrastructure, 2017

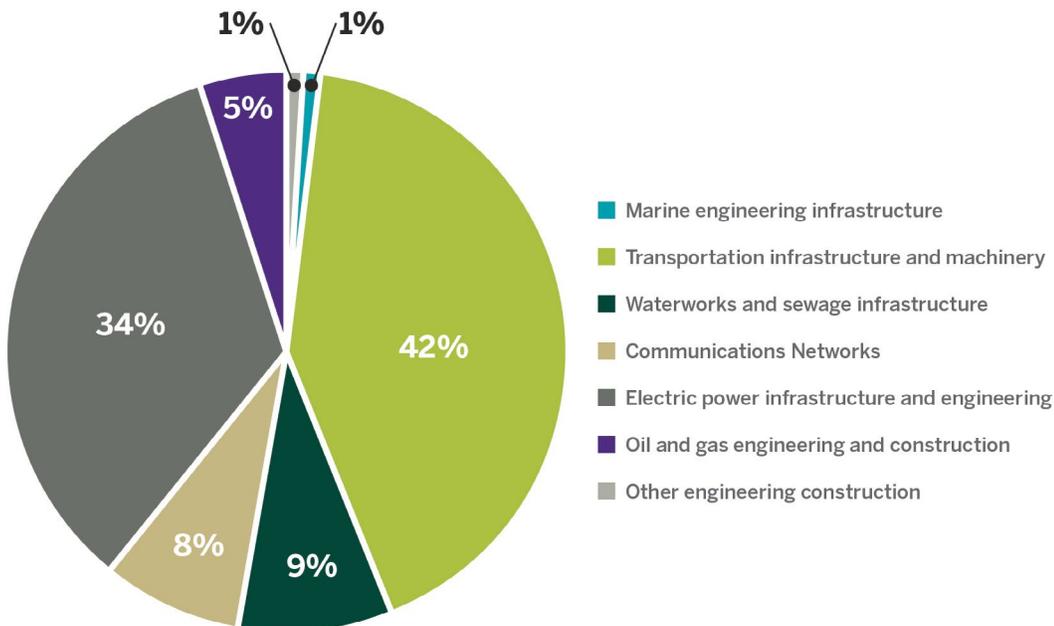


Figure 4: Total Investment in Economic Infrastructure Development by Sector, 2017
 Source: Statistics Canada. Table 36-26-0002 Infrastructure economic Accounts – Data Tables.

INFRASTRUCTURE AS AN EMERGING PRIORITY: KEY DEVELOPMENTS (1995 TO 2018)

By the mid-1990s, Canada had fallen behind most of its OECD peers in “capital investments that enhance productivity and economic growth.”⁸ In the United Kingdom and other jurisdictions, privatization and P3s became popular methods to increase the rate of development and to share infrastructure risk with private partners. It was not until the late 1990s that Canada began to see the merits of P3 procurement. Adopting a full accrual accounting approach to fixed capital investment in 2003 allowed more large investments to be initiated in tandem.⁹ The resulting projects created a short-term reprieve by extending the life of some of Canada’s critical economic infrastructure assets.

Canada’s infrastructure challenges are not unique within the global context. The combination of population growth, aging infrastructure, and significant underinvestment has led to a growing infrastructure gap worldwide. According to the McKinsey Global Institute, an estimated US\$57 trillion in infrastructure spending is required between 2013 and 2030 simply to keep pace with projected global GDP growth. On an annual basis, it is expected that the world will need to invest US\$3.3 trillion to meet growth demand by 2030, compared to the US\$2.5 trillion a year required today (i.e., approximately 25% more).¹⁰

Although this widening gap has triggered the adoption of long-term plans federally and in many provinces, it is clear that Canada’s infrastructure performance is still lagging (see Table 1). Currently, the Canadian government has promised greater infrastructure spending as part of a strategy premised on incurring budgetary deficits in exchange for greater investment capacity. This approach has enabled the federal government to commit over \$180 billion to a 12-year strategy beginning in 2016. Yet, the Canadian picture remains troubling, with current estimates of the gap ranging from \$500 billion to \$1 trillion.

Index	Current Ranking
<i>World Economic Forum Global Competitiveness Index: 2nd Pillar: Infrastructure</i>	16
<i>Statista: Quality of Infrastructure</i>	22
<i>World Bank Global Rankings</i>	20

Table 1: Canada’s Ranking on Global Infrastructure Indices
Sources: Schwab (2017); World Economic Forum (2018); World Bank (2018).

According to a recent study, Canada will need to invest an average of 5.4% of its GDP annually over the next 50 years to realize its economic growth potential, compared to the current investment trend of 4%.¹¹ There are, of course, many factors related to growth targets that must be considered, but taken at face value, this projection implies a required rate that is well above the current actual rate of fixed capital expenditure. The required rate stipulates an annual investment of \$80 billion, whereas a one-year truncated calculation of the current federal and provincial committed investment still

8 Chiara Cautillo, Noah Zon, and Matthew Mendelsohn, “Rebuilding Canada: A New Framework for Renewing Canada’s Infrastructure,” *Mowat Research #92*, 2014, http://mowatcentre.ca/wp-content/uploads/publications/92_rebuilding_canada.pdf.

9 Timothy J. Murphy, “The Case for Public-Private Partnerships in Infrastructure,” *Canadian Public Administration / Administration Publique Du Canada* 51, no. 1 (2008): 99–126, https://mcmillan.ca/files/tmurphy_caseforp3_infrastructure_0508.pdf.

10 Jonathan Woetzel et al., “Bridging Global Infrastructure Gaps” (McKinsey Global Institute, 2016), <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/bridging-global-infrastructure-gaps>.

11 Canadian Centre for Economic Analysis (CANCEA), “Infrastructure Update 2018: Ontario Infrastructure Investment - Federal and Provincial Risks & Rewards” (Residential and Civil Construction Alliance of Ontario (RCCAO), 2018), http://www.rccao.com/news/files/RCCAO_Infrastructure-Update-2018.pdf.

totals less than \$60 billion (see Table 2). This \$60 billion sum is the amount committed across Canadian governments in 2018 and does not consider actual spending figures, which are acknowledged as being significantly short of the committed sum.

Therefore, even if Canada successfully invested all of its current committed infrastructure funding, it would still be well behind the pace necessary to reduce the gap.

Region	Estimated 12-Year Commitment	Estimated Annual Commitment
AB	\$60.44	\$5.32
BC	\$100.67	\$8.73
MB	\$17.57	\$1.56
NB	\$9.11	\$0.82
NL	\$5.47	\$0.50
NT	\$9.41	\$0.83
NS	\$16.37	\$1.43
NU	\$8.49	\$0.75
ON	\$163.54	\$14.62
PE	\$1.70	\$0.17
QC	\$112.94	\$10.04
SK	\$11.59	\$1.04
YT	\$6.68	\$0.59
Federal	\$154.81	\$12.90
Total	\$678.80	\$59.32

Table 2: Estimated Infrastructure Commitments Made by Governments in Billions (\$)

Sources: Provincial/territorial/federal budget announcements (see Table 2 Data Sources in Bibliography for a complete listing).

Note: 12-year and Annual allocation assumes current yearly commitment rate remains constant. Federal 12-year figure refers to federal-related projects. Federal 12-year figure under annual commitment counts only the sum to be transferred to provinces/territories. It is unclear whether new governments will honour prior proposed spending programs.

LOOKING AHEAD: RISKS AND OPPORTUNITIES (2019 AND BEYOND)

The substantial fiscal commitments made to infrastructure development by all levels of government in Canada in recent years represent a positive development, and it will be critically important to sustain an appropriate level over a longer period. However, the fiscal commitments alone are not sufficient. As a number of observers, including the Parliamentary Budget Officer, have noted the federal government has been unable to flow these funds in a timely manner to provinces and municipalities.¹² Some of the delays are due to the lack of agreement between the different levels of government on project selection and the issue of “incrementality,” a federal policy to restrict newly available funding to new projects only (rather than previously approved ones). A more flexible approach is needed to ensure that project priorities (and, in the process, strategic projects) are not distorted or compromised.

The delays associated with flowing the funds also pose another potential consequence: as governments face new economic and fiscal realities, they are unlikely to have the fiscal capacity to undertake the breadth of strategic projects, which would once again widen the infrastructure gap. In addition to delays in public sector investment, regulatory risk and other uncertainties have resulted in a corresponding lack of investment in economic infrastructure by the private sector.

12 Parliamentary Budget Officer, “Status Report on Phase 1 of the Investing in Canada Plan,” 2018, https://www.pbo-dpb.gc.ca/en/blog/news/Phase_1_Investing_in_Canada_Plan.

RISKS TO INFRASTRUCTURE DEVELOPMENT AND DELIVERY

What risks are undermining Canada’s ability to plan, select, and complete infrastructure projects? The factors are numerous, increasingly predictable, and shared by many jurisdictions globally. At the same time, experience tells us that these same risks can be converted into opportunities to bridge the infrastructure gap. Government funding commitments can be used to create a business-enabling environment for investment by:

- aligning incentives and risks appropriately among project stakeholders;
- using innovative structures, mechanisms, and designs; and,
- effectively and transparently selecting and prioritizing projects.

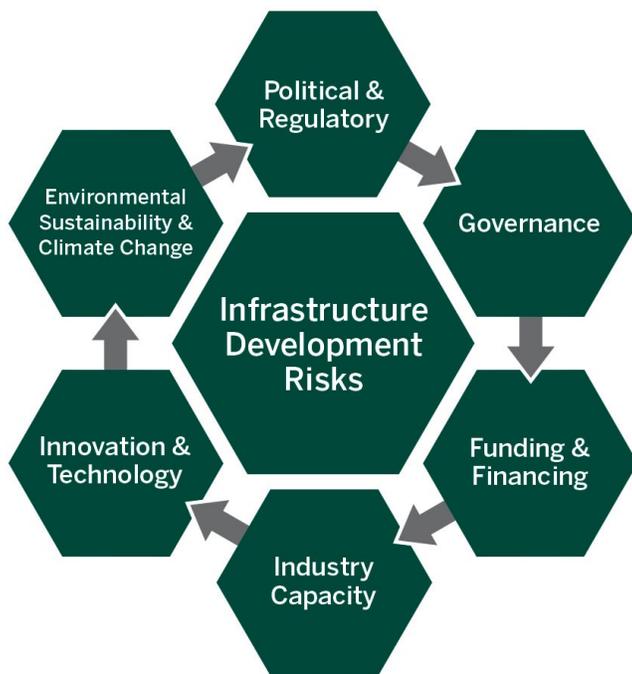


Figure 5: Risks to Infrastructure Development

Project risks are generally well understood, but the broader systemic risks impacting infrastructure development are less clear and warrant more attention. Some of these risks were recently highlighted at McKinsey’s fifth Global Infrastructure Initiative Summit in London, including the need for capability building and recruiting; building resilient and “climate-smart” infrastructure; diversifying revenue sources for financing; changes to regulatory and procurement processes to encourage innovation; collaborative contracts that incorporate risk sharing; use of a robust, outcome-focused business case; and “a pipeline of talented and diverse project leaders to set critical major projects up for success over the long term,” among other items.¹³ Successfully mitigating risks associated with these objectives could reward Canada by allowing it to close its infrastructure gap, while setting a business-enabling precedent that extends far beyond infrastructure projects. As noted, through secondary research, the Lawrence Centre has identified six main risks to infrastructure development: political and regulatory; governance; funding and financing; industry capacity; innovation and technology; and environmental sustainability and climate change (see Figure 5).

13 Global Infrastructure Initiative, “London 2018 Summit: Major Project Delivery and Digital Transformation,” 2018, 6–7, <http://bestideas.globalinfrastructureinitiative.com/wp-content/uploads/Best-Ideas-London-2018-GII-Summit-WEB.pdf>.

1. POLITICAL AND REGULATORY RISK

Investors characterize the potential for certain external factors interfering with sound business decisions or counterparty relationships as “moral hazards,” a term that has its origins in the insurance industry. Nobel Prize-winning economist Paul Krugman describes moral hazards as “any situation in which one person makes the decision about how much risk to take, while someone else bears the cost if things go badly.”¹⁴ In the world of infrastructure investment by the private sector, one of the greatest moral hazards cited is political risk.¹⁵ Accordingly, this first risk category combines both political and regulatory risk, in light of their closely related characteristics.

KEY RISK COMPONENTS

- Political intervention
- Sensitivity to public opinion
- Private partner autonomy
- Role of quasi-government organizations
- Extent of regulation
- Environmental assessment

Political Intervention and Public Opinion

From an investor’s perspective, political risk arises when state actors use the power of the state, often retroactively, to (1) override contractual terms or (2) alter the business conditions and markets through taxation or regulation, or (3) by imposing supplementary, uneconomic performance-related, or design requirements on the counterparty. In taking these actions, the state actor either runs no risk because of legislative supremacy, or because the resources of the state effectively indemnify the state actor from any negative consequences resulting from its actions, at least in proportion to the financial risk incurred by the private counterparty. Political risk may also arise from political direction given to project management, without transparent and accountable authority to do so. From the perspective of the public authority, political risk results from projects being over budget, not being delivered on time, or suffering significant changes in scope once commissioned (i.e., so-called “scope creep”). The nature of these political risks has been well documented by Bent Flyvbjerg, an economic geographer and expert on infrastructure megaprojects falling prey to “optimism bias” in the designing and costing stages.¹⁶

The Coface country risk assessment survey for the third quarter of 2018 analyzes political risk based on “macroeconomic expertise in assessing country risk, comprehension of the business environment, and microeconomic data collected over 70 years of payment experience.”¹⁷ This survey gives Canada an “A3” or “satisfactory” rating, and cites a shrinking labour force, growing household debt, and a dependency on the U.S. economy as key weaknesses. Additionally, in the sector risk assessment conducted under the same study, North America receives a “high risk” rating for construction. Although the Canadian business environment is given a very strong rating due to its well-regulated corporate ecosystem, overall country risk is driven up by “changes in [a] generally good but somewhat volatile political and economic environment [that] affects corporate payment behaviour. A basically secure business environment [gives] rise to occasional difficulties for companies.”¹⁸ By comparison, the United States, Australia, many European jurisdictions, and several nations in East/Southeast Asia have all been awarded superior ratings. The U.K. shares a “satisfactory” rating with Canada, driven primarily by the general uncertainty resulting from its proposed exit from the EU. Although this rating implies adequacy, a comparison of global rankings makes it very clear that Canada is on the lower end of the ranking spectrum for developed countries.

¹⁴ Paul Krugman, *The Return of Depression Economics and the Crisis of 2008* (New York City: W. W. Norton, 2009).

¹⁵ Financial Services Council of Australia, “Financing Australia’s Infrastructure Needs: Superannuation Investment in Infrastructure” (Sydney: EY Australia, 2011), 16, 18, 21–22.

¹⁶ Bent Flyvbjerg and Alexander Budzier, “Report for the Edinburgh Tram Inquiry,” 2018, http://www.edinburghtraminquiry.org/wp-content/uploads/2018/08/TRI00000265_Expert-Report-Prof-Bent-Flyvbjerg.pdf.

¹⁷ Coface, “Economic Studies: Canada,” 2018, <https://www.coface.com/Economic-Studies-and-Country-Risks/Canada>.

¹⁸ Ibid.

What factors appear to increase the perception of political risk in Canada? As with any democracy, acceptance of political protest and a greater sensitivity to public opinion may encourage governmental intervention in infrastructure projects, as exemplified by the recent suspension of the Trans Mountain Pipeline initiative after a lengthy period of controversy. In this case, developer Kinder Morgan cited its biggest concern with the pipeline as the political risk posed by the B.C. government. Time will tell whether or not this project can be salvaged, but the precedent for political intervention resulting in project cancellation is not encouraging. The bridge proposed to replace the George Massey Tunnel in Vancouver, which is “aging” and “could collapse,” was scrapped when a government transition took place in 2017. The new government cited the need for greater consultation in spite of contractors already being signed on. Similarly, the cancellation of the Energy East project caused some politicians to argue that decision-making regarding these sorts of projects is placing too much emphasis on public opinion and too little emphasis on potential economic benefit. As one political leader remarked, “[Canada’s] national railways would not have been built if we had been governed by ‘social licence’ rather than rule of law.”¹⁹

The success of projects and their ability to attract long-term investment may depend on private investors enjoying a degree of autonomy once a contract has been awarded. An investor whose returns are hindered by government intervention will typically make no secret of its displeasure in its public reporting. Regarding the cancellation of Ontario’s Feed-In Tariff (FiT) program, one Wells Fargo analyst remarked that the “long-term consequences ... could materially increase Ontario’s cost-of-capital [and] investors would ascribe far more risk to any investments in the province.”²⁰ This comment demonstrates how, in a globally competitive infrastructure investment market, investors take note and may charge a premium for exposure to political risk.

The Role of Stakeholder Relations

To build mutual confidence between public and private stakeholders, there is a need to develop a “pipeline” of infrastructure projects. Ideally, a priority roster of projects would be identified and prioritized from an evidence-supported business case that reflects a consistent approach to procurement and standardized models of delivery. Infrastructure Ontario and Partnerships British Columbia have successfully advanced this programmed approach to infrastructure procurement, offering the private sector an arm’s-length, contractual relationship between the government and the infrastructure builder, overseen by a procurement agency with an independent mandate.

Government agencies such as Infrastructure Ontario are recognized as having the potential to reduce political risk, but their role generally becomes evident once the political decision has been made about which projects should be undertaken. Before that stage, risk mitigation requires an evidence-supported business case for selecting and prioritizing projects across orders of government. It also requires greater attention throughout the life cycle of a project to maximize investor confidence and to balance public opinion, political culture, and respect for legitimate private interests. From the perspective of the private sector, this approach reduces political risk, one of its main concerns about infrastructure projects in Canada.

19 Jacques Poitras, “Opinion: Is Energy East Still in the Pipeline?” *The Globe and Mail*, September 21, 2018, <https://www.theglobeandmail.com/opinion/article-energy-east-is-coming-back-to-life-should-it-remain-dead>.

20 David Berman, “Doug Ford May Have Created a Buying Opportunity in Canada’s Renewable Energy Stocks,” *The Globe and Mail*, July 16, 2018, <https://www.theglobeandmail.com/investing/markets/inside-the-market/article-amid-the-uncertainty-in-ontarios-energy-industry-buying>.

Political risk can erode public and private support for further projects. Recent history has shown a trend of newly elected federal and provincial administrations undoing the actions of the previous administration, potentially impacting the political risk tolerance of investors. For example, the cancellation of wind power contracts by a new government in Ontario after construction had begun will likely result in a financial loss for the German-based company backing the project, and a financial penalty for the Ontario government due to contractual obligations.²¹

Impact of the Regulatory Process

Regulatory risk represents a particularly concerning component of political risk for investors. Regulation—inclusive of siting, permitting, environmental assessments (EAs), duties, applications, and licences, among other things—plays an important role in society. However, overly complex, ambiguous, and/or burdensome regulatory regimes can result in governments failing to act in a timely and transparent manner, which may have significant financial and reputational risk for investors. When regulation creates an asymmetric risk relationship between public and private parties, it can become a substantial obstacle to the efficient flow of capital. As the 2013 SME Regulatory Compliance Cost Report articulates,

In a developed world economy, regulatory systems are used to protect property rights and enforce contractual agreements, protect the environment and the health and safety of citizens, and ensure a well-functioning tax system. Over the last decade, however, there has been growing concern among government officials and business owners in Canada regarding the cost of regulatory compliance.²²

The exact burden that regulatory compliance creates, in terms of both time and cost, is difficult to quantify and varies considerably from project to project, in some cases acting as a less tangible risk of projects becoming a non-starter if the perceived burden exceeds the perceived potential return. On the Energy East project, regulatory costs were undeniably a consideration, as “the vast majority of the \$1 billion in Energy East development costs went to pursuing regulatory approval. No private sector entity would ever have expended such a vast amount of capital seeking regulatory approval if it had known the dimension of the regulatory and political risk.”²³ As two energy experts have observed, “Evidence suggests that regulatory timelines and uncertainties and political interventions have increased project development costs and perceived project approval risk, making energy and natural resources less attractive for long-term capital commitments.”²⁴

Inconsistency in regulatory application is always an issue in an environment where much of the existing infrastructure is owned and operated by local authorities, whose individual regulatory and procurement processes tend to be unique. These projects are typically funded in part by federal or provincial authorities, which in turn have complex regulatory processes of their own that require meticulous navigation. The uncertainty surrounding the time and resources necessary to satisfy these regulatory demands has a deterring impact on both bidders and investors; it also adds significantly to the (often hidden) costs of bidding on and ultimately delivering infrastructure. This burden is especially pertinent to transformative, strategic infrastructure, as these projects usually require greater regulatory costs than the maintenance or refurbishment of existing assets.

21 Shawn McCarthy, “Cancellation of German-Owned Ontario Wind Project Prompts Warning from Berlin,” *The Globe and Mail*, July 23, 2018, <https://www.theglobeandmail.com/business/article-cancellation-of-german-owned-ontario-wind-project-prompts-warning-from>.

22 David Seens, “SME Regulatory Compliance Cost Report” (Industry Canada, 2013), http://www.reducingpaperburden.gc.ca/eic/site/pbri-iafp.nsf/eng/h_sx00145.html.

23 Dennis McConaghy, “I Helped Plan Energy East, and I Know the Government’s Excuses Are Bunk,” *Financial Post*, October 12, 2017, <https://business.financialpost.com/opinion/i-helped-plan-energy-east-and-i-know-the-governments-excuses-are-bunk>.

24 Guy Holburn and Margaret Loudermilk, “Risks and Costs of Regulatory Permit Applications in Canada’s Pipeline Sector” (Ivey Energy Policy and Management Centre, 2017), 1, <https://www.ivey.uwo.ca/cmsmedia/3776986/risks-and-costs-of-regulatory-permit-applications-in-canadas-pipeline-sector-march-2017.pdf>.

Navigating Environmental Assessment

Global institutional investors considering investing in infrastructure, both domestically and abroad, look for a regulatory environment that is well established, stable, and autonomous, and that has an industry/consumer focus. For these major infrastructure investors, the lack of a good regulatory regime poses a significant risk and may mean that a project fails to meet their risk-profile test for an infrastructure investment. In Canada, regulatory processes are often considered to be excessive and unpredictable processes.²⁵ Of particular note is the EA legislation and protocols adopted at provincial and federal levels and imposed on municipal projects, which can create a difficult regulatory landscape for public and private parties to navigate before a proposal can be approved. Unsurprisingly, this regulatory maze is a deterrent for potential investors. According to Mark Wiseman, former CEO of the Canada Pension Plan Investment Board (CPPIB), “To really make infrastructure investing attractive ..., we need ... predictability of the regulatory framework.”²⁶

Another consideration is the nature of the public consultation processes themselves. Many of the consultation statutes and regulations were modelled on those used for localized land-use planning issues, before the advent of social media, and without the benefit of court decisions on consultation with Indigenous groups. These three factors may combine to make the consultation process for infrastructure projects very protracted and to bias consultation in favour of local interests over broader interests, which, in turn, can easily render projects cost prohibitive, operationally uneconomic, or politically unsustainable. Using traditional public consultation processes can generate “Not in My Backyard” (NIMBY) opposition and delay. Projects may be opposed due to perceived negative impacts on neighbourhoods or special interests arising from the construction or operation of the infrastructure, despite the widespread benefits the project will bring to an entire community or even to the national economy. NIMBY opposition is often encountered in affordable housing public consultations, public transit projects that may have long construction times, natural resource projects, and so on. This type of opposition has certainly exacted an opportunity cost on Canadians, with projects being abandoned, delayed, scaled back, or modified in a suboptimal fashion. As captured by terminology employed in the U.K., NIMBY can easily become “BANANA”—“Build Absolutely Nothing Anywhere Near Anyone.”

As long as the regulatory burden in Canada continues to deter investment and/or increase opportunity costs, governments should continue to focus their attention on the mitigation of regulatory risk. Simply telescoping EA requirements (e.g., adopting vehicles like municipal class EAs in Ontario) could greatly reduce the cost, ambiguity, time, and capacity for unpredictable delays involved in EA. Without a reform of EA processes, Canada is biasing its infrastructure investments in the direction of existing infrastructure and conventional infrastructure, which either have predictable outcomes or require no EA at all. New and innovative “strategic” infrastructure projects may be disadvantaged by the comprehensive EA risks of time, cost, and uncertainty. The federal government’s 2018 Fall Economic Statement offers some optimism in this area, with specific references to the importance of aligning, modernizing, and streamlining federal regulation for increased economic competitiveness; however, its success will depend heavily on the speed and manner of implementation.²⁷

25 Herbert Grubel, “Too Much Regulation Is Stifling Canada’s ‘Innovation Economy,’” *Financial Post*, April 5, 2016, <https://business.financialpost.com/opinion/too-much-regulation-is-stifling-canadas-innovation-economy>.

26 Mark Wiseman, “Rethinking Infrastructure: An Investor’s View” (McKinsey & Company, March 2013), <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/mark-wiseman>.

27 Government of Canada, “Fall Economic Statement 2018: Investing in Middle Class Jobs,” 2018, <https://budget.gc.ca/fes-eea/2018/docs/nrc/2018-11-21-en.html>.

2. GOVERNANCE RISK

Governance issues are frequently cited as undermining infrastructure development, at both the “macro” or project-selection level and at the “micro” or project-delivery level. These challenges initially arise from the division of the roles and responsibilities of levels of government and the often-conflicting governance systems that must be navigated to receive funding and approval for infrastructure projects. At a later stage in the process, governance issues focus on the structure of the winning bid consortium and its relationship with the procurement agency and project sponsor.

Intergovernmental Fragmentation

At the macro level, the division of roles among federal, provincial/territorial, and municipal governments in Canada generates ambiguity and raises concerns about accountability and strategic alignment. Capital funding is more readily available at the federal and provincial levels, owing to their more extensive and robust tax sources. However, as noted, almost 60% of Canada’s public infrastructure is in the hands of local municipalities or similar regional entities, though they collect barely 8% of every tax dollar to maintain existing assets and build new ones. As a result, there is a great deal of variety in locally crafted procurement processes and a determined effort to de-risk projects—notably, by fiscally vulnerable municipalities and through the Government of Canada’s “contribution agreements,” which cap federal financial risk. These measures add to the cost and complexity of building infrastructure and limit the number of domestic firms that are in a position to take on such risks.

Fragmented communication channels and approval processes among levels of government result in a lack of transparency about project-selection criteria. When governance lacks synergy, this can lead to improper project selection, cost overruns, scope change, and delays. With no national prioritization criteria for infrastructure projects, it is challenging to allocate funding to the most pressing national infrastructure concerns and strategic opportunities.

Local municipalities have many pressing local infrastructure priorities. For municipalities with small tax bases, it is difficult to strike the right balance between the refurbishment of existing assets and the construction of new assets, which is an ongoing issue identified by the Auditor General of Ontario.²⁸

KEY RISK COMPONENTS

- Strategic national prioritization framework
- Transparency and evidence-based approach selection criteria
- Application-based funding programs
- Refurbishment versus new construction

28 Auditor General of Ontario, “Annual Report 2015” (Office of the Auditor General of Ontario, 2015), 289–90, http://www.auditor.on.ca/en/content/annualreports/arreports/en15/2015AR_en_final.pdf.

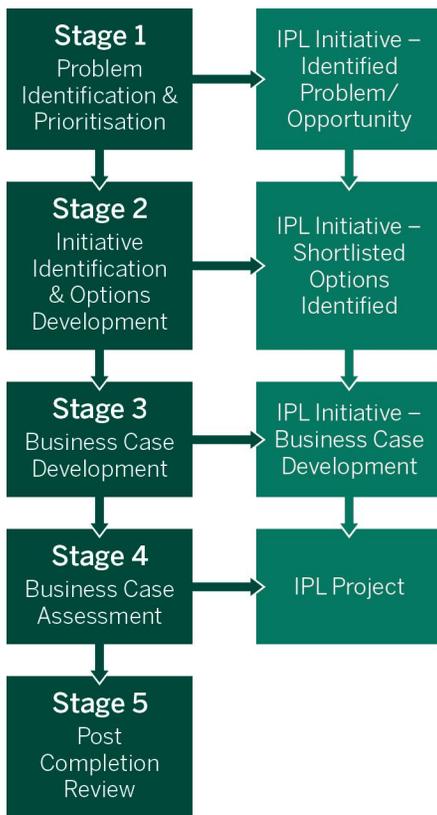


Figure 6: Infrastructure Australia's Infrastructure Priority List (IPL) Stages. Adapted from: Infrastructure Australia. Five Stages of the Assessment Framework. 2018. <http://infrastructureaustralia.gov.au/projects/Stages-of-the-Assessment-Framework.aspx>.

Faced with these pressures, and with project delivery largely left to municipalities and provinces, decision-makers are likely to pass over projects that support widespread economic growth in favour of neglected local infrastructure that may have less economic benefit. In a competition for scarce capital funds, municipal and regional authorities have limited interest in projects that target improvements in national economic competitiveness or productivity, or in infrastructure with a regional, linear, or inter-regional footprint. In fact, municipalities and regional authorities may avoid new types of infrastructure outside of their traditional areas of responsibility, or projects with an unproven financial or consumer patronage record ("greenfield" projects). This practical reality argues for a clear distinction between necessary capital funding for refurbishing and expanding existing public infrastructure, and a specific allocation of capital funding in support of innovative and transformational strategic infrastructure projects.

One possible solution to this dilemma is to have a capital investment framework that reconciles these diverse intergovernmental interests. The various orders of government must cooperate on the selection of projects that meet their specific political interests and jurisdictional priorities. Before that cooperation, however, they must first collaborate on criteria that will ensure that common objectives are achieved. These common objectives should address restoring and strengthening the existing infrastructure stock, but must also ensure an appropriate allocation of capital investment for strategic infrastructure initiatives in fields ranging from the infrastructure to support housing supply through to infrastructure that will enhance Canada's economic productivity and global competitiveness.

If a national prioritization framework existed, municipalities and provinces/territories would have clearer objectives with which to align their priority areas for development. Infrastructure Australia, an arm's-length body that provides advisory services for infrastructure projects in Australia, has a documented project prioritization list that is regularly updated to include productivity-enhancing infrastructure projects of national significance that have been approved based on data-driven evidence for construction (see Figure 6).²⁹ Evidence-based business cases prepared by project proponents can propose different solutions depending on the nature of the problem, including regulatory reform, governance reform, better asset use reform, or capital investment, instead of immediately jumping to fill a need with a financial investment.³⁰ Additionally, many countries (including Australia and New Zealand) use these arm's-length bodies to develop and support long-term infrastructure plans which span several decades. If Canada were to adopt a similar model, the benefits would be two-fold: (1) private investors would see long-term continuity beyond the constraints of the political cycle, and (2) infrastructure could be more efficiently constructed by prioritizing the highest national needs first.

29 Infrastructure Australia. "Infrastructure Priority List," 2018. <https://infrastructureaustralia.gov.au/projects/infrastructure-priority-list.aspx>; Ernst & Young Australia, "Australian Infrastructure: Some Facts and Figures," 2016, [https://www.ey.com/Publication/vwLUAssets/ey-australian-infrastructure-some-facts-and-figures/\\$FILE/ey-australian-infrastructure-some-facts-and-figures.pdf](https://www.ey.com/Publication/vwLUAssets/ey-australian-infrastructure-some-facts-and-figures/$FILE/ey-australian-infrastructure-some-facts-and-figures.pdf).

30 Infrastructure Australia, *Assessment Framework: For Initiatives and Projects to Be Included in the Infrastructure Priority List*, 2018, 26, https://infrastructureaustralia.gov.au/policy-publications/publications/files/IFA_Infrastructure_Australia_Assessment_Framework_Refresh_v26_lowres.pdf.

As infrastructure owners, municipalities and regional administrators frequently miss the opportunity to refurbish or build new assets due to governance constraints. For example, as funding priorities shift, the opportunity to build a new transit line may not be in line with federal funding priorities, even though the opportunity existed in a previous budget. At present, it is especially difficult to determine short- versus long-term priorities, as transformational projects can often span multiple political cycles; this can encourage governments to undertake more short-term projects within the constraints of the four-year political cycle, as opposed to much-needed long-term development that may be completed under a different government than the one that initiated it. In this context, an arm's-length advisory body can be helpful in establishing long-term priorities and a pipeline of nationally significant projects.³¹

While priority-setting would seem to be an obvious part of intergovernmental infrastructure decision-making, the current mechanisms for selecting projects do not always favour an evidence-based and timely process. For example, at the federal level, there are efforts to ensure that funding is incremental to existing local and provincial infrastructure commitments and budget allocations. Without this stipulation, there may be concern that funding partners will view the federal capital contribution as “fungible,” allowing earmarked local and provincial funds to be redeployed to other fiscal priorities. However, this “incremental” approach can easily lead to political officials picking their favourite projects on the basis of a line-by-line review of potential candidates. If a decision-making framework and related criteria existed, many such projects would not meet the test of top priority and best choice. Segregating “refurbishment and expansion” projects from “strategic and transformational” projects would also avoid this weakness in the intergovernmental project-selection process.

In addition to the challenges of prioritizing and selecting projects, many infrastructure project approvals have to navigate complex application-based programs that may have different criteria for funding. Application-based programs have received significant criticism as additional administrative barriers to accessing funds for projects. Instead, many have advocated for more single-window funding approaches, similar to the current Gas Tax Fund provided by the federal government, which municipalities can access directly.³² Increasing standardization among funding program requirements and across project applications can help reduce the administrative burden of applying for funding and allow a more steadier stream of funding to reach municipalities for much-needed projects.

3. FUNDING AND FINANCING RISK

Canadian methods for infrastructure procurement may be perceived as lacking innovation relative to comparable jurisdictions such as the U.K. or Australia.³³ For example, with regard to funding models, the U.K. P3 market is described as the “most mature market in the world with a large and diverse contractor base including construction, finance, and equity.”³⁴ In spite of the recent discontinuation of the Private Finance Initiative (PFI), the precedent set over the last several decades has established the U.K. as a leader. Likewise, in terms of financing methods, Australia has been increasingly exploring

KEY RISK COMPONENTS

- Attracting private capital
- Embracing P3 procurement
- The role of the Canada Infrastructure Bank
- Revenue-generating projects
- Land value capture
- Equity as an incentive

31 Matti Siemiatycki, “Implementing a Canadian Infrastructure Investment Agency” (Residential and Civil Construction Alliance of Ontario (RCCAO), 2016), http://rccao.com/research/files/RCCAO_infraagency_Septemper2016_WEB.pdf.

32 Parliament of Canada, and Standing Senate Committee on National Finance. *Smarter Planning, Smarter Spending: Achieving Infrastructure Success*. 1st sess. 41st Parliament, 2017, https://sencanada.ca/content/sen/committee/421/NFFN/Reports/NFFN_12thReplnfra_e.pdf.

33 Mike Moffat and Hannah Rasmussen, “Big Idea: Re-Invent Firm and Infrastructure Financing in Canada,” Canada 2020, 2016, <http://canada2020.ca/matchmaker>.

34 HM Treasury and UK Trade & Investment, “Investing in UK Infrastructure,” 2014, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/357135/infrastructure_pitchbook_28072014.pdf.

instruments such as concessional loans and equity injections as ways to raise capital.³⁵ Even in the U.S., municipalities use tools ranging from tax-increment financing to federally supported financial structures (such as the Transportation Infrastructure Finance and Innovation Act in transportation infrastructure). These funding and financing instruments can offer Canada useful lessons. A far more reluctant, gradual adoption of P3s can be observed in Canada, and with the possible exception of so-called “green bonds,” we have seen no similar deployment of such innovative financial instruments.³⁶ The fiscal foundation that has allowed the U.K. and Australia to become leaders in building infrastructure exists in Canada, including a dynamic and innovative financial services sector with large pools of investment capital available for risk-appropriate infrastructure investments. Canada must improve its funding and financial risk management in order to adequately leverage these resources.

Implications of Public Debt Financing

In budgeting and accounting terms, there is a need to treat infrastructure investment as fundamentally different from other kinds of more transient fiscal expenditures. Infrastructure investment creates new assets and can enhance economic performance and quality of life for decades. Infrastructure assets can also be leveraged to expand the range of investment opportunities in new infrastructure, and to spin off those assets that are no longer core government priorities. With rising concern about levels of public debt, measures to fund infrastructure in ways that attract private capital will be needed to sustain infrastructure investment over time, including mechanisms to ensure that more of the cost of building and operating infrastructure is borne by those who use and benefit from it. With governments becoming increasingly fiscally constrained, the general tax base is becoming a less and less viable source of funding. Increased use of debt financing to reduce this tax burden is attractive, given lower costs of borrowing and the implicit deferral of partial project costs to the future tax base. Future users of long-life infrastructure should contribute to its cost, whether as taxpayers or by fees. Moreover, as interest rates rise, the public sector may have difficulty allocating so much of its available capital to so many infrastructure priorities over a relatively short timeline with its traditional funding methods.

Fortunately, there is abundant private capital available. Large potential investors such as pension and private equity funds have expressed a keen interest in diversifying their portfolios through alternative investments such as infrastructure projects globally. The private sector desire for projects to invest in, combined with the public sector project agenda and need for more capital, has created a clear opportunity for collaboration. Hence, developing a more robust framework for this collaborative funding is an important first step for Canada to deploy the collective available capital. However, without identifying clear sources of funding for infrastructure’s construction and operation, acknowledging the availability of capital and creative financing options is of little value.

It is not enough for Canada to proclaim itself “open for business” with regard to its infrastructure pipeline, as the market for assets worldwide is flush with opportunities that offer the stable cash flows or risk management standards that the private sector demands of its investments. Canada’s apparent aversion to levying user fees for infrastructure asset usage has emerged as a major barrier to collaborative funding. This problem is especially acute because the majority of public infrastructure is owned by municipal governments. While municipal governments in Ontario, for example, have credit ratings among the highest available, their lack of access to significant and varied sources of revenue makes them understandably cautious when undertaking long-term financing of infrastructure—both directly

35 Department of Infrastructure Regional Development and Cities, “Innovative Funding and Financing” (Australian Government, 2018), http://investment.infrastructure.gov.au/about/funding_and_finance/index.aspx.

36 United States Department of Transportation, “Transportation Infrastructure Finance and Innovation Act (TIFIA),” 2018, <https://www.transportation.gov/buildamerica/programs-services/tifia>; Sara Ditta et al., “Vital Capital: Using Alternative Procurement and Financing Models to Capitalize on the ‘Infrastructure Moment’ in the Great Lakes and St. Lawrence Region,” *Mowat Research #114* (Mowat Centre, 2015), 29–30, http://councilgreatlakesregion.org/wp-content/uploads/pdfs/114_VitalCapital.pdf.

and through P3s—even when the needs are great. With high personal tax rates relative to comparable jurisdictions, the public sector is likely cautious about the prospect of levying tolls and other fees on infrastructure users who, in theory, have already paid their share of the cost through the tax rate. Yet, implementing such fees could help redistribute the usage cost and microeconomic benefits of the assets to those who use them the most, while maintaining a relative proportion of the overall cost and macroeconomic benefit to the broader body politic. Most importantly, increased use of user fees would provide consistent revenues to incentivize private parties to give greater consideration to investing in Canadian infrastructure, helping to ensure that the projects are sufficiently capitalized in the first place.

Funding Structures for Improved Incentive Alignment

Perhaps deterred by negative commentary from some provincial Auditors General and public sector trade unions, Canadian governments still have not fully embraced P3s. Recent research has demonstrated that, properly structured, the P3 model has many benefits.³⁷ The P3 procurement model is generally more attractive than other models, as long as the value of the project exceeds a certain level (often in the \$100 million range and beyond, implying a level of complexity better suited to a cooperative partnership involving greater expertise). For this reason, governments may not consider the P3 model for projects on the lower end of the infrastructure scale. Given the inherently smaller dollar value of many municipal infrastructure projects, it may be worthwhile to pursue the “bundling” of generically similar individual projects to increase the overall value and scale. For example, the need for bridge maintenance projects, as recently documented by Statistics Canada,³⁸ could merit the adoption of the methods used by the states of Missouri and Pennsylvania to overcome similar issues with greater efficiency. In those states, bundling bridge projects using the P3 model yielded over 500 refurbished bridges in each state, for a fixed price and in a record period of time.³⁹ Refurbishment or a more resilient initial build tends to be cheaper than waiting until more extreme or time-sensitive repairs are required. Of course, the circumstances vary greatly from jurisdiction to jurisdiction, so while bundling may not be a one-size-fits-all solution, its success with the ONRoute highway rest stops along the 401 may be replicated in other Canadian contexts where near-fungible projects require work.

Research conducted by Boothe and others has also concluded that P3 deals must be well structured, with adequate incentive protections written into the contracts (in order to protect the interests of all involved parties and prevent costs from rising where possible).⁴⁰ In light of Canada’s significant infrastructure gap, projects over the next 10 to 15 years are much more likely to exceed the value and complexity thresholds outlined in existing literature, warranting more P3 projects. Canada must not let itself fall any farther behind comparable jurisdictions with regard to innovative funding structures. While Canada continues to adapt to the P3 concept, other jurisdictions are already considering public-public-private partnership (P4) arrangements that extend from bilateral public-private arrangements to projects where multiple levels of government are involved.⁴¹ Canadian public pension funds have globally recognized investment expertise in infrastructure and invest billions worldwide, but relatively little in Canada, aside from a few exceptions like Bruce Power. In an attempt to attract private capital into infrastructure development, the federal government

37 Paul Boothe, “Public-Private Partnerships Are Still the Better Way to Build,” *Maclean’s*, November 30, 2015, <https://www.macleans.ca/economy/economicanalysis/public-private-partnerships-are-still-the-better-way-to-build/>; Paul Boothe et al., “The Procurement of Public Infrastructure: Comparing P3 and Traditional Approaches,” 2015, <https://www.ivey.uwo.ca/cmsmedia/1964203/comparing-p3-and-traditional-approaches.pdf>.

38 Statistics Canada, “Canada’s Core Public Infrastructure Survey: Roads, Bridges and Tunnels, 2016,” *The Daily*, August 24, 2018, <https://www150.statcan.gc.ca/n1/daily-quotidien/180824/dq180824a-eng.pdf>.

39 Michael Fenn, “Infrastructure Ontario: A Key Agency to Implement the Long-Term Infrastructure Plan,” 2017, 55, http://www.rccao.com/research/files/RCCAO_FENN-REPORT_SEPT2017.pdf.

40 Boothe et al., “The Procurement of Public Infrastructure: Comparing P3 and Traditional Approaches.”

41 Deloitte, “The Changing Landscape for Infrastructure Funding and Financing,” 2009, [https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/Real estate and infrastructure/the_changing_landscape_for_funding_and_finance_Deloitte_Ireland_Real_Estate_and_Infrastructure.pdf](https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/Real%20estate%20and%20infrastructure/the_changing_landscape_for_funding_and_finance_Deloitte_Ireland_Real_Estate_and_Infrastructure.pdf).

established the Canada Infrastructure Bank (CIB) with a mandate of “attracting private investment in Canadian infrastructure projects that generate revenue and are in the public interest.”⁴²

Two distinct views have emerged regarding the CIB. Those who approve of the CIB’s mandate claim that risks for taxpayers are mitigated by having an arm’s-length body that can serve as a liaison between government and private investors. In this way, they argue, the CIB can help to bring aboard greater expertise that will lead to more accurate forecasts and subsequently stronger project prioritization, selection, planning, development, and operation, thus lowering the cost to the taxpayer. Alternatively, those who disapprove of the CIB point out that one of the primary functions of the bank is to provide “loan guarantees” to private investors, essentially protecting their return on investment and making the taxpayer entirely liable in situations where forecasts prove inaccurate, projects fail, or costs otherwise accrue above and beyond what was expected.⁴³

It could also be argued that some features of the CIB may limit its initial success. For example, offering a lower cost of capital to municipalities with outstanding credit ratings does not address the funding challenges of those municipalities. Similarly, funding criteria that require productivity-enhancing or revenue-generating features may eliminate many conventional community infrastructure projects. Despite its merits and potential, the CIB is far from a one-size-fits-all solution for the many financing and funding risks related to Canada’s infrastructure. In practice, improving the investment climate for infrastructure investment and the success of project delivery may result from a mutually supportive combination of small, targeted improvements and innovations, rather than from two or three masterstrokes.⁴⁴

Land Value Capture and Benefit Sharing

Land value capture is “a policy by which governments capture some of the increased value of land that results from the building of a piece of new infrastructure ... [and] is used to help fund the project ... and similar benefit-sharing mechanisms.”⁴⁵ Leaving key project details to be negotiated is often a precondition for land value capture, as negotiations to share benefits and risks will focus on things like the location of interchanges or transit stations, or adjacent development rights and access to the right-of-way of linear infrastructure. Such flexibility and leverage are difficult to achieve under regulatory regimes that favour cumbersome project approval and EA processes, where end results are often predetermined and property investors have years to anticipate and profit from government infrastructure investment plans.

Land value capture is a topic of considerable interest to those building public infrastructure, but few jurisdictions have successfully taken advantage of its potential. Linking significant public investment in infrastructure to the rise in adjacent property values and the commercial benefits it confers can help to defray the capital and operating costs of infrastructure. While most would cite the outstanding success of Hong Kong’s Mass Transit Railway (MTR) in this respect, the experience of the vast Crossrail project in London, U.K. is perhaps a more relevant illustration of the “value capture” dilemma, where some success was achieved but much “left on the table.”⁴⁶ In Ontario, the concept is currently

42 Steven F. Robins, “Banking on Infrastructure: How the Canada Infrastructure Bank Can Build Infrastructure Better for Canadians,” *Commentary No. 483* (C.D. Howe Institute, 2017), <https://doi.org/10.2139/ssrn.2990016>.

43 Pierre Poilievre, “Opinion: What Is Canada’s Infrastructure Bank For?” *Maclean’s*, June 7, 2017, <https://www.macleans.ca/opinion/what-is-canadas-infrastructure-bank-for>.

44 Fenn, “Infrastructure Ontario: A Key Agency to Implement the Long-Term Infrastructure Plan,” op. cit., 9–11.

45 Marion Terrill and Owain Emslie, “What Price Value Capture?” *Grattan Institute Report*, vol. 2017-05 (Grattan Institute, 2017), <https://grattan.edu.au/wp-content/uploads/2017/03/888-What-price-value-capture.pdf>.

46 Oliver Wainwright, “The Line That Ate London: Our Critic’s Verdict on the £15bn Crossrail Colossus,” *The Guardian*, August 14, 2018, <https://www.theguardian.com/artanddesign/2018/aug/14/the-line-that-ate-london-our-critics-verdict-on-the-15bn-crossrail-colossus-elizabeth-line>.

being tested with the potential sale of land on which new GO Transit stations are planned to the private sector in exchange for the right of the buyer to build on those sites. To this end, however, the government must be cautious about protecting the interests of the public, rather than being myopic in an attempt to balance the budget in the near term with the proceeds.⁴⁷

The Role of Innovative Financing

Establishing a precedent for greater innovation and creativity in project financing may be one way to catalyze increased investment and accelerate funding. Identifying mutually beneficial ways that financial risk and reward can be transferred throughout the phases of a project is an avenue for incentive alignment that remains relatively unexplored in Canada. For example, based on sentiments surrounding the 407 ETR Highway, there appears to be an aversion in Ontario to levying user fees for many transportation-related infrastructure projects, in spite of the clear profitability, reinvestment, and expansion that the 407 ETR Highway was able to achieve as a toll route. The Champlain Bridge in Montréal, a P3 project well under development, was intended to levy tolls on travellers upon completion until the federal government backtracked on this decision in the interest of “fairness.” This outcome created a \$3 billion cost for taxpayers and, likely, a much larger cost in terms of lost revenues for the private consortium invested in the project.⁴⁸

Equity or a percentage of revenue can be used to incentivize private parties to deploy their readily available capital for Canadian projects. The CPPIB has identified “boring, predictable, long-term cash flows” as a priority when considering investment candidates.⁴⁹ These are achievable only once the government parties concede such incentives and sufficient uncertainty is removed surrounding the timing and values of such flows. In order to achieve the latter, some banks have begun to develop types of sophisticated derivatives to help private parties hedge the risk of infrastructure investment.⁵⁰ Canada must also explore these types of creative financing opportunities in order to make its infrastructure projects competitive candidates for investment.

4. INDUSTRY CAPACITY RISK

Given the unprecedented commitments made by the public and private sectors to build and refurbish infrastructure in Canada, surprisingly little attention has been paid to whether there is sufficient industry capacity (namely, construction firm and skilled talent capacity) to meet this growing demand. This challenge is even greater due to (1) increasing scale and complexity; (2) the impact of innovation and technology; and (3) the need for environmental sustainability and resilience. Consider the “megaprojects” (i.e., projects typically costing \$1 billion or more) that are currently under development—such as the Gordie Howe International Bridge, the Kitimat-Dawson Creek LNG project, the refurbishing of the Darlington and Bruce Power nuclear plants in Ontario, and the Muskrat Falls Generating Facility in Newfoundland—and the resources that these projects will demand. Beyond these megaprojects, there are numerous other commercial projects

KEY RISK COMPONENTS

- Supply of experienced megaproject managers
- Capacity of domestic construction and engineering firms
- Supply of skilled trades, including digital talent
- Materials supply chain

47 Editorial Board, “Private Deals to Develop GO Stations Need to Meet Public Needs,” *Toronto Star*, December 4, 2018, <https://www.thestar.com/opinion/editorials/2018/12/04/private-deals-to-develop-go-stations-need-to-meet-public-needs.html>.

48 Don Wall, “Champlain Bridge Tolls Decision Could Cost Taxpayers \$3B,” *Daily Commercial News*, July 4, 2018, <https://canada.constructconnect.com/dcn/news/government/2018/07/cartier-bridge-tolls-decision-cost-taxpayers-3b>.

49 Wiseman, op. cit.

50 Organisation for Economic Co-operation and Development, “Infrastructure Financing Instruments and Incentives,” 2015, <http://www.oecd.org/finance/private-pensions/Infrastructure-Financing-Instruments-and-Incentives.pdf>.

that will also require tremendous resources and talent. As future projects adopt new technologies and more innovative approaches to design and construction, more specialized and skilled talent will be required. An assessment of Canada's industry capacity to handle the volume and complexity of these projects would need to focus on five key areas:

1. Construction firm supply;
2. Engineering and design firm supply;
3. Equipment and materials supply chain;
4. Project management capacity; and,
5. General labour supply and skilled trades.

While there is an established industry of construction firms across Canada, only a limited number have the capacity to undertake megaprojects.⁵¹ This fact was recently highlighted by the Chinese state-owned CCCC International's unsuccessful attempt to acquire Aecon, a move intended to expand capacity.⁵² A key question is whether this capacity gap will be closed by inviting foreign firms to compete for Canadian procurements, or whether future regulatory processes will be more forgiving, given industry demand. The same constraint is also present with respect to engineering and design firms. Despite the growth of this industry, megaprojects will require significant amounts of engineering expertise. The equipment and materials challenges will vary depending on the nature of the projects, and some limited-supply types of machinery (i.e., tunnel boring machines) could delay projects.

Although the five areas identified above present enormous challenges, they could also be an opportunity for Canadian firms to grow to capture the domestic demand and to compete for infrastructure procurements globally. Some members of the construction industry believe that this goal is manageable if there is a consistent project pipeline that is staggered appropriately. This supply-side approach would suggest that the demand can be managed without any consequences. However, in reality, slowing down the construction of critical economic public and private infrastructure projects could significantly impact productivity and economic growth.

Another consideration is the availability and efficiency of the Canadian construction labour market. Currently, there is a serviceable level of general construction labour. However, increasing demand will put pressure on industry and organized labour to expand the pool—including more apprentices and foreign workers and more modern and rapid training methods for skilled trades—and to reduce the barriers to labour market mobility. As in any supply-and-demand marketplace, high demand for construction labour, especially among skilled trades, will reflect itself in collective bargaining, including higher labour costs, labour disruptions, more resort to non-union employers, and more use of labour-displacing technologies and processes. Experienced project managers for large-scale megaprojects are scarce in Canada. Due to the lengthy nature of these projects, experienced megaproject managers may be occupied with individual projects for a dozen or so years, limiting the ability of domestic consortia to find such talent for other megaprojects across the country.

On the general and skilled labour supply side, skilled labour shortages have become a global issue. The 2018 ManpowerGroup Talent Shortage Survey reported that skilled trade positions have been the hardest roles to fill for six years in a row.⁵³ The demand for talent will only increase as projects are developed in response to increased investment. Canada's most pressing talent shortages are in skilled trades and engineering, which are critical for infrastructure

51 Bent Flyvbjerg, "What You Should Know about Megaprojects and Why: An Overview," *Project Management Journal* 45, no. 2 (2014): 6–19, <https://doi.org/10.1002/pmj.21409>; Matti Siemiatycki, "Cost Overruns on Infrastructure Projects: Patterns, Causes, and Cures," *IMFG Perspectives* 11 (2015), https://tspace.library.utoronto.ca/bitstream/1807/82852/1/imfg_perspectives_no11_costoverruns_siemiatycki_2016.pdf.

52 Jesse Snyder, "Ottawa Blocks Chinese Takeover of Aecon on Security Grounds," *Financial Post*, May 23, 2018, <https://business.financialpost.com/news/chinese-takeover-of-aecon-blocked-on-security-grounds>.

53 ManpowerGroup, "2018 Talent Shortage Survey," 2018, <https://go.manpowergroup.com/talent-shortage-2018>.

development. To effectively manage these constraints, prioritizing and staggering projects to ensure that labour can be effectively allocated to projects will allow more efficient and affordable construction over time. Yet, as project sizes grow, another risk may emerge as Canadian construction firms prove unable or unwilling to “pledge their balance sheets” to win contracts.⁵⁴

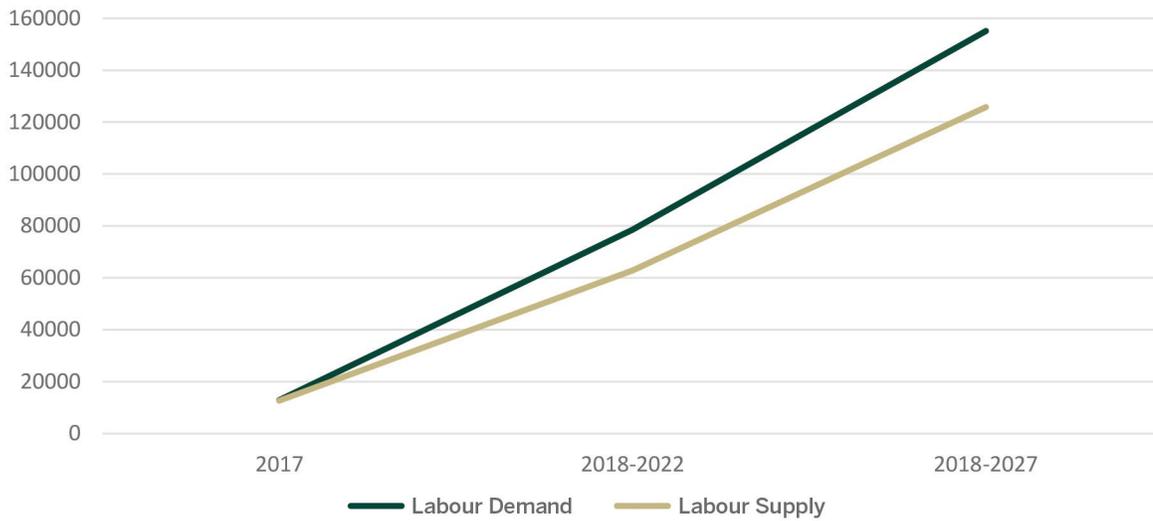


Figure 7: Supply and Demand of Non-Residential Construction Workforce in Canada
 Source: BuildForce Canada. Construction & Maintenance Looking Forward – 2018–2027.
<https://www.buildforce.ca/en/products/national-summary-2018-highlights>

One possible opportunity to develop skilled trade workers could be through the adoption of a work-integrated learning strategy. Many companies already partner with post-secondary institutions and offer experiential learning opportunities, but standardizing these programs at either the provincial or federal levels could help encourage students to see skilled trades as viable long-term career options. Additionally, by offering work placements, government programs can develop the specialized talent that today’s infrastructure projects require, increasing the employability of these students post graduation and helping companies fill any looming gaps. With high retirement rates and sector growth continuing, Canada will be challenged to fill the gap between the supply and demand of workers, as illustrated in Figure 7. Canada should look to standardize qualifications across jurisdictions to allow for increased mobility of skilled tradespeople, and step up recruitment efforts for immigrants, women, Indigenous groups, and other under-represented groups. At the provincial level, efforts to balance the supply and demand of workers has resulted in strategies to increase the emphasis on on-site training as compared to traditional classroom learning, to increase retraining opportunities, and to remove strict apprenticeship regulations for workers in transition and for those lacking formal academic credentials.

As global infrastructure leaders recently observed, the industry needs to build a pipeline of talented and diverse project leaders to set critical projects up for success over the long term. This goal will require “digital talent” young professionals (e.g., data scientists) who can assist in the use of new technologies to better anticipate and mitigate issues and risks, including designing infrastructure that is adaptable over time.⁵⁵

54 Fenn, “Infrastructure Ontario: A Key Agency to Implement the Long-Term Infrastructure Plan,” op. cit., 39.

55 Global Infrastructure Initiative, “London 2018 Summit: Major Project Delivery and Digital Transformation,” op. cit., 10.

5. INNOVATION AND TECHNOLOGY RISK

Global trends such as increasing urbanization and technological advancement are impacting the types of infrastructure we build and how we build it. For example, public transit systems and utilities need to incorporate innovative and technologically-enabled design elements to meet the needs of an urbanized 21st-century population.

In order to design and build this infrastructure effectively, pertinent data must be collected on the state of current assets to better understand where investment is needed immediately. “Smart city” data and Internet of Things (IoT) connected nanosensors can help municipalities with asset management to ensure that infrastructure remains in good shape and is repaired before complete deterioration occurs, thereby saving asset owners substantial costs.⁵⁶ These technologies can also ensure that funds are not invested prematurely or when infrastructure should be replaced rather than sustained. Smart city measures have the potential to improve the daily lives of citizens and increase efficiency in a number of ways. The Government of Canada has initiated a modest but intriguing program to solicit proposals for developing smart cities, but there is significant work to be done to scale up this technology and leverage the potential benefits.⁵⁷

Asset management practices have long been fragmented across municipalities, with Statistics Canada reporting that almost 40% of core public infrastructure owners, including municipalities, now have asset management plans in place.⁵⁸ Ontario has recently mandated municipal asset management plans, which is a progressive measure, but advancements in this area will not sufficiently clarify investment needs. Surveys of the condition of existing assets do not address the need for replacement or new infrastructure. An equally productive, complementary inventory would be a database of completed infrastructure projects. The data Canada currently relies on to select infrastructure projects is fragmented across levels of government and requires more consistency in order to effectively develop state-of-the-art projects. There is a well-positioned role for the CIB to require a central inventory of public infrastructure owned by all levels of government, including information such as what the all-in project costs were, whether there was scope creep, and whether the projects were delivered on time and on budget. This data collection role is provided for in the legislation establishing the CIB as a “centre of best practices.”⁵⁹

A risk related to rapid technological advancement—especially if widespread smart city adoption occurs in the infrastructure space—is the risk of technological obsolescence. This risk can be described as technological advancement outpacing what is currently being adopted, making current technologies obsolescent compared to their modern counterparts. A potential strategy for mitigation in this area could be to adopt more scalable and adaptable technology to allow for gradual integration and updating as technology advances.

Innovative technologies are also at the forefront of Ontario’s consideration of high speed transportation options. In 2018, the former Ontario government committed to building high speed rail between Toronto and Windsor. Start-up companies like Transpod have encouraged federal and provincial decision-makers to look beyond conventional technology and consider hyperloop transportation systems, which are in various stages of planning in the United

KEY RISK COMPONENTS

- Asset management
- Standardized project data
- Smart city technology
- Procurement challenges
- Partnerships driving innovation

56 Michael Fenn, “Megatrends: The Impact of Infrastructure on Ontario’s and Canada’s Future,” 2016, 20, http://rccao.com/research/files/RCCAO_Future-of-Infrastructure_JULY2016_WEB.pdf.

57 Infrastructure Canada, “Smart Cities Challenge,” 2018, <https://www.infrastructure.gc.ca/cities-villes/index-eng.html>.

58 Statistics Canada, “Canada’s Core Public Infrastructure Survey: Asset Management, 2016,” *The Daily*, 2018, <https://www150.statcan.gc.ca/n1/en/daily-quotidien/181210/dq181210c-eng.pdf?st=2CPTdmBw>.

59 Fenn, “Infrastructure Ontario: A Key Agency to Implement the Long-Term Infrastructure Plan,” op. cit., 22–23.

States, Europe, Asia, and the Arabian Peninsula as they offer exciting prospects for “new” infrastructure that could offer a longer-term competitive edge.⁶⁰ With ongoing challenges in IT procurement at different levels of government and concerns regarding cybersecurity, agile or smart procurement processes will need to be implemented to ensure that infrastructure technology can keep pace with change. At a minimum, we must design our infrastructure in a manner that it can be adapted to respond to new technological innovations and changes in the patterns of infrastructure use over time.

Beyond addressing the current issues and solving problems as they arise, Canada should also strive to employ innovative thinking to capitalize on future opportunities. Employing “smart growth” policies that work on solving the issue of urban sprawl and creating resilient communities for the future is one potential area where innovative thinking can be leveraged to solve an immediate problem, while also being an area to export Canadian expertise to other markets facing similar challenges.⁶¹ Similarly, construction and engineering needs to evolve to incorporate innovative materials and design in project plans. To encourage innovation, flexible procurement processes should be leveraged, but provinces should also look at adapting a similar model to Alberta Innovates, which supports and accelerates research, innovation, and entrepreneurship in Alberta by partnering with companies and organizations within the province to create solutions to modern problems that citizens face.⁶² A key aspect of the innovation ecosystem is partnering and collaborating with companies and community organizations. All levels of government should be looking for opportunities to leverage these partnerships to create a promising future for Canadian infrastructure.

6. ENVIRONMENTAL SUSTAINABILITY AND CLIMATE CHANGE RISK

There is a pressing need for environmentally sustainable and climate-resilient infrastructure worldwide. These issues are especially important in the infrastructure space due to the potential costs of neglecting them or making wrong decisions in project selection. While notions of what is “sustainable” vary, sustainable infrastructure can be understood as “projects that are planned, designed, constructed, operated, and decommissioned in a manner to ensure economic and financial, social, environmental (including climate-resilient and climate-smart), and institutional sustainability over the entire life cycle of the project.”⁶³ Environmentally sustainable infrastructure considers the preservation, restoration, and integration of infrastructure projects within the natural environment, including maintaining biodiversity and ecosystems, as well as being sited and designed for long-term resilience to climate and natural disaster risks. This type of infrastructure also endeavours to limit pollution over the life cycle of the project and contributes to a low-carbon and resource-efficient economy.⁶⁴

KEY RISK COMPONENTS

- Higher costs of infrastructure
- Shared responsibility among stakeholders
- Traditional procurement processes
- Environmental policy and innovation

60 TransPod, “TransPod Releases Initial Cost Study for Hyperloop System in Toronto-to-Windsor Corridor,” 2017, <https://transpod.com/en/press-room/press-releases/transpod-releases-initial-cost-study-hyperloop-system-toronto-windsor-corridor>; Josh Lipton, “Hyperloop Will Be Here in 2020 and the Impact Will Be Huge,” CNBC, March 7, 2016, <https://www.cnbc.com/2016/03/07/hyperloop-will-be-here-in-2020-and-the-impact-will-be-huge.html>.

61 Smart Growth America, “What Is Smart Growth?” 2018, <https://smartgrowthamerica.org/our-vision/what-is-smart-growth>.

62 “Alberta Innovates,” 2018, <https://albertainnovates.ca>.

63 Inter-American Investment Bank, “What Is Sustainable Infrastructure? A Framework to Guide Sustainability Across the Project Cycle,” *Technical Note No. IDB-TN-1388*, 2018.

64 Inter-American Investment Bank, op. cit., 12.

As the recent report by the Intergovernmental Panel on Climate Change makes clear, governments must take immediate steps to reduce carbon emissions to slow the progression of global warming.⁶⁵ If global warming progresses at current rates, natural disasters will also continue as major structural disruptors, potentially resulting in trillions of dollars in damage and loss of human life. This prediction is reinforced by a recent report which states, “Over the past decade, climate change and storm events have cost the world nearly \$2 trillion and affected nearly 4 billion people. Projects around the world face the challenge of building and protecting infrastructure that can withstand several climate and weather impact scenarios that could unfold because of global warming.”⁶⁶ Infrastructure has a unique opportunity both to mitigate the impact of climate change (e.g., via storm water management systems and more resilient buildings and bridges, etc.) and to reduce the impact of human activity on the environment (e.g., via energy conservation, reductions in traffic congestion, reduced carbon footprint in transport, energy generation, and construction techniques). Governments and infrastructure contractors have a responsibility to work together to ensure that construction techniques are reducing their carbon output and using the latest construction innovations to ensure long-term resiliency of assets in the face of natural disasters.

As noted earlier regarding infrastructure itself, environmental sustainability measures require cooperation in their execution, but first, they require a collaborative effort across society to set goals and targets. Fortunately, many institutional investors, including pension plans, have recognized the need for environmental sustainability and built these requirements into their investment criteria, adding incentives for project planners seeking investment to incorporate environmental sustainability considerations. Additionally, shifting the focus of corporate social responsibility towards environmental sustainability concerns can help infrastructure project partners embrace sustainable infrastructure projects and sustainable designs in procurement processes. Government funding programs have also included criteria for investments that consider environmental implications. For example, Infrastructure Canada has adopted a climate lens as a requirement for several funding programs, using both a greenhouse gas (GHG) mitigation assessment and a climate change resilience assessment to anticipate, prevent, withstand, respond to, and recover from a climate change-related disruption or impact.

Paradoxically, current public procurement practices may “over-specify” projects in the interest of avoiding project risks. Some industry players assert that over-specifying may be denying designers the opportunity for innovation, including in the areas of environmental sustainability and energy efficiency. Project design is an area where Canadian industry capacity could be expanded and innovation encouraged with the right procurement requirements and incentives. Leveraging innovations in engineering and construction technology can help to ensure the resiliency of long-lived assets in the face of climate change. Recognizing that construction and engineering techniques from 50 years ago may not be sufficient for current climate patterns is critical in integrating 21st-century engineering and construction innovation into project proposals. Although upfront costs for innovation may be higher, long-term resiliency can save investors money by preventing costly emergency refurbishment down the road. These long-term resilient innovations also ensure that assets remain safe for public use and continue to support economic productivity in the face of climate change. An alternative to building traditional capital assets could be to invest in natural infrastructure solutions, such as wetlands and floodplain conservation. To achieve (and fund) these outcomes, many municipalities are exploring storm water levies, full-cost water rates, and expanded floodplain land dedications for new urban developments.

Long-term responsibility for long-lived assets may be achieved through procurement contracts and infrastructure management structures; an example would be including provisions for long-term maintenance, operation, and rehabilitation in the deal structure of a P3 project. If a project consortium is responsible, under penalty, for ongoing

65 Intergovernmental Panel on Climate Change, “Special Report on Global Warming of 1.5 °C (SR15),” 2018, http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.

66 Global Infrastructure Initiative, “London 2018 Summit: Major Project Delivery and Digital Transformation,” op. cit., 11.

operation and for returning the infrastructure to the public authority to a specified standard at the end of the concession term, the consortium inevitably pays more attention to designing more robust infrastructure to reflect those expanded obligations.

If global emissions continue on the current trajectory, coupled with Canadian population growth patterns, the economic consequences of climate change in Canada could escalate from approximately \$5 billion per year in 2020 to between \$21 billion and \$43 billion per year by the 2050s.⁶⁷ These figures only address part of the economic impact of climate change. Additional economic consequences may result from the immediate need to stabilize or repair damaged infrastructure that was most vulnerable to natural disasters. Similar risks arise from failure to maintain infrastructure in a good state of repair, like the 2018 Genoa Autostrada bridge collapse or the 1995 Toronto Transit Commission subway tragedy.

The results of *Canada's Core Public Infrastructure Survey* indicate an increasing adoption of climate change considerations in asset management plans for public assets, but that almost 20% of municipal and regional public infrastructure owners nationally have not considered climate change adaptation in asset management plans.⁶⁸ Climate change has impacted many economic sectors in Canada. At present rates, it may have a very strong impact on Canada's future economic competitiveness and on our ability to attract business investment. Additionally, the current preoccupation with low-cost project delivery may stifle Canada's ability to procure sustainable infrastructure that can come at a higher cost than traditional assets. In mobilizing public support for sustainable and resilient infrastructure, and by investing in and taking action on climate change adaptation for existing public and private infrastructure, Canada could be in a position to save billions of dollars in emergency repairs, improve the resiliency of the Canadian economy, and protect businesses from lost profits due to infrastructure failure.

With strategies to reduce carbon and GHG emissions coming from all levels of government, companies and project partners may find advantages in becoming more "carbon competitive." These policies and procurement ratings that reward carbon-competitive bids may further incentivize companies to leverage new technology and design elements to reduce carbon and GHG emissions in order to gain a competitive edge in procurement processes. Effectively leveraging asset management data and climate data in combination with vulnerability assessments and scenario planning can also assist policymakers in long-term infrastructure planning.

67 National Round Table on the Environment and the Economy (Canada), "Climate Prosperity Paying the Price: The Economic Impacts of Climate Change for Canada" (Government of Canada, 2011), <http://nrt-trn.ca/climate/climate-prosperity/the-economic-impacts-of-climate-change-for-canada/paying-the-price>.

68 Statistics Canada, "Canada's Core Public Infrastructure Survey: Asset Management, 2016," op. cit.

CONCLUSION

Decades of complacency and neglect have left Canada with a concerning infrastructure deficit. While recent investments in infrastructure by governments and the private sector across the country have had a positive impact, significant risks and challenges remain and if they are not adequately addressed, they could have consequences for Canada's economic competitiveness.

Allocation of massive funds for a wide range of infrastructure projects will not necessarily result in success. Existing infrastructure assets will need to be properly maintained and will require sufficient budgets. However, it is the strategic transformative infrastructure investments which have the potential to make a real difference. Such project decisions will need to be made on the basis of compelling evidence in terms of demand, return on investment, and strategic value to the economy.

This discussion paper has emphasized the importance of understanding and mitigating the macro risks facing Canada's economic infrastructure agenda; central to this is the relationship between business leaders/investors and government to collectively find solutions to address these risks.

Political and regulatory risk represents uncertainty and unpredictability for various partners in infrastructure projects and can impact the mobilization of public and private capital. Investors desire stable, consistent, and reliable environments and sufficient autonomy. Governments want reassurance on timely delivery and value for money. Mitigating political and regulatory risk requires a balanced approach to the regulatory processes, including adequate public consultation to protect the public interest and sensitivity to business needs.

Governance risk relates to the transparency and communication of priorities among different stakeholders. Critical considerations include how, by whom, and on what basis decisions are made on project selection. Prioritization and incentive alignment among governments—and with infrastructure business partners—are essential mitigating factors moving forward.

Funding and financing risk arises when there are potentially limited options for procurement and funding of projects. The P3 model has proven to be an effective approach for certain large-scale infrastructure projects as it leverages the relevant expertise of both private sector and public sector partners. Further, more creative instruments can be adopted to allow infrastructure's investors, builders, and government sponsors to manage risks.

Industry capacity risk requires a proper assessment of the capabilities of firms, the workforce (including specialized expertise), and the supply chain in order to ensure that projects do not get bottlenecked and lead to delays and cost overruns.

Innovation and technology risk relates to practices of leveraging technology to assist in data collection and asset management to support data-informed decision-making, and public and private sector collaboration to encourage innovation.

Finally, **environmental sustainability and climate change risk** considers the rising costs of climate change and the opportunity for Canada to protect economic infrastructure assets from climate-related deterioration through collaboration between the public and private sectors.

To facilitate further discussion of the risk-based approach to economic infrastructure investment and development in Canada, the Lawrence Centre has identified a series of questions below. We hope all those interested in this critically important policy area will reflect on these questions and offer their ideas, perspectives, and insights with a view to making Canada one of the global leaders in economic infrastructure.

KEY DISCUSSION QUESTIONS

1. What strategies can be employed to manage the needs and costs of refurbishing and expanding existing assets while also initiating new, strategic, transformative infrastructure?
2. Which global best practices can Canada adopt to help mitigate political and regulatory risk for infrastructure's investors, builders, and government sponsors?
3. How can public-private partnerships be optimized to advance infrastructure investment and development in Canada?
4. What approaches and strategies should Canadian governments consider to ensure a better balance of infrastructure projects funded from the tax base and public debt, as well as through user-pay and commercial mechanisms?
5. What global practices should Canada adopt to ensure optimal infrastructure project selection and prioritization in order to support its economic competitiveness and other public policy goals?
6. Is the industry capacity gap real or perceived, and what steps are necessary to prevent it from becoming a major barrier?
7. How can Canada adopt more flexible infrastructure procurement methods, in order to allow for increased innovation in project design, while preserving the quality of its infrastructure assets and managing financial risks?
8. Where are there opportunities to make a technological leap in areas of infrastructure (e.g., transportation), rather than simply refurbishing existing or even obsolescent infrastructure?
9. What steps must Canada take to become a global leader in the development of sustainable, energy-efficient, and climate-resilient infrastructure?
10. Beyond the risks identified in this paper, what other significant risks need to be considered in the future development of infrastructure projects?

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