

INVESTING IN ONTARIO'S PUBLIC INFRASTRUCTURE: IMPROVED ECONOMIC EVALUATION OF BENEFITS AND RISKS

With the recent Federal election, the landscape for infrastructure investment has been transformed. The majority Liberal governments in both Queen's Park and Ottawa have an excellent opportunity to proceed with their plans to invest more than \$255 billion collectively in public infrastructure over the next 10 years. Less well understood but at least as crucial is the opportunity to address evidence-driven research calls for a new era of cooperation between Ottawa, Queen's Park and municipalities. Much better data, metrics and other analytics are essential for all three levels of government to work more closely together to achieve long-term, sustainable approaches to infrastructure investment in Ontario.

With federal-provincial political and policy barriers softening for good infrastructure investment decision making, strategic considerations and realistic evidence-based approaches to resource allocation will be crucial to attain the socioeconomic prosperity that Canadians deserve. Choosing the proper method of execution will depend critically upon accurate and effective analytics to ensure that the Canadian economy continues to grow.

SERIOUS CHALLENGES: CONVENTIONAL INFRASTRUCTURE EVALUATION METHODS

Despite the clear need for coordinated and effective policy, there are serious issues with the conventional models currently available. Traditional approaches such as input-output models do not properly recognize the unique characteristics and critical support role of public infrastructure. These conventional models result in a limited measurement focused mainly on the short-term economic stimulus effects.

CANCEA's Prosperity at Risk (PaR) computer simulation platform uses agent-based modelling (ABM) and a "systems thinking" framework. PaR's platform acknowledges the vast range of economic, financial, mobility and other interactions in order to understand a system, such as an economy, as more than the sum of its parts, but rather as the relationships among a mixture of entities that act upon one another. **A critical weakness in traditional thinking is its inability to capture what is at risk tomorrow if an investment is not made today.** Systems thinking valuation includes all of the jobs and other indicators of a well-functioning society that are preserved if the investment is made, and stand to be lost if it is not. It therefore serves as a fundamental differentiator of not just investment quantities, but investment types, timing and amounts.

To showcase the point, CANCEA's research considered the impact of a hypothetical \$10 billion in infrastructure investment made in Ontario to the impact of an equivalent (but much more humorous) provincial spend on the consumption of ice cream. While this scenario of ice cream spending is not a

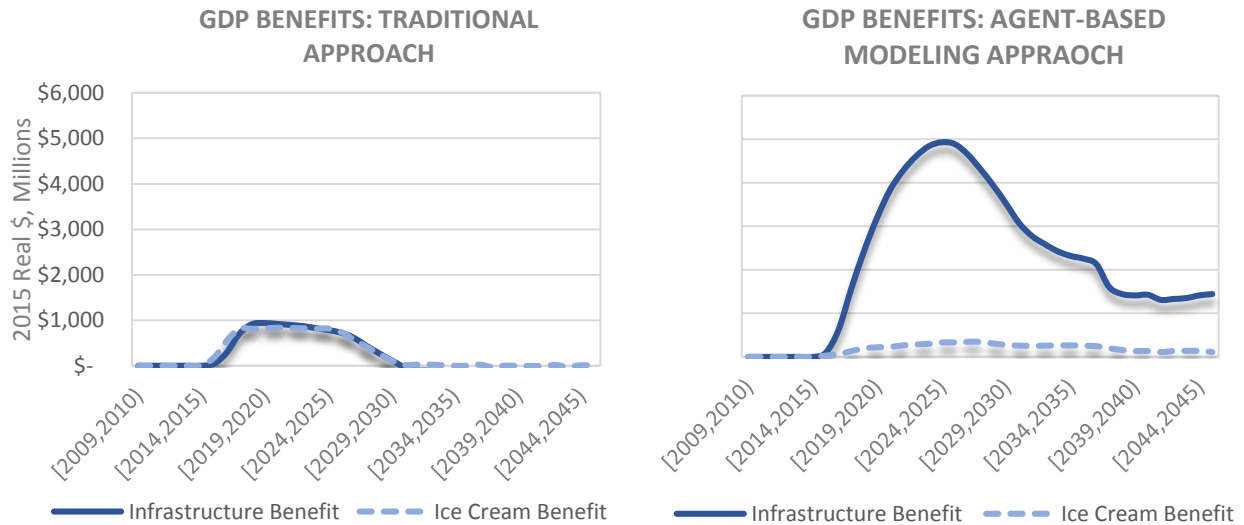
reflection of reality, in comparing the results between the types of investment across the two models considered, we are able to demonstrate the following:

- ✿ The value of the quality, type and timing of the infrastructure investment to the economy;
- ✿ The economic value of infrastructure beyond its impact as a short-term economic stimulus;
- ✿ The importance of accounting for the system effects when evaluating an investment in infrastructure; and
- ✿ The overall capacity and appropriateness of ABM that includes productivity coupling for the evaluation of infrastructure investments relative to traditional input/output modeling.

When accounting for the systems effects of infrastructure supporting socioeconomic activity, we found that the GDP impact in Ontario of an infrastructure investment is almost:

- ✿ Eight times as large as the impact predicted by traditional modeling; and
- ✿ Over eleven times as large as the GDP impact expected from an equivalent expenditure on ice-cream.

GDP BENEFITS OF \$1 BILLION ANNUAL INVESTMENT: A COMPARISON



Considering the results shown on the left graph, the research demonstrates that conventional models would need to label their results very clearly to show whether you were looking at the effects of infrastructure or ice cream spending. Using ABM to measure infrastructure’s vital support role, the results on the right graph provide a stark difference: creating eight times the growth in real GDP relative to what conventional models show. The graphs illustrate how standard economic models miss much of infrastructure’s benefits, especially the multi-decade contributions to GDP, incomes, private investment, and public sector revenues.

EVALUATION OF ONTARIO’S \$130 BILLION 10-YEAR PLEDGE

Turning attention to Ontario’s 10-year pledge for a \$130 billion infrastructure investment, the same evaluation approach was used to demonstrate the direct, indirect, induced, and systems effects that will support the growth of GDP, jobs, employment, wages, and tax revenues across all levels of governments. Key results for Ontario from the analysis are presented in the following table.

**KEY RESULTS FOR \$1 BILLION IN INFRASTRUCTURE INVESTMENT
(\$130B TOTAL INVESTMENT PROGRAM MODELED AFTER PROVINCIAL PUBLIC ANNOUNCEMENT)**

Economic Indicator (2015 real \$, Billions)	30-year Traditional Analysis Results	10-Year Agent-Based Modeling Results	30-year Agent-Based Modeling Results
Real GDP	\$1.2 (0% systems benefit)	\$9.1 (\$6 systems benefit)	\$16.3 (\$13.4 systems benefit)
Private Capital Investment	\$0.1	\$4.3	\$4.3
Job creation (job-years)	15,000 job-years (0% systems benefit)	45,000 job-years (66% systems benefit)	85,000 job-years (80% systems benefit)
Total wages paid	\$0.9	\$2.7	\$6.5
Provincial tax revenue	\$0.2	\$0.9	\$1.7
Federal tax revenue	\$0.2	\$0.8	\$1.6

CANCEA’s PaR projections show that Ontario’s economy is projected to grow by over 40% over the next 30 years, and that Ontario’s public infrastructure investment of \$130 billion supports approximately 11% of that GDP growth. That is, on average, a **\$1 billion investment in Ontario’s infrastructure generates and supports \$16.3 billion in GDP in the Province over the next 30 years, assuming other growth occurs.** Other economic impacts merit highlighting.

- **Job growth** is expected to reach approximately 20% above current levels with approximately 30% of the growth being supported by the planned infrastructure investments. On average, a \$1 billion investment generates 15,000 job-years and potentially supports a further 70,000 job-years in the province over the next 30 years.
- **Wages** paid are expected to grow by approximately 42%, with 19% of that growth supported by the planned infrastructure investments. That is, over the next three decades, \$6.5 billion in additional total wages paid are expected for every \$1 billion invested in infrastructure.
- **Tax revenue** benefits follow. Provincially, for every \$1 billion invested in infrastructure as part of the outlined \$130 billion planned investment, \$1.7 billion in Provincial tax revenues and \$1.6 billion in Federal revenues will be generated over the next 30 years.

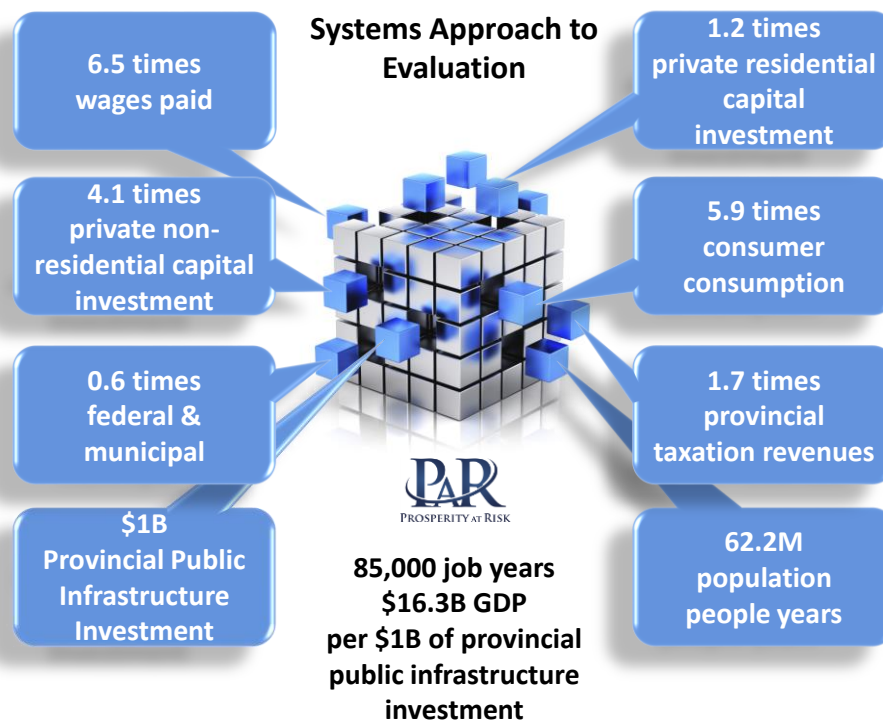
85,000 job-years per \$1B of the 10-year pledge invested include:

- **15,000 job-years are generated**
- **70,000 job-years are supported (systemic)**

Systemic benefits are vitally dependent upon other things occurring. It is a measure of both benefits and what is at risk.

MEASURING THE ABILITY OF INFRASTRUCTURE TO SUPPORT, NOT JUST GENERATE

The results demonstrate that infrastructure investment has a much greater role in supporting population and enabling economic growth; it is much more than simply a short-term stimulus to the economy. That is, appropriate infrastructure investment is one support pillar in a portfolio of events that combine to generate economic prosperity. Of the 85,000 job-years that a \$1 billion infrastructure investment supports on average, 83% of the result is due to supporting other activities that occur at the same time, as the following figure illustrates.



So while the role and value of infrastructure is significant, the bulk of its value is dependent upon economic development, appropriate and coordinated planning, population growth and whether the \$130 billion is invested in infrastructure stock that supports growth. This is essentially what makes the difference between generating only 15,000 job-years for every \$1 billion of infrastructure invested, and 85,000 job-years over the next 30 years.

CONCLUDING REMARKS

Given that much of the public infrastructure in Canada requires investment, proper evaluation of the investment opportunities to support effective spending is not just an academic exercise. With the federal election over, all three tiers of government have important decisions to make for strategic infrastructure investment. We all know that public infrastructure investments are important and we understand that good projects are essential. This analysis has uncovered a crucial policy challenge: our evaluation techniques need to improve. Otherwise, the funding may be misallocated relative to our urgent infrastructure priorities.

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