

An Independent Study Commissioned by



RESIDENTIAL AND  
CIVIL  
CONSTRUCTION  
ALLIANCE OF  
ONTARIO  
**Constructing Ontario's Future**

# Investing in Ontario's Infrastructure for Economic Growth and Prosperity

May 2013




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## EXECUTIVE SUMMARY

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This report documents the potential employment and other value-added benefits of infrastructure investments in Ontario. In particular, it details the impact of infrastructure investment as a counter-cyclical fiscal policy tool. A review of the recent literature reveals that infrastructure investment serves both as a tool for job creation and as a stimulus for the economy as a whole. During recessionary times infrastructure investments have been able to boost the economy and have served as a primary job creation tool, especially when the private sector investments have dried up. At the same time, these investments have produced the infrastructure necessary to support future economic growth. Published research also revealed that the input-output models have been the preferred tool to capture the relationship between infrastructure investments and their impact on economy. Thus, the primary aim of this report is to illustrate the impact of infrastructure investment on job creation, GDP, and tax revenue in the Province of Ontario using an input-output model.

The report documents the results of a simulation exercise, using an input-output model of the Ontario economy based on a 2008 industry structure that estimated the economic impact of a \$12-billion public sector (government) investment in non-residential building and engineering construction in Ontario. This infrastructure investment is estimated to have a \$38.4-billion impact on the province's economy. The \$12-billion investment would create an estimated 203,000 jobs (person-years of employment) in the provincial economy, generate an estimated \$10 billion in employment income and increase the provincial GDP by an estimated \$18.5 billion. This investment would also generate an estimated \$668.7 million in corporate taxes and \$161.2 in personal income taxes.

When the impacts are normalized to a \$1-billion stimulus, the IO simulations revealed that during the 2008 recessionary period in Ontario, every billion dollars invested in non-residential building and engineering construction would create almost 17,000 new jobs. Of those, the model estimated 3,050 jobs in direct impact, 2,850 jobs in indirect impact, and 11,000 jobs in induced impact.

These benefits are in addition to the longer term direct benefits of infrastructure investments that would result from the use of new or rehabilitated infrastructure. For instance, a \$12-billion investment in transportation infrastructure could result in a significant improvement in accessibility and mobility in the region, and related improvements in labour and business productivity. The above-mentioned monetized impacts of infrastructure investments, however, are above and beyond the positive impacts on accessibility and productivity.

Finally, the report reviews transportation infrastructure plans for the Greater Toronto and Hamilton Area (GTHA) and discusses the investment tools identified recently by various agencies. The report concludes that public-private partnerships for infrastructure development will promote greater use of private capital in the construction and

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development of public infrastructure. User fees and those taxes that are likely to modify consumer behaviour are recommended as the preferred tools for revenue generation to support the construction of new infrastructure.

We recommend that sufficient funds should be made available for infrastructure development and renewal in Ontario (as well as in Canada) to maintain the competitiveness of our businesses. The opportunity cost of not spending now reduces the productive capacity of the economy in the future, especially when public capital investments in infrastructure have the potential to generate immediate and substantial productivity gains.

## **1.0 INTRODUCTION**

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The latest economic recession that began in 2008, which spread from North America to the rest of the world, is arguably the worst recession since the Great Depression in the 1930s. In fact, several economists argue that the devastating impact of the latest recession may be worse than the Great Depression.

This report explores the potential benefits, costs, and risks associated with investing in public infrastructure to address the devastating economic impacts of recession. More specifically, it explores the argument that a long-term program of public sector investment in infrastructure development and rehabilitation, in partnership with the private sector, would have two immediate benefits:

1. Any investment in critical infrastructure will add to the productive capacity of the economic engine. Thus, when the demand for goods and services starts to increase, the newly added capacity, brought about in part by investments in infrastructure, will sustain and promote continued economic growth.
2. Infrastructure development during recessions creates job opportunities at a time when lack of investment and/or expansion by the private sector results in either no new job creation or worse, and, more likely in the emerging context, job losses.

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There continues to be a debate amongst economists about the role of government during recessions, as evidenced in a recent Huffington Post article by Jeffrey Sachs, entitled “Professor Krugman and Crude Keynesianism”, in response to Krugman’s articles urging governments to offer broad economic stimuli to kick-start the economic recovery. Sachs argues against “...temporary tax cuts and temporary spending programs” but for “...a consistent, planned, decade-long boost in public investments in people, technology, and infrastructure.” He also argues that: “Such a sustained rise in public investment should have been paid for by ending Bush-era tax cuts in 2010, or by adopting a comparable boost in revenues.”<sup>1</sup>

Investment in critical infrastructure, i.e., roads, tunnels, bridges, public transit, seaports, sewers, fibre optic networks, and the like, are examples of infrastructure investments that have been cited in the academic and professional literature to put national and sub-national (i.e., state, provincial, or municipal) economies back on track.

This report will provide greater clarity about investments in infrastructure during recessionary times by:

1. Providing a detailed review of academic and professional literature about infrastructure investments during recessions and their impact on economic recovery, and adding production capacity to the national and/or sub-national economic systems.
2. Simulating the impact of infrastructure investments in Ontario using input-output (IO) modelling to determine the multiplier effects of infrastructure investments in the socio-economic spheres of Ontario.

It is hoped that the resulting deliverables will contribute to the debate on the opportunities for governments in addressing job losses during recessions by investing in infrastructure in partnership with the private sector. The study supports the mission statement of the Residential and Civil Construction Alliance of Ontario (RCCAO), which states that RCCAO will “strive to provide real solutions to difficult issues affecting the industry by ... researching these issues and developing reports that outline recommended courses of action.”

1 [huffingtonpost.com/jeffrey-sachs/professor-krugman-and-cru\\_b\\_2845773.html](http://huffingtonpost.com/jeffrey-sachs/professor-krugman-and-cru_b_2845773.html):  
posted March 9, 2013



## 2.0 LITERATURE REVIEW

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Most of Canada's public infrastructure is decades old and is approaching the end of its useful service life. During the same period, Canada's population grew and became increasingly urban, such that 80% of Canadians now live in urban areas. The cores of older cities are experiencing infrastructure deterioration affecting roads, bridges, transit, and water and wastewater systems. The implications of these trends are illustrated by two examples: the Walkerton Tragedy in 2000, which resulted in seven deaths from a contamination of the water supply with E. coli bacteria; and the collapse of the de la Concorde overpass in Quebec on September 30, 2006, which killed five individuals and seriously injured another six.

Public investment in infrastructure (including roads and highways, rapid transit, water supply, and wastewater treatment, rail, aviation, water transportation, as well as electricity and broadband infrastructure) should be seen as a strategic policy concern, given the recent global financial crisis and the increasing reliance for economic productivity on the underlying infrastructure endowments of competing economies. While the present governments in Ontario and Canada have shown greater interest in investing in infrastructure in recent years, it is important that longer term plans be developed to ensure that investment in critical infrastructure continues to sustain growth in Canadian productivity. Such plans must recognize the dangers and high costs of allowing infrastructure deterioration to continue. At the same time, the economic plans should recognize the benefits of investing in new infrastructure and rehabilitation of the existing infrastructure for sustained economic growth.

Infrastructure investment is an important determinant of economic growth in developed and developing countries. The long-term effects of investment in infrastructure are the benefits to the general welfare of society, private individuals, and firms (see RCCAO reports by RiskAnalytica, 2010, 2011). A lack of sufficient investment in critical infrastructure creates economic stagnation in the long term, and missed short to medium-term job creation opportunities.

One of the short-term benefit of infrastructure investments is job creation; however, the academic literature and political decision makers often overlook these short-term benefits because of the long-term nature of these investments, as well as their lumpy and large financial commitment. Paying now to benefit in the future is a much less enticing offer than an immediate tax cut (Fedelino and Hemming (2005), page 503, 2nd footnote).

Public infrastructure is seen as a public good in that an individual's use of infrastructure such as roads or transit does not take away from anyone else's use of that infrastructure. It is therefore difficult or impractical to exclude an individual from using infrastructure. Therefore, public infrastructure produces widespread direct and indirect benefits for everyone in society. The provision of new transportation infrastructure by public agencies

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(or through public-private partnerships, such as Highway 407 ETR where user fees cover the capital as well as operating costs) allows households to enjoy time savings and firms to benefit from improved access to goods and workers.

Numerous countries recognize the short and long-term benefits of infrastructure investments and have incorporated these in their development strategies. In fact, several economists and policymakers recommend aggressive public spending on infrastructure as one of the most favoured expansionary fiscal policies to implement during a recession.

### **Overview of the Literature**

The authors reviewed recent and relevant research into the benefits and costs of a wide range of public infrastructure investments, including urban and regional transportation infrastructure; airports, inland waterways, and marine ports; electricity infrastructure; broadband infrastructure; and water management infrastructure.

The authors considered the short-term benefits of the various types of infrastructure investments, documented the methods used to estimate these benefits, and proceeded to consider the fiscal policy implications of policy options based on recent research findings with respect to government spending multipliers, and the benefits and costs of tax cuts and transfer payments, relative to public investments in infrastructure, especially during recessionary periods.

Additional topics addressed in the literature review of short-term benefits included the “crowding-out” effect (the extent to which investments in public infrastructure might potentially reduce private investment spending) and the dangers associated with a “liquidity trap” (when additional infusions of capital fail to lower interest rates or stimulate economic growth). Separate sections address the literature on firm level productivity effects from public investment and long-term benefits of infrastructure investments including infrastructure and municipal fiscal deficits, fiscal management, long-run costs, and output effects.

### **Short-term Benefits of Infrastructure Investment**

The short-term benefits of infrastructure investment by the government include job creation, improved factor productivity, increased consumption demand, and complementary private capital investment. However, there are also concerns about the potential negative effects of infrastructure investments on financial and goods markets.

Infrastructure investments by taxpayers often raise concerns about the potential crowding out of private investment by increased government spending. However, the validity of these concerns depends on asset substitutability. In theory, at least, public utilities such as public transport, education, and hospitals are substitutable for the

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same services being provided privately. Since the benefits from these services accrue to everyone, the general welfare of society is improved and private firms benefit through the use of public utilities such as roads, railways, and human capital from a well-educated labour force.

At the same time, there are several public sector infrastructure investments, such as highways and sewers, which could not have been profitably provided by the private sector. For these services it is not so much a question of substitutability, but deficiency in provision of a useful service.

The demand-side effect, or the effect on the goods market, is more explicit and has been known to policymakers since the Great Depression. An important concept that changed economic theory was that fiscal policy and government investment can be used to stabilize the economy during recessionary periods. This implies that supplementing low consumer demand and investor pessimism with government spending by running budget deficits could bolster aggregate demand and hopefully stabilize the economy.

By investing in infrastructure projects required to support long-term growth and development objectives, the government can create jobs in the short term, which will reduce recessionary unemployment, provide a substantial number of workers with a steady source of income, and avoid increased reliance on transfer payments.

Public investment in infrastructure has the potential to stimulate economic activity during an economic downturn, despite issues related to implementation delays and fiscal financing schemes. Moreover, infrastructure investment in the United States and Canada has been declining over the past few decades, which has resulted in massive infrastructure deficits in both countries. Mirza and Haider (2003) estimated that the Canadian infrastructure deficit—the amount needed to bring the infrastructure to a “state of good repair”—had reached \$125 billion by 2003.

If the government is to address the pressing long-run structural problems in the economy, there is a clear need for substantial infrastructure investment. In the short run, expansionary fiscal policy in the form of infrastructure investment will stimulate short run aggregate demand, create jobs, and combat economic downturns.

### **Estimation of Economic Impacts – Early Approaches**

In predicting the developmental impacts of new infrastructure, one must not only predict future demand for a currently non-existing facility, but also account for the external effects on the fortunes of cities and regions (McCann and Shefer, 2005). This comment goes a long way in explaining uncertainty with respect to the impact of infrastructure investment. Mera (1973) and Ratner (1983) produced the first estimates of the economic impact of public capital using a macro-level approach, which consists of the estimation

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of a production function, but it was the provocative work of Aschauer (1989) that generated the most interest in the field.

Aschauer (1989) estimated implausibly large returns for public investment. Over the following decades, researchers continued to investigate the relationship between infrastructure investment and economic performance using increasingly sophisticated techniques, resulting in a vast range of estimates of the effect of public capital investment. The conclusions drawn by Aschauer (1989) were challenged on several fronts, including the geographic level of analysis, the bias introduced through measurement error, and the static nature of the aggregate production function model.

The updated multivariate methodology solved some these problems but the results remained inconclusive. Shah (1992) found labour and public capital to be substitutes using a cost function approach, while Lynde and Richmond (1992), Nadiri and Mamuneas (1994), and Seitz and Licht (1995) also found these inputs to be substitutes. For policy purposes, the difference is substantial. If public capital is substitutable with labour, the projected employment effects will be less impressive. When this approach was extended to profit functions, the same ambiguity persisted. Estimating a cost function captures the effect of public infrastructure as an input, but it does not capture the effect of infrastructure as a factor that impacts the productivity of a firm nor does it capture the effect of infrastructure as an amenity that attracts labour or additional private capital (Immergluck, 1993).

Duffy-Deno and Eberts (1991), Garcia-Mila and McGuire (1992), Holtz-Eakin and Schwartz (1995), Morrison and Schwartz (1996), and Munnell (1990) all attempted to estimate the effects of additional investment in infrastructure using a macro-level approach, which identifies the average effect of infrastructure investment on economic growth, but does not identify the economic returns from additional investment, nor does it identify the effect of aggregate investment on an individual firm's production decisions (Berechman, 1994). Econometric studies using this approach generally produce results supportive of the idea that there is a shortage of infrastructure investment, though the literature contends that there are methodological issues and data constraints. Dalenberg et al. (1998) argue that the static aggregate production function analysis used in the macro-level approach is insufficient due to statistical problems such as the endogeneity of inputs and outputs, spillover effects, and stationarity issues.

There is yet another challenge dealing with jurisdictional issues in studying the impact of infrastructure investments. The earlier research used national data and found a positive impact of infrastructure on output. Much of the expansion and maintenance of infrastructure, however, is the obligation of cities and regions. Moreover, because

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investment in infrastructure typically consists of specific projects carried out in a specific area, the economic impacts of a particular project are mostly confined to a narrowly defined region. Beginning with Munnell (1990) and Garcia-Mila and McGuire (1992), the literature began to shift to state-level data, which increased the cross-sectional variation relative to the national data. By using fixed effects to control for differences in regions, researchers found that the estimated relationship weakened between infrastructure investments and economic development.

Much of the literature in Canada has used the third approach mentioned by Gramlich (1994): the implied rate of return of public capital. The recent estimates of the return on public capital (e.g., roads, sewers, airports, etc.) range from 17% in Macdonald (2008) to an upper bound of 25% in Brox (2008), compared to a return on private capital (e.g., telecommunication and power grids) of only 10% to 13%.

Given the difference in rates of return between public and private capital, one can assume that investments should flow to public capital. As the stock of public capital increases, the marginal rate of return on new investments in public capital will decline as a result, until the point where the rates of return in public and private capital are similar. However, this will not occur until the shortage in public capital, which is indicated by the higher rate of return to public capital, is addressed.

## **Causality**

With estimates of the effect of public capital on the economy still far from conclusive, another stream of research considered the issue of causality. While many believe that infrastructure is essential for long-run economic growth, the impact of infrastructure could be endogenous, which means that economic growth leads to expansion of the public stock of capital. Vector auto-regression (VAR) modelling of the dynamic feedbacks between public capital and output has resulted in new insights into the direction of causality. Pereira and Flores de Frutos (1999) found not only that the productivity of public capital is much smaller than implied by Aschauer (1989), but also that public capital exhibits characteristics of an endogenous variable.

Public capital leads directly to higher private production over time. Increasing private output provides the government with increased revenues, which as a result increases the capacity for public investment. Pereira (2000) provides additional confirmation, finding that the evolution of transportation infrastructure is positively related to prior changes in private output. Granger causality tests, as an alternative strategy, have been used in an attempt to establish the direction of causality between public infrastructure and economic development, though with similarly mixed results.

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## Recent Issues in Infrastructure Investments

### Implementation Delays

A common criticism of public investment in infrastructure as a tool for stimulating the economy is the time it takes to get large infrastructure projects underway. It could be the case that by the time public funds are put to use, the economy is already out of recession, particularly for large-scale infrastructure projects. One way to respond to this critique is to place an emphasis on particularly aggressive infrastructure investment programs when there is a substantial probability that the economy will remain in recession for an extended period of time. At the same time, if interest rates are near the zero lower bound or monetary stimulus has not had a real impact on credit markets, public investment will not have any crowding effect.

Another side of this critique is the implication that it is important that expansionary fiscal policy ends with the end of the recession. Many argue that this is bound to be an issue with public infrastructure investment due to implementation delays, but other forms of discretionary fiscal policy such as tax cuts and transfer payments to unemployed citizens or low-income families are not so different—even if the policy was introduced as a form of stimulus. In a democracy, it is politically impractical to reduce transfer payments. Interest groups that form around these programs exert significant pressure on policymakers to leave the increases in place. Similarly, increases in tax rates are not easy to introduce in any economic climate, especially with the short political cycles and the prevalent anti-taxation rhetoric in the U.S. print and electronic media, which are followed in Canada as well.

Leeper et al. (2010) argue that implementation delays and expected fiscal adjustments can diminish the effects of government investments. The velocity of spending is fundamental to the magnitude of the short-run stimulative effects associated with public investment. Many infrastructure projects take months or years to get started, so researchers may want to model these delays. For instance, Leeper et al. (2010) modelled the formation of public capital using a time-to-build setup that includes a parameter that can range according to the estimated implementation delay.

### Modelling Techniques

Recent research has turned to input-output analysis as opposed to the multivariate regression framework. This type of analysis is aimed at estimating the effect of investment on employment—and the economy in general—by modelling the relationships between economic sectors at a point in time using a table of input-output multipliers. This decomposition allows the research to break down the economic impact of infrastructure investment and estimate the three types of economic impacts including job creation:

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direct, indirect, and induced effects. In this context, the direct effects are the jobs directly involved in the building of new infrastructure, the indirect effects are the jobs generated from the purchase of intermediate goods used for the infrastructure projects, and the induced effects are the jobs created through the increased spending of those workers receiving incomes from the infrastructure projects (Heintz et al., 2009).

When one sector of the economy receives a stimulus from the government, this enters the input-output model as a “shock.” An investment of \$1 million into a sector would enter as a demand stimulus, which would lead to a long chain of expenditures in different sectors of the economy. The sector that receives the stimulus will purchase intermediate inputs, and the producers of those inputs will need to buy the raw inputs from other industries further upstream in the supply chain.

The literature generally focuses on the direct and indirect employment effects. One reason for this preference is that induced effects are more difficult to estimate. One must estimate a consumption multiplier (the percentage of new income that is spent rather than saved) through the use of a household consumption function. The size of this multiplier is highly dependent on economic conditions, as an individual’s marginal propensity to consume is a function of expectations of future income and the health of the economy as a whole. Moreover, if employment is high when the infrastructure project starts, there is a small pool of workers that are unemployed and willing to fill the new job opportunities induced by increased spending. For example, Heintz et al. (2009) estimate the consumption multiplier, and then estimate the number of jobs that an increase in spending would create, assuming the economy has some level of excess capacity. In recessionary times this assumption is definitely suitable.

A benefit of using input-output models, as opposed to multivariate regression analysis, is the ability to account for leakages and decompose the employment effects (Heintz et al., 2009). If some of the spending associated with infrastructure projects is used for imported goods and services, this portion of the funding will not create additional jobs in the local economy because there is no effect on domestic output. Additionally, these models allow the researcher to learn much more about the jobs that are created, including the number of jobs in each sector and also the average wage disaggregated by sector. Thus, input-output models contain useful characteristics that permit detailed probe of the employment outcomes from various projects.

Whereas input-output models are regarded to be a reliable method for predicting the impact of an investment, they are static in nature. Thus, the aim of an analysis using this approach is to identify the relationship between economic sectors at a fixed point. It has been noted in the literature that this method may lead to an upward or downward bias, depending on how the parameters of the model change through time, or in response to investment and policy decisions (Katz and Suter, 2009).



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Studies focused on Canadian economy have used Statistics Canada's input-output accounts at both the national and provincial level to calculate induced effects of a shock to the economy. Researchers commonly use household expenditures data to determine the proportion of spending that occurs within the domestic economy. Statistics Canada input-output and household expenditures data are not available at the municipal level, so multipliers estimated at the provincial level must be adjusted using survey data to create an accurate depiction of municipal economies.

### **Timing for Infrastructure Investments**

In recent years, all levels of government in Canada have collaborated and provided funding for local infrastructure in stimulus plans. Federally, the Building Canada Plan provided funding over seven years for public infrastructure investment and was scheduled to expire in 2014. As part of 'Canada's Economic Action Plan 2013', however, the BCP program has been extended, using \$53 million in new and existing (unspent) funds to support ongoing federal investments in "job creating infrastructure." (<http://actionplan.gc.ca/en/blog/new-building-canada-plan>).

The development of a long-term infrastructure plan is in progress, but it is important that this plan is bold and addresses the massive infrastructure deficit in Canada for the nation to reap the long-term benefits of world-class public infrastructure.

The predominant view among policymakers in the western world is that investment in infrastructure should be undertaken only when the economy is doing well enough to concentrate its efforts in that sector. However, there is sufficient evidence to indicate that government investment in infrastructure during a recession can be a viable and effective option in delivering the sought after outcomes. Policymakers have found it easier to view public investment as pro-cyclical, while discretionary forms of fiscal policy such as taxes and expenditures are the primary counter-cyclical tools. The recent global financial crisis saw many governments incorporate infrastructure investment into their expansionary fiscal policies, but for the most part the magnitude of the investment was quite modest. Public investment in infrastructure contributes to the economy's capital accumulation while also helping to reduce volatility around the economy's growth path when implemented as part of discretionary fiscal policy.

### **Findings from the Literature Review**

From the review of academic literature, one can argue that the effect of infrastructure investment on the economy is positive in the short run, but the effect varies across regions and depends on economic conditions and types of infrastructure. The estimation methodology has progressed from simple production functions to more complex dynamic systems in an attempt to capture the total impact of infrastructure investment,



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which has brought with it new insights and new issues. In general, the estimates appear to converge on robust positive effects of infrastructure investment that are more modest, and believable, than initially claimed by Aschauer (1989). With additional investment in infrastructure, one should expect job creation to follow.

The results from the (professional) literature that focus on specific regions, projects, and types of infrastructure are much more conclusive. The professional literature provides evidence for overwhelming positive employment effects from all types of urban, energy, aviation, and water management infrastructure.

Those infrastructure projects that contribute to increases in productivity while simultaneously addressing public health issues and environmental agendas are attractive initiatives. From public transportation to smart grid electrical generation and transmission, there are infrastructure investments that not only produce short-term employment benefits and long-term productivity gains, but also contribute to other priorities of the Ontario and Canadian governments. Even without investing in anything that is explicitly “green,” by investing in productivity increasing infrastructure, there could indirectly be positive environmental impacts as a result of reduced overall energy consumption for a given level of output.

Taking these issues into account, any policy framework should seriously consider the use of aggressive public infrastructure investment as the expansionary fiscal policy of choice. Not only will these programs lead to job creation in periods of high unemployment, they will also increase the general welfare of individuals, and increase productivity and output in the long run.

Here are the key findings from the literature review:

1. Public infrastructure has been a significant contributor to economic growth in the past.
2. Most studies have revealed that the short and long-term impacts of infrastructure investments have been positive.
3. While economists have argued about the magnitude of the impacts, there is a general consensus that the relationship between investments in public infrastructure and economic growth has largely been positive.
4. Previous research has also shown that during recessionary times infrastructure investments have been able to boost the economy and have served as a primary job creation tool, especially when the private sector investments have dried up. At the same time, these investments have produced the infrastructure necessary to support future economic growth.
5. While earlier research has relied on econometric and other methods to capture the impact of infrastructure investments on economy, the general consensus in the literature is that input-output models are the preferred tool to capture the relationship between infrastructure investments and their impact on economy.

## 3.0 INPUT-OUTPUT SIMULATION ANALYSIS AND RESULTS

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This section documents the potential employment and other value-added benefits of infrastructure investments in Ontario. In particular, it details the impact of infrastructure investment as a counter-cyclical fiscal policy tool. The primary aim of our analysis is to illustrate the impact of infrastructure investment on job creation, GDP, and tax revenue in the Province of Ontario.

### Primary Impacts

Using an input-output model of the Ontario economy based on a 2008 industry structure, the simulation exercise estimated the economic impact of a \$12-billion public sector (government) investment in non-residential building and engineering construction in Ontario. This infrastructure investment is estimated to have a \$38.4-billion impact on the province's economy. The \$12-billion investment would create an estimated 203,000 jobs (person-years of employment) in the provincial economy, generate an estimated \$10 billion in employment income and increase the provincial GDP by an estimated \$18.5 billion. This investment would also generate an estimated \$668.7 million in corporate taxes and \$161.2 in personal income taxes.

These benefits are in addition to the longer term direct benefits of infrastructure investments that would result from the use of new or rehabilitated infrastructure. For instance, a \$12-billion investment in transportation infrastructure could result in a significant improvement in accessibility and mobility in the region, and related improvements in labour and business productivity. The monetized impacts of infrastructure investments, however, include more than the positive impacts on accessibility and productivity.

### Methods

The authors have relied on a customized synthetic input-output model of the provincial economy to estimate the impacts of infrastructure investments on employment and other important metrics in Ontario. Our analysis allowed us to visualize the total economic impact of infrastructure investments—impacts that extend well beyond the direct benefits of the infrastructure expenditures themselves. Our model estimated a total impact of infrastructure investments in Ontario (in terms gross industry output, GDP, employment, corporate tax revenue, and personal income taxes) inclusive of all direct, indirect, and induced effects. For example, a direct employment impact includes all jobs generated by the building of new infrastructure (in terms of the sum total of all input expenditures made by the non-residential building and infrastructure industry). The indirect effects, by comparison, would include those jobs generated through the purchase of intermediate goods by all firms (across all industrial sectors)

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directly and indirectly impacted by the direct input expenditures associated with the original infrastructure investment. Induced impacts are those resulting from the overall impact to aggregate consumer demand stemming from the aforementioned direct and indirect impacts. For all metrics, total impacts were computed as the sum of direct, indirect, and induced effects.

When one sector of the economy receives a stimulus, in this case from the government, this enters the input-output model as a “shock.” Based on the review of recent annual investments in infrastructure (see next section, Magnitude of Public Investment), we have conducted our simulations using a value of \$12 billion in public-sector infrastructure investment. Because of data constraints, we are not able to disaggregate the impact of infrastructure investment by infrastructure type, such as roads, bridges, and sewers, all of which would be produced by firms within the non-residential building and engineering construction industry.

This investment will enter as a demand stimulus, resulting in a long chain of expenditures in different areas of the economy. The sector that receives the direct stimulus will purchase intermediate inputs, and the producers of those inputs will need to buy the raw inputs from other industries further down the supply chain.

Past input-output analyses of infrastructure investment in Canada and the United States have typically estimated total employment effects between 10,000 and 15,000 for all infrastructure types for an investment of \$1 billion. The input-output simulation results presented here indicate that the \$12-billion infrastructure investment results in 203,000 jobs, which is equivalent to 16,961 jobs (person years of employment) for every billion dollars invested. These estimates include jobs created as a direct result of the investment in infrastructure construction, indirect effects in industries that provided intermediate goods, and induced effects creating jobs resulting from increased demand because of the new infrastructure. Later in the report, we present a breakdown of jobs by sectors after accounting for direct, indirect, and induced impacts.

A detailed literature review conducted for this study revealed that previous analyses had generally ignored the role of prevailing economic climate on the estimated employment effect. This leaves important information missing. It is widely argued that in recessionary times governments should use expansionary fiscal stimulus, such as infrastructure investment, to mitigate the impact of the economic downturn. The 2008 input-output tables used in the study correspond to the recessionary period in Ontario. Thus, the input-output models estimated using the input-output tables for 2008 indicate that during recessionary period in Ontario, every billion dollars invested in non-residential building and engineering construction would create almost 17,000 new jobs. Of those we estimate 3,050 jobs in direct impact, 2,850 jobs in indirect impact, and 11,000 jobs in induced impact.

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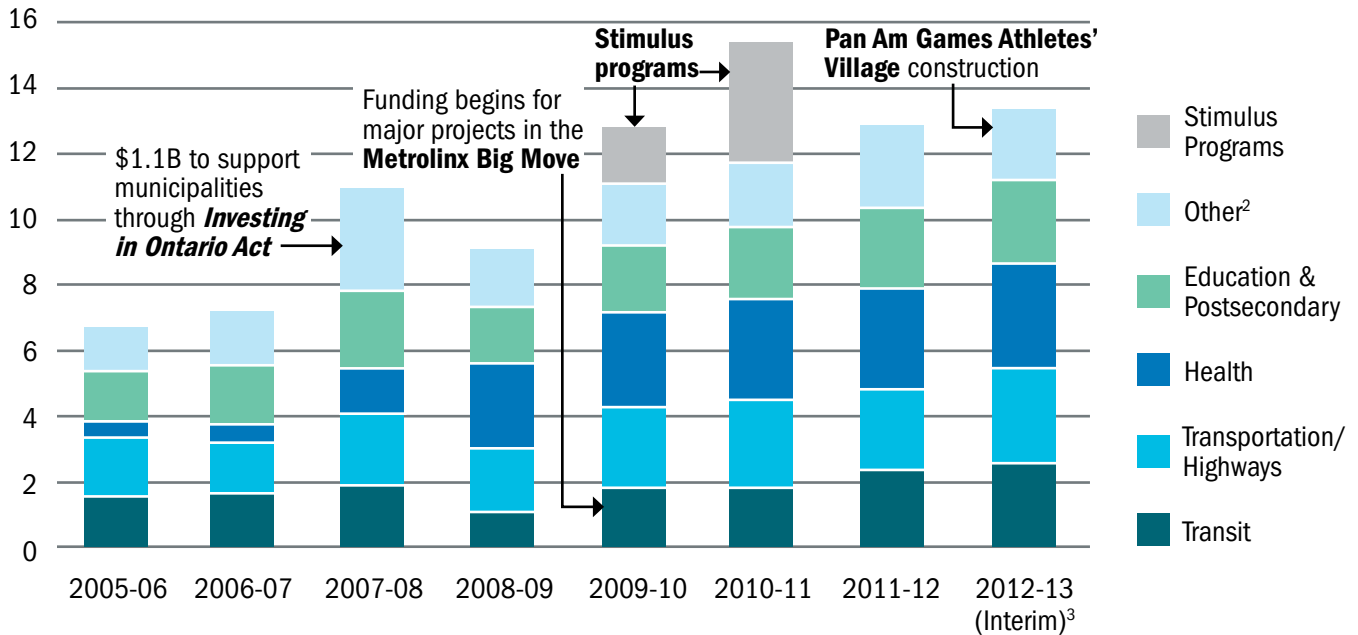
If the infrastructure investments are made during a recession, as was the case in 2008, the estimated jobs would be created at the same time that the private sector would have stopped creating new employment opportunities. Thus the government spending on infrastructure during recessions not only helps construct the much needed new infrastructure (during a period of lower costs for capital, goods, and labour) but it would also generate new employment opportunities for the workforce that struggles to find gainful employment.

The 2008 input-output tables are disaggregated at 104 economic sectors. A background report to this document entitled Investing in Ontario's Infrastructure for Economic Growth and Job Creation: An Input-Output Analysis by Regional Analytics (Feb 8, 2013) presents the economic impact of the \$12-billion infrastructure investment for the 104 economic sectors. The largest impact in dollar terms is felt for the services demanded by the owners of owner-occupied dwellings. This is followed by the impact on retail trade. Most new jobs created in sectors directly related with infrastructure construction were in legal, accounting, architectural, engineering, and related services.

### **Magnitude of Public Investment**

We have chosen \$12 billion in infrastructure investments to be in line with the recent spending by the provincial government. The Government of Ontario's June 2011 Ten-Year Infrastructure Plan included \$35 billion of infrastructure investment in Ontario over a three-year period, or approximately \$12 billion per year. According to the 2012 Ontario Budget, this capital plan allocated \$12.9 billion to 2012-2013, leaving over \$20 billion for the coming two years. Our analysis starts from this level of investment. A review of Ontario's annual infrastructure investments since 2005 demonstrates that there has been a gradual increase from approximately \$7 billion in 2005-2007 to a high of approximately \$15 billion in 2010-2011, as illustrated in Figure 1.

**Figure 1: Infrastructure investments in Ontario (Billion \$)<sup>1</sup>**



1 Includes third-party contributions to capital investment (in consolidated schools, colleges, hospitals and provincial agencies), and federal government transfers for capital investments.

2 Other includes investments in the water/environment sector, justice facilities, and municipal and local infrastructure.

3 2012-13 based on interim outlook forecast.

Source: Ontario Ministry of Finance (2013). 2013 Ontario Budget. Chart 1.12: Highlights of Infrastructure Expenditures by Sector since 2005-06. [http://www.fin.gov.on.ca/en/budget/ontariobudgets/2013/papers\\_all.html#charts](http://www.fin.gov.on.ca/en/budget/ontariobudgets/2013/papers_all.html#charts).

It cannot be ascertained whether these high levels of public investment will continue throughout the rest of the decade. The rapid increase in the latter part of the previous decade was in large part a result of the global financial crisis, which led governments across the world to use public investment as a counter-cyclical policy tool. What has followed the crisis is a widespread concern about levels of public and private debt in the West, as well as a move towards austerity.

**Table 1: A select list of projects proposed by Metrolinx**

ID	Project	Length (km)	Annual ridership (millions)	Estimated capital cost (2014\$ in millions)
1	Downtown Relief Line <sup>2</sup>	13	107	7,400
2	GO Lakeshore Express	121	40	1,700
3	Hurontario-Main LRT	23	29	1,600
4	Brampton Queen Rapid Transit (BRT)	10	17	600
5	Dundas Street BRT (Halton-Peel-Tor)	40	13	600
<b>Total</b>			<b>206</b>	<b>11,900</b>

The rapid transit projects shown in Table 1, selected from the Next Wave Projects that Metrolinx is considering, could be built with a \$12-billion investment in transportation infrastructure. These investments, when completed, would serve an estimated 206 million transit riders per year.

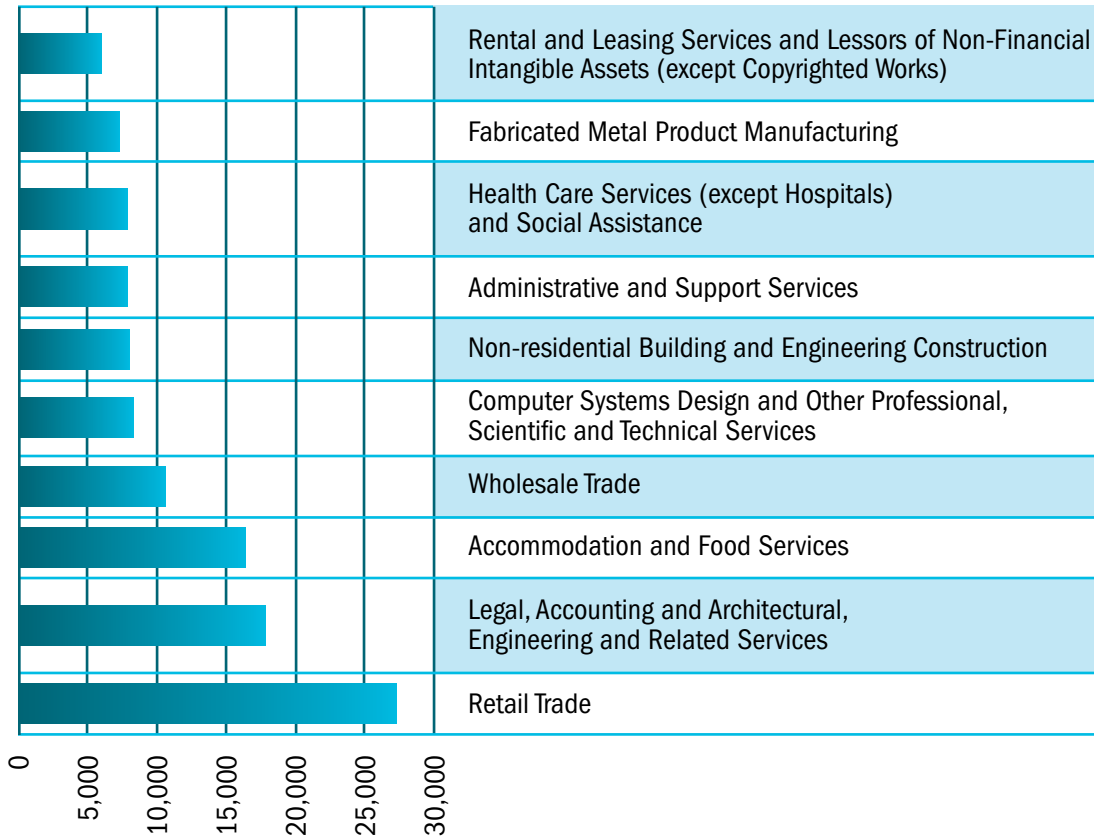
### Employment Effect by Sector/Occupation

Given the dependencies in the economic structure of Ontario, a \$12-billion investment in infrastructure would result in employment generated in many sectors of the economy as shown in Figure 2, which illustrates the top 10 sectors generating the highest employment opportunities.

The direct impacts of non-residential construction would generate employment in construction related trades. Overall, however, most new employment opportunities would likely be created in the retail sector, where an estimated 27,000 new jobs would be created. Following retail, the second-highest number of jobs would be created in legal, accounting and architecture, engineering and related services, with an estimated 18,000 new jobs.

2 In some circles, the phrase 'Regional Relief Line' has been used because of the line's projected regional benefits.

**Figure 2: Employment generated in the top 10 employment sectors**



Another way of looking at the sectoral breakdown of employment is to focus on occupations rather than industries. Instead of focusing on the retail sector, one can focus on occupations employed across the various sectors of the economy. The top 10 occupations generating the highest number of employment opportunities are listed in Table 2. A \$12-billion investment in the non-residential engineering and construction building industry would likely generate 22,000 new clerical positions in addition to the 21,000 middle and other management occupation jobs. Sales and service jobs are the next biggest occupations followed by trades and skilled transport operators.

**Table 2: Top 10 occupations generating employment from investments in infrastructure**

<b>Occupation</b>	<b>Jobs</b>
Clerical Occupations	22,014
Middle and Other Management Occupations	21,072
Intermediate Sales and Service Occupations	20,196
Elemental Sales and Service Occupations	18,762
Trades and Skilled Transport and Equipment Operators	15,948
Skilled Administrative and Business Occupations	12,564
Professional Occupations in Natural and Applied Sciences	11,063
Skilled Sales and Service Occupations	10,922
Processing and Manufacturing Machine Operators and Assemblers	10,598
Intermediate Occupations in Transport, Equipment Operation, Installation and Maintenance	7,255

### **Not All Jobs are Created Equal**

While there has been a general consensus in the research reviewed for this project that infrastructure investments result in economic growth and job creation, the magnitude of these impacts remains debateable. Table 3, which illustrates the range of employment opportunities resulting from new infrastructure investments, indicates that a variety of estimates have been reported in the literature.



**Table 3: Summary of Empirical Studies of Transportation Infrastructure**

Study	Direct/Indirect Jobs per \$1 billion	Induced Jobs per \$1 billion	Infrastructure Type
Heintz et al. (2009)	12,638	17,472	Road Expansion
	14,790	20,317	Road Repair
	17,784	22,849	Mass Transit
SOGC (2006)	8,958	1,791	Road Expansion
Shirocca (2009)	15,300	N/A	Light Rail Vehicles
ECONorthwest (2002)	Total: 30,000 to 60,000		Mass Transit
Peltier (2011)	Total: 11,400		Pedestrian/Bicycle Paths
	Total: 7,800		Bicycle/Roads
Board of Trade of Metro Montreal (2011)	Total: 18,360		Mass Transit
City of Edmonton (2012)	Total: 7,278		Mass Transit

The other source of debate is the fact that the direct, indirect, and induced impacts of infrastructure investments are attached different priority in terms of the degree of importance of these impacts. We present a brief discussion on the nature of the debate and then present our results accordingly.

Academics, economists, policy analysts, and others have been cognizant that the economic impacts of infrastructure investment in terms of new jobs created are at times exaggerated. Thus, some have argued that employment opportunities created in sectors directly and indirectly impacted by infrastructure investments are significantly more relevant than the employment opportunities resulting from induced demand. We have been mindful of these concerns and have therefore disaggregated our employment forecasts by the type of impact on a particular industrial sector resulting from infrastructure investments in Ontario.

We begin by briefly describing the distinction between direct and indirect impacts in input-output models. When modelling the impact of a given shock (stimulus) to an economy using an input-output model, the total impact of the stimulus can be determined in a number of ways, each prefaced on a particular view of where the impact pattern starts and where it ends. Most would agree that the impacts begin when the firms

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immediately affected by the stimulus (i.e., infrastructure investment) begin to purchase inputs to meet the increased demands. These input purchases require suppliers of the said inputs to scale up production; these are the direct impacts. Each of the firms called upon to provide inputs (i.e., those which represent the direct impact) must also draw more inputs from their suppliers as a result. The sum of these “rounds of spending” that come from the initial direct impacts is known as the indirect impact.

In a framework where we assume that income earned by workers in all industries (through direct and indirect effects) is saved and not spent, then the total impact is adequately represented by the sum of the direct and indirect effects. In a system where personal expenditures on goods and services are, to some extent, driven by earnings, then the induced effects of personal consumption need to be added to the direct and indirect effects to approximate the total impact of a given stimulus. Table 4 presents the top 10 industries in Ontario in terms of the direct employment impacts.

The statistics presented in Table 4 are illustrative on several accounts. First, the input-output model is successful in capturing the direct impacts of infrastructure investments. This could be judged from the fact that the industrial sectors most closely associated with infrastructure construction are the ones predicted by the input-output model to have generated most employment opportunities. The second important point that Table 4 illustrates is 72% of the employment generated in the most impacted industrial sector (legal, accounting and architectural, engineering and related services) was a direct impact. Another 28% for the same industrial sector was recorded as indirect (11%) and induced (17%) impacts. This suggests that even the most impacted sector will see two-thirds of the jobs created as a direct impact whereas another one third of the jobs in the same industrial sector will be accounted for by indirect and induced impacts.

**Table 4: Employment opportunities created in the top 10 sectors directly impacted by a \$12 billion investment in infrastructure**

Industrial sector	Direct Employment	Indirect Employment	Induced Employment	Total Employment
Legal, Accounting and Architectural, Engineering and Related Services	12,980	1,932	2,955	17,868
Fabricated Metal Product Manufacturing	4,659	1,407	1,223	7,290
Wholesale Trade	2,708	1,949	5,846	10,503
Rental and Leasing Services and Lessors of Non-Financial Intangible Assets	2,259	1,072	2,728	6,059
Computer Systems Design and Other Professional, Scientific and Technical Services	1,783	2,283	4,077	8,143
Other Activities of the Construction Industry	1,221	942	1,272	3,434
Machinery Manufacturing	1,153	599	847	2,598
Retail Trade	1,094	1,345	24,680	27,118
Electrical Equipment and Component Manufacturing	942	467	529	1,938
Electronic Product Manufacturing	725	381	755	1,861

While some may argue that one should consider only the direct impacts of infrastructure investments as they relate to employment opportunities, this constrained approach to recognizing the impacts of infrastructure investments is likely to seriously underestimate the benefits of infrastructure investment, which Table 5 illustrates. Given the structure of input-output models, the construction jobs in non-residential building and engineering construction, the most relevant sector for construction employment, are recorded as indirect impacts. The direct impacts for the same are nil because the sector does not purchase inputs from itself. This situation illustrates the need to include both direct and indirect impacts when accounting for the immediate employment impacts of infrastructure investments.

**Table 5: Top 10 industrial sectors generating employment in indirect impacts of \$12 billion in infrastructure investments**

Industrial sector	Direct Employment	Indirect Employment	Induced Employment	Total Employment
Non-residential Building and Engineering Construction	-	7,981	-	7,981
Computer Systems Design and Other Professional, Scientific and Technical Services	1,783	2,283	4,077	8,143
Administrative and Support Services	574	2,261	4,962	7,797
Wholesale Trade	2,708	1,949	5,846	10,503
Legal, Accounting and Architectural, Engineering and Related Services	12,980	1,932	2,955	17,868
Fabricated Metal Product Manufacturing	4,659	1,407	1,223	7,290
Primary Metal Manufacturing	687	1,376	600	2,663
Retail Trade	1,094	1,345	24,680	27,118
Rental and Leasing Services and Lessors of Non-Financial Intangible Assets	2,259	1,072	2,728	6,059
Accommodation and Food Services	301	1,029	15,011	16,340
Other Activities of the Construction Industry	1,221	942	1,272	3,434

Given that the consumer spending and the retail sector are a significant component of the economy, we need to comment on the induced impacts of employment generation in the retail sector. The retail spending in Canada (\$468 billion in 2012) usually accounts for 35% of the Canadian economy. This shows that a large percentage of the Canadian workforce is employed in the retail sector. Ignoring the impacts of infrastructure investments in a huge component of the Canadian economy will result in a partial picture of the impacts. Thus, we present the induced impacts in job creation.

**Table 6: Top 10 industrial sectors generating employment in induced impacts of \$12 billion in infrastructure investments**

Industrial sector	Direct Employment	Indirect Employment	Induced Employment	Total Employment
Retail Trade	1,094	1,345	24,680	27,118
Accommodation and Food Services	301	1,029	15,011	16,340
Health Care Services (except Hospitals) and Social Assistance	8	111	7,598	7,717
Wholesale Trade	2,708	1,949	5,846	10,503
Owner-Occupied Dwellings	-	-	5,468	5,468
Administrative and Support Services	574	2,261	4,962	7,797
Arts, Entertainment and Recreation	55	245	4,621	4,921
Computer Systems Design and Other Professional, Scientific and Technical Services	1,783	2,283	4,077	8,143
Personal and Laundry Services and Private Households	84	85	3,252	3,421
Legal, Accounting and Architectural, Engineering and Related Services	12,980	1,932	2,955	17,868

Table 6 indicates that a \$12-billion investment in infrastructure would generate approximately 27,000 jobs in the retail sector, most of which would be induced employment, primarily because the non-residential building construction and engineering industry can be expected to buy only a small share of inputs from the retail sector (represented by 1,094 direct impact jobs in the table). However, the economic engine would set in motion a series of linked transactions that would end up generating the demand for consumer spending resulting in higher retail sales and more retail sector jobs.

## 4.0 OPTIMIZING INFRASTRUCTURE INVESTMENTS

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While the previous sections of this report have focused on quantifying the impacts of infrastructure investments in Ontario, this section discusses infrastructure investment strategies by reviewing infrastructure investments in the past and the proposed investment plans, especially in Ontario. Reviewed strategies include various investment vehicles, public-private partnerships (P3s), and suggestions for different tiers of government to collaborate on infrastructure plans.

### Introduction

There is an urgent need for expanding public infrastructure in Ontario to sustain economic growth. The Scorecard on Prosperity, a study published by the Toronto Board of Trade, argues that if the population increases to the expected levels in the future, the current estimated \$6 billion in lost productivity from traffic congestion alone would rise to \$15 billion. Existing infrastructure maintenance is another key area that has lagged as a priority, resulting in a huge infrastructure deficit. Municipal infrastructure in many jurisdictions could not be categorized to be in a state of good repair. The report highlighted that it is not just transportation infrastructure that is in serious need of renewal and expansion. In fact, much of the water and wastewater infrastructure in Ontario was built before the 1980s and is now nearing the end of its useful life. The Drummond Report, a study commissioned by the Government of Ontario, identified a funding gap of \$1.5 billion for the maintenance of water and wastewater infrastructure alone.

Canadian businesses rely on public infrastructure as an input in the production process. Efficient and reliable infrastructure helps to reduce costs and keep businesses competitive in global markets. Consider that a strong transportation infrastructure network allows companies to ship goods and employees within and across borders at competitive costs. Well-coordinated airport networks allow for businesses to attract and interact with clients across the country and across borders. As an alternative mode of transportation for shipping cargo, air transportation can abate pressure on surface transportation routes.

It is imperative that sufficient funds are available for infrastructure development and renewal in Canada to maintain the competitiveness of Canadian businesses. The opportunity cost of not spending now is the reduced productive capacity of the economy in the future, especially when public capital investments in infrastructure have the potential to generate immediate and substantial productivity gains.

Some may argue that during times of fiscal austerity governments should reduce capital spending. Based on the extensive literature review, we contend that overwhelming evidence supports the notion that stimulus spending on infrastructure during economic recessions helps to revive the economy while providing the infrastructure needed to maintain competitiveness in global markets.

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## Infrastructure Investment Vehicles and Jurisdictional Responsibilities

Given the need to invest in infrastructure development, it is crucial that the governments not only identify those infrastructure projects for investment that are most crucial for the socio-economic welfare of citizens, but also that policymakers identify reasonable and sustainable revenue streams to support these investments.

A significant portion of the jurisdictional responsibility for public infrastructure maintenance lies at the municipal level; however, municipal governments primarily rely on property taxes to generate revenue. This particular source of revenue has not grown proportionately for municipal governments to deliver on their responsibility to maintain roads, bridges, and other infrastructure that falls under municipal jurisdiction. Brox and Brox (2007) refer to this situation as the “municipal fiscal deficit.” Municipal governments can also rely on user fees, which are useful but not sufficient to meet operational and capital expenditures in the GTHA.

To work towards closing the municipal fiscal deficit, the 2008 Ontario budget included a statute that dedicated a portion of any surpluses to municipalities for infrastructure investment (Brox, 2008). This strategy, though welcomed, is not sufficient for a viable long-term infrastructure investment plan, considering the current concern with Ontario public finances. The discussion that needs to be had is whether municipalities will be forced to continue funding capital and operating costs with property taxes or if new revenue tools will be introduced to create the sustainable revenue streams needed to close the infrastructure funding gap in both Ontario and Canada.

Funding for infrastructure can come in the form of provincial or federal grants, as seen during the recent recession. However, this type of on again/off again funding can introduce inefficiencies while it also neglects the long-run costs introduced through the expansion of the public capital stock in this way. Moreover, governments often face challenges in spending money from this source as quickly as planned. A recent report by the Parliamentary Budget Office revealed that only half of the \$8.8 billion from the Building Canada Fund was spent over a seven-year period.

Commonly, these grants are critiqued for the disconnect between raising funds and the eventual spending—municipalities are arguably more efficient, transparent, and accountable when the funds raised for projects is done by the municipal government (Kitchen and Lindsey, 2013). Furthermore, the stimulative effect of public investment is maximized if funds are spent rapidly. In the context of a recession, a period that typically prompts governments to undertake these large injections of public money, the government investment multiplier decreases as the economy moves out of a recession.

Governments at the provincial and federal level can do more to aid municipalities in raising funds for needed investment in public capital. To facilitate the implementation of new charges and taxes, the province should allow municipalities to add locally determined

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sales and fuel tax rates on to already existing provincial charges. This would minimize administration and implementation costs and would speed up the introduction of these revenue generators.

At the federal level the creation of an earmarked funding stream for crucial infrastructure such as transit, roads, sewage, and water would improve the ability of municipalities to create long-term plans and will help justify introducing new charges and taxes. Admittedly, infrastructure investment levels are determined, to a significant extent, by the ability of a nation to credibly commit to a specific policy environment (Henisz, 2002).

Kitchen (2008) identifies a framework for the evaluation of a set of revenue generators. This framework includes economic efficiency, accountability, transparency, fairness, sustainability of the revenue source, and simplicity of administration. Essentially, the public will not agree to a plan that is not guaranteed to reap clear and rapid improvements to the public transit system and the revenue tool should in large part be imposed on those who will benefit the most from the investment. He argues that if the entire community does not share in the benefits of a public investment, then user fees, like toll lanes, congestion fees, or transit fare, should fund the projects. In this context, transit users benefit directly from the expansion of infrastructure, but these benefits are indirectly shared by large parts of the region, as increased use of public transit can relieve pressure on roadways, thereby reducing congestion, pollution, and transportation costs. Thus, a mix of tools that include regional taxes and user fees may be a sensible approach for funding transit infrastructure.

The user pay principle, a key principle in infrastructure investment, is readily applied in instances where users are willing to pay for the service or the use of infrastructure. This also applies to pricing the tariff structure for the resulting infrastructure.

Ultimately, the key to financing most types of infrastructure—in particular those with clear benefits to users—is to accurately price the use of said infrastructure. For instance, the use of property taxes to fund roads, transit, and maintenance, has largely been found to be inefficient. Property tax provides municipalities with insufficient revenue and does not impact the travel behaviour of commuters. A typical principle implemented in discussion of infrastructure financing is known as benefits-based model of intergovernmental finance (Kitchen, 2006). This approach seeks to identify a price for use of infrastructure that creates a direct link between the costs associated with the infrastructure and the user, ensuring increased efficiency in the use of the service (Kitchen, 2007).

New taxes are notoriously difficult to introduce. With a public that is ostensibly unwavering in its opposition to increased taxation and suspicious of the efficacy of government spending, as well as some politicians who fear the electoral repercussions of carrying the blame for an increased tax burden on constituents, it is crucial that



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the proposals be transparent and that the proponents must ensure that the purported benefits of investment are realized to the highest order. Moreover, the new tools must be structured in such a way that those who will directly or indirectly benefit from reduced congestion are targeted (Kitchen, 2006).

With the discussion revolving around a problem as evident as traffic congestion and a seemingly lacklustre public transit system, however, the public appears to be relatively open to a much-needed dialogue that seeks to identify a reasonable set of tools to fill the gap. A recent survey by Forum Research Inc. shows that the majority of residents in the Greater Toronto Area (GTA) believe that increased time spent commuting reduces quality of life, and two thirds of respondents believe that transit expansion, as opposed to investment in roadways, is the solution to Toronto's gridlock problems (Forum Research Inc., 2013).

We further the discussion by first reviewing the recently tabled ideas about transport infrastructure investments in Ontario. Subsequently, we will focus on one of the plans in detail and review four investment alternatives in detail.

## **Transit Funding Proposals and Investment Strategies in Ontario**

Over the course of the last year myriad proposals aimed at closing the funding gap for planned transit expansion have been released by various levels of government and organizations. The four reports that have gained the most traction in the public debate and in the coverage of this issue by the media are:

1. Big Move Implementation Economics: Revenue Tool Profiles (commissioned by Metrolinx)
2. A Green Light to Moving the Toronto Region (Toronto Region Board of Trade)
3. Metrolinx Transportation Growth Funding – Dedicated Revenues (City of Toronto)
4. Government of Ontario's Infrastructure Priorities

Below is a summary of the proposals in these reports.

### **Metrolinx Transit Expansion Plan**

This report by AECOM KPMG, prepared on behalf of Metrolinx, includes 25 revenue tools that could help to raise the \$2 billion annually that is needed to fund The Big Move. Each tool is ranked on a scale of 1 to 5 for characteristics of the revenue tool such as revenue potential, incremental costs, impact on travel behaviour and transportation network performance, technical implementation considerations, governance considerations, equity and distributional impacts, as well as overall efficiency impact (Metrolinx, March 2013).

From a revenue generating potential, the tools that appear to be the most attractive are a carbon tax, highway tolls, an income tax, a sales tax, and a vehicles kilometres

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travelled fee (VKT). Among the next group of high revenue generators are property taxes, parking space levies, land transfer taxes, fuel taxes, and corporate income taxes. However, revenue potential is just one of several metrics needed to select from among the options presented in this report. For instance, if one looks at the impact on behaviour and network performance, the sales tax, income tax, carbon tax, corporate income tax, payroll tax, land transfer tax, property tax, and parking sales tax all do little to directly impact driver behaviour and reduce congestion.

On the other hand, VKT, highway tolls, and fuel taxes all have a relatively high revenue generation potential and create clear incentives for road users to consider driving less or using public transit when possible. Interestingly, the only revenue tool with a high score for revenue potential, impact on behaviour, and ease of implementation is a fuel tax. VKT and highway tolls appear to be difficult to implement and have a significant time-to-implement lag.

The final two metrics analyzed in the AECOM KPMG report are equity and distributional impacts and economic efficiency. In terms of minimizing the distortionary impact of a new tax or charge, VKT, highway tolls, high-occupancy toll lanes are the top performers, while income, fuel, and property taxes and parking space levies are among the tools that create the largest distortions because they are not merely targeted at the potential users of the planned infrastructure.

Metrolinx decided to shortlist these tools: development charges, employer payroll tax, fuel tax, high-occupancy toll lanes, highway tolls, land value capture, parking space levy, property tax, sales tax, transit fare increase, and VKT.

### **Toronto Region Board of Trade recommendations**

A Green Light to Moving the Toronto Region, published by the Toronto Region Board of Trade, also made use of the AECOM KPMG report that was commissioned by Metrolinx. From the extensive list of potential revenue tools discussed in the Metrolinx report, the Toronto Region Board of Trade chose to recommend four tools: regional sales tax, parking space levy, regional fuel tax, and high-occupancy toll lanes. This list of candidate tools does not contain any options that were not shortlisted by Metrolinx, but the recommendations do provide more information about the geographic scope of some of the new charges and taxes. In particular, both the sales and the fuel tax are suggested as regional taxes, implying that only those in the GTHA would be subject to the new revenue generators because they are the main beneficiaries. This would mean that the municipal government would establish a local tax rate and have the provincial government add it on to the pre-existing tax, or alternatively, the provincial government would set the rate and distribute the money to the relevant municipalities.

A more detailed discussion of the four investment tools is presented later in this report.

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## City of Toronto Recommendations

In April 2013, a report produced by the City Manager, the Deputy City Manager, and the Chief Financial Officer included several recommended dedicated revenue streams that City Council may consider implementing to fund the Metrolinx transit expansion plan. This set of recommendations is unique in that the report proposes four revenue tools to implement immediately, as well as an additional three revenue tools to be implemented “upon substantial completion of the first wave of Big Move projects” (City of Toronto, 2013).

The recommended revenue tools are development charges, fuel tax, parking levy, and sales tax. These suggestions are all included in the Metrolinx shortlisted revenue tools and overlap almost entirely with the proposed tools included in the Toronto Region Board of Trade report. This report seems to place a greater weight on the ease of implementation to differentiate between tools that are useful in the short-run and those that should be implemented in the long run. Thus, the City Manager suggests to City Council that high-occupancy toll lanes, highway tolls, or other road pricing schemes, and a vehicle registration tax, be introduced after the first wave. Ostensibly, this recommendation reflects the difficulties in setting up the latter taxes and charges.

In addition, this report lists revenue tools that it does not support, which include a congestion levy, employer payroll tax, land transfer tax, land value capture, personal income tax, property tax, transit fare increase, and utility bill levy.

## Government of Ontario’s Infrastructure Priorities

Ontario’s Premier Kathleen Wynne has articulated her government’s vision on transit funding. Essentially, the view is that funding should come from those who directly benefit from the planned infrastructure projects included in The Big Move, which implies that the Premier will support measures that focus on commuters, particularly those who have access to public transit but choose to use personal vehicles. This type of targeted charge or tax can come in the form of fuel taxes, highway tolls, parking space levies, and many of the other revenue tools discussed in earlier reports.

While the Liberal government in Ontario has not yet revealed its preferred set of revenue tools, Premier Wynne expressed her commitment to any tools that target those people who will benefit from the projects, as well as those that will generate the revenue needed to support capital costs as well as future increases in operational costs. The Government of Ontario has also emphasized the need for new dedicated sources of revenue to address concerns about the government’s ability to handle a long-term project that will span over several electoral tenures.

While the provincial government has kept relatively quiet about which funding tools are to be officially proposed or implemented, the Premier has expressed her support for The Big Move and some combination of the associated revenue tools. As for which

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projects should come first—another contentious issue—the arguments currently in circulation are pointing towards a Downtown Relief Line (DRL) being built before any further extensions northbound on the Yonge Street line. This recommendation reflects awareness that the Yonge subway line, south of Sheppard, cannot accommodate the additional demands that will be generated by other planned rapid transit projects in Toronto and York Region, and the DRL will offer region-wide benefits. Hence, there are efforts to rename this line as the Regional Relief Line (RRL).

The Liberal minority government presented the budget in May 2013. The government must secure the support of at least one other political party if it were to avoid, or survive, a vote of no-confidence in the coming weeks. According to Progressive Conservative finance critic Peter Shurman, his party will be voting against the budget regardless.

NDP leader Andrea Horwath, on the other hand, appears to be open to discussion. However, the idea of implementing a new revenue tool seems unacceptable to her party, leaving a large amount of uncertainty as to what the NDP is willing to support. Despite the political risks, Premier Wynne's commitment to invest in expanding public transit infrastructure remains steadfast.

### **The Big Transit Idea – The Big Move**

In the following section we present a brief discussion on various infrastructure investment strategies using public transport as an example. Public transit investment has gained the most attention in recent years in Ontario, and specifically in the GTHA. Progress has been made in Ontario to update and upgrade transportation infrastructure—mainly through investments in the expansion of the public transit system in the GTHA—but the fiscal deficit and the large capital and operational costs have prevented policymakers and the public from committing to major system-wide transit expansion plans.

The Big Move, a 25-year plan developed by Metrolinx, is one of the plans being discussed for transit expansion in Ontario. Based on the discussion presented in the last section, one could see that various agencies and governments have expressed opinions about how they would like to fund transit infrastructure expansion. In all instances, the discussion has revolved around the ideas presented in The Big Move. Thus it is important to review in detail the four short-listed revenue generating tools proposed so far to fill the funding gap.

As mentioned earlier, The Big Move is a \$50-billion transit expansion plan. However, only a portion of the required \$50-billion capital cost has been secured. A series of recent reports have attempted to tackle this funding gap in a way that may be acceptable for the public and politicians alike. These recommendations appear to have sparked the interest of many in the GTHA region by identifying innovative solutions that are aimed at generating sufficient revenue, garnering public support, ensuring a fair distribution of

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costs across demographics and regions, and importantly, impacting commuter behaviour to optimize the performance of the overall transportation infrastructure network.

The four most common proposals are a regional sales tax, a parking space levy, a regional fuel tax, and high occupancy toll lanes. We discuss these tools briefly in the following space.

### **Regional Sales Tax**

According to *A Green Light to Moving the Toronto Region*, a 2013 report published by the Toronto Region Board of Trade, a regional sales tax of 1% on all goods and services sold in the GTHA has the potential to generate between \$1 billion to \$1.6 billion annually. Wide-reaching tools like this sales tax have been successfully utilized internationally and are acceptable in the context of transit investment as the benefits are enjoyed by drivers and transit users across the entire economy. This could be a promising tool with the ability to raise enough in revenue to pay approximately half of the annual costs of The Big Move.

However, one must also consider the distortionary impacts of consumption taxes. Business location decisions are, to some extent, a function of regional tax rates, thus a broad-based tax may contribute to decisions by firms to relocate outside of the GTHA or may reduce the appeal of the region for potential incomers. In addition, there are significant administrative and compliance costs associated with the tax (Toronto Region Board of Trade, 2013).

### **Parking Space Levy**

Another common proposal in the recent slew of reports is a levy paid by non-residential property owners based on parking space area (Toronto Board of Trade, 2013; Kitchen and Lindsey, 2013). The proposed levy in *A Green Light to Moving the Toronto Region* is \$1 per space per day, which has the potential to generate \$1.2 billion to \$1.6 billion in revenue annually. The main advantage of this tool is the predictability of the revenue stream, as well as the targeted nature of the levy. Transportation networks should witness a decline in automobile traffic—depending on the impact of the levy on parking prices for drivers—as this levy creates a disincentive for individuals to drive to central destinations.

### **Regional Fuel Tax**

A regional fuel tax has the potential, alongside a regional sales tax and a parking space levy, to create a large and predictable revenue stream. Fuel taxes are widely used, in the Greater Montreal and Greater Vancouver areas for instance—and act to directly impact driver behaviour. Unlike a sales tax, which does nothing to discourage individuals from driving when utilizing public transit is feasible, a fuel tax impacts only those who are contributing to congestion and environmental pollution by consuming fuel for their vehicles.

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According to Kitchen (2013), given current tax rates and the average price of gasoline in Toronto, fuel price elasticity estimates translate to fuel tax elasticities of about -0.1 in the short run, and -0.19 to -0.25 in the long run. Thus, as one would expect, the tax base erodes as the tax increases. In the same literature, Spiller and Stevens (2012) analyze the behaviour of those with a choice between modes of transportation. For those with access to relevant and competitive public transit the impact of increased fuel prices on demand is substantially higher, with an estimated average price-elasticity of -1.23 (Kitchen, 2013, pp. 62). Thus, a regional fuel tax will not only raise substantial revenue, but also directly influence the mode choices of those drivers with access to improved public transit.

To some extent this tax creates a virtuous circle whereby the fuel tax decreases congestion while generating substantial revenue, which is then invested in the expansion of public transit infrastructure, resulting in access to improved public transit for a larger segment of the population. As shown in Spiller and Stevens (2012), this newfound access to improved public transit will increase the impact of the fuel tax on demand. Estimates suggest that annual revenue from a tax of this type could range from \$640 million to \$840 million at a rate of 10 cents per litre (Toronto Region Board of Trade, 2013).

The primary critique of this tax—similar to problems identified with a regional sales tax—is that it is not targeted at those users who use roadways at peak hours or in high population density areas (Kitchen and Lindsey, 2013). If a fuel tax were to be introduced, the rate would ideally be set by the regional government and simply added on to the already existing provincial fuel tax. In Canada, provinces set tax rates, collect the revenue, and distribute it to cities, typically in the form of an earmarked remittance (Kitchen and Lindsey, 2013). British Columbia's government gives TransLink, the Greater Vancouver Transit Authority, 12 cents per litre of provincial fuel tax, which is used for capital and operating costs of public transit and major roads within the region (Kitchen, 2008).

Another key concern is about not taxing those who are unlikely to benefit from the use of the planned infrastructure development. For instance, if the newly generated fuel tax is introduced province-wide, individuals who will be quite far removed from the obvious benefits of investment in this type of infrastructure will also be forced to share the bill.

### **Road Pricing: High-Occupancy Toll Lanes (HOT)**

The proposal that appears to be the most efficient, in terms of reducing congestion and raising revenue, is the introduction of HOT lanes that are priced dynamically. Although the revenue generation potential of this tool is far less than the three suggestions discussed above, estimated at between \$25 million to \$45 million for a \$0.30 kilometre rate, these toll lanes will directly influence the behaviour of drivers by identifying the typical driver's willingness to pay for access to the "carpool" lane (Toronto Region Board of Trade, 2013).

Several recent studies have aimed to estimate the revenue generation potential of road

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pricing in the GTHA. Depending on the number of roads covered by tolls and the pricing setup, the estimates range from annual revenues of \$74 million for prices of 10 cents per kilometre during peak hours and 5 cents per kilometre during non-peak hours for the Don Valley Parkway and Gardiner Expressways to annual revenues of \$1.5 billion with a 10 cent per kilometre charge on all highways (Hemson Consulting, 2007; Toronto City Summit Alliance, 2007).

High-occupancy vehicle (HOV) lanes are already used in the GTHA, but this plan will allow vehicles with less than the minimum number of occupants to use the lanes for a fee. HOV lanes are underutilized, likely as a result of a coordination problem, so it is sensible to allow those who have the highest willingness to pay for a faster trip to do so, although the introduction of HOT lanes cannot be expected to support increased transit use. One virtue of this form of road pricing is that the prices can be dynamic, changing during peak hours or according to levels of congestion on the rest of the roadway (Kitchen and Lindsey, 2013).

### **Final Thoughts on Transit Infrastructure Investments**

In summary, the tools to generate sufficient revenue to fund The Big Move in particular, and infrastructure in general, are either broad-based taxes or targeted user fees. In order of revenue generation potential for public transit, the frequently suggested tools are a regional sales tax, a parking space levy, a regional fuel tax, and road pricing in the form of toll lanes or toll roads. Reviewed literature suggests that the basket of tools has the potential to generate the \$2 billion needed annually to fund the capital and operational costs of the Metrolinx transit expansion plan, but gaining approval for these tools and implementing them quickly may prove to be difficult.

Though some of these tools are only suitable in the context of transportation infrastructure investment, the two general classes of revenue generators—broad-based taxes and user fees—can be extended to discussions of funding other types of infrastructure. The key challenge, however, will be to implement a pricing mechanism that will raise money to fund maintenance and expansion, while directly affecting the over or under utilization of the infrastructure in question. For instance, user fees and accurate pricing were central to proposals in a 2007 report on infrastructure (Kitchen, 2007).

### **Public-Private Partnerships**

Noticeably absent from the ideas floated around revenue tools is the opportunity to invest in new infrastructure using public-private partnerships (P3s) or alternative financing and procurement (AFP) methods, in the Ontario Context. The operating and capital costs associated with large infrastructure development projects are often incurred by municipal,



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provincial, and federal governments. In times of fiscal austerity, the funding available for these projects at all three levels of government is sparse. When public sector funding is lacking, governments often turn to the private sector to provide resources, skills and expertise in delivering and financing infrastructure services. This partnership, between public and private sectors, has been envisioned as a method to bridge infrastructure deficit and sustain economic growth (Narayan, 2013).

A P3, as it relates to the development of infrastructure projects, can be defined as:

*A long-term contract between the public and private sectors where mutual benefits are sought and where ultimately the private sector provides operating services or puts private finance at risk (Garvin, 2009).*

Inherent in this definition is the notion that the private sector contributes to P3s in two ways: 1) providing the public sector with funding to satisfy infrastructure needs, and 2) optimizing the time and cost efficiencies in service delivery (Abdel Aziz, 2007). P3s have been used in a variety of contexts including large transportation projects (roads, rail, public transit, seaports, airports), utilities (power, water, waste), and other industries (health care, education, defense) (BC Ministry of Finance, 2002).

P3s have been the subject of much academic and institutional research over the past 25 years as a tool for developing and managing infrastructure projects. Canada has been a leader in this field and has implemented a number of notable, large-scale P3s to fund and maintain infrastructure projects. Examples include the Confederation Bridge in Atlantic Canada, the 407 Express Toll Route in Southern Ontario, and the Canada Line in Vancouver (Pirie, 1997; Siemiatycki, 2006).

### **Benefits of P3s/AFPs for Canadian and Ontario Governments**

Large-scale infrastructure projects in Canada can benefit from increased involvement of the private sector in a number of ways. Generally, as private sector involvement in a P3/AFP increases, so too does the level of risk assumed by the private agency in question (Jooste & Scott 2012). As an example, the public sector is more susceptible to the political risk incurred by rising construction and maintenance costs. Conversely, the private sector often has more expertise and experience with allocating risk to parties most able to price and assume it (Vining & Boardman, 2008).

The private sector can also provide infrastructure and services faster, at a lower cost and with greater certainty (BC Ministry of Finance, 2002). P3 infrastructure projects are often delivered faster and more efficiently due to greater private sector specialization in construction and operation than those funded and operated solely by the public sector. By contrast, governments engage in more diverse activities with a



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lower level of expertise with the specific technologies used in large scale infrastructure projects (Vining & Boardman, 2008). The expertise provided by some private agencies may even be international or global resulting in an economy of scale that can further reduce construction and operating costs. Private industry also tends to have greater incentive to reduce costs in order to receive greater returns on investment (Estache, Juan & Trujillo, 2007).

P3s/AFPs can also provide governments with greater budget certainty because private investment in large infrastructure projects can minimize or eliminate project-specific capital expenditures resulting in decreased debt levels. Whole-life costing in P3s allows for the preparation of longer term budgets that spread repayment obligations over longer periods (BC Ministry of Finance, 2002). Transferring the construction and operating cost to the private sector will also reduce unexpected government budget increases. The immediate savings realized from P3s can then be allocated to other public projects or services.

Another benefit of P3s is that user fees, where the direct beneficiaries of a service incur some or all of the cost of operation, can be more readily imposed if revenues are being received by the private sector as opposed to the public sector (Vining & Boardman, 2008). It is more feasible to impose user fees in this way because users are more willing to accept that private agencies have to cover their costs whereas they might view user fees paid directly to the government as a form of taxation.

## **Concluding Remarks about Investment Strategies**

In this section we have reviewed strategies for infrastructure investments in general and various investment tools in particular. The purpose of reviewing infrastructure investment strategies and plans was to determine how infrastructure investment decisions can be optimized for greater benefit to the society and the economy.

The following key lessons can be derived from this discussion.

- Continued infrastructure deficits will contribute to a slowdown in economic growth. It is therefore imperative that sustained funding plans are in place to ensure that infrastructure is maintained in a state of good repair so that Canadian businesses maintain their competitive advantage in the global market place.
- Infrastructure investment decisions require a consensus on which infrastructure projects need to be built in order of priority. While there seems to be a general consensus in Ontario about funding the projects highlighted in Metrolinx's The Big Move, there are conflicting options on which projects should be completed first, with political considerations being given greater consideration than important network and operational considerations.

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- Most infrastructure investment tools fall under two general categories, namely broad-based taxes and user fees.
  - Some tools are easier to implement than others. Some tools may have a greater potential for revenue generation, but may not offer additional benefits. For instance, a sales tax will raise sufficient revenue, but will not assist in modifying the behaviour of the users of infrastructure. A regional fuel tax or congestion pricing may have comparatively smaller potential for revenue generation; however, these measures are most likely to impact consumption behaviour, encouraging the users to make more efficient use of available transportation resources.
  - The principle of fairness implies that those who are unlikely to have the opportunity to benefit from the new infrastructure should not be expected to finance it. Thus, network expansion of local transit should not be funded from a province-wide tax.
  - There is a greater need for various tiers of government to collaborate on infrastructure development and maintenance.
  - Stable, reliable, and sustainable revenue sources should be identified by all tiers of government for infrastructure maintenance and development to encourage long-term planning for infrastructure development.
  - Opportunities for greater involvement of the private sector through public private partnerships and similar initiatives should be sought to attract private capital for infrastructure development. Research suggests that P3 (AFP) projects are cost efficient and are completed faster than projects funded entirely by tax dollars.

## 5.0 CONCLUSIONS

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This report studied the impacts of infrastructure investments on economic growth and job creation in Ontario, focussing on the impact of investment decisions during economic recessions when job losses are substantial and the private sector fails to create new jobs and spur economic growth.

The analysis builds on the comprehensive literature review that was completed in December 2012. The literature review presented a detailed account of the debate on the economic impacts of infrastructure investments during recessions.

The majority opinion amongst economists and policymakers is that infrastructure investments have a positive impact on economy and job creation, especially during recessionary periods. Infrastructure investments during recessionary times help boost the economy and create jobs, thus further invigorating the demand for consumer spending. Furthermore, the overall economic dividends of infrastructure investments extend beyond the benefits derived from the direct use of the infrastructure.

There is, however, a lack of consensus about the magnitude of the impacts of infrastructure investments. The literature review revealed that the difference in the estimated impacts were largely a result of the empirical methods used and the assumptions made in the analysis. Input-output models, however, are the most favoured methodology for determining the system-wide impacts of infrastructure investments.

Based on the recent infrastructure investment outlays in Ontario, which equalled approximately \$12 billion per year, we studied the impact of a \$12-billion investment in infrastructure in Ontario using the 2008 input-output tables. The 2008 tables captured the economic structure in Ontario during the recession and were ideally suited to estimate the impact of investments in infrastructure.

The input-output model simulated the impact of an exogenous public sector stimulus of \$12 billion in the non-residential building and engineering construction sector in Ontario. The model results presented earlier suggest that \$12 billion in infrastructure investments would result in a \$38.4-billion impact and a net increase in provincial GDP of approximately \$18 billion. At the same time, 203,000 person-years of employment would be created from the investment in infrastructure projects. These benefits are above and beyond the benefits resulting from the construction of the new infrastructure, such as reduced congestion and faster travel times for commuters and goods movement.

When the impacts are normalized to a \$1-billion stimulus, the input-output simulations revealed that during recessionary period in Ontario, every billion dollar invested in non-residential building and engineering construction would create almost 17,000 new jobs. Of those the model estimated 3,050 jobs in direct impact, 2,850 jobs in indirect impact, and 11,000 jobs in induced impact.

During recessionary times, when the private sector is not creating new jobs, the much needed investments in either new infrastructure development or in the rehabilitation of existing infrastructure do help to sustain the faltering economic engine by engaging a large number of workers in gainful employment.

## 6.0 RECOMMENDATIONS

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1. Infrastructure investments have been proven to be an effective way to stimulate the economy and create the much-needed jobs during recessions, and therefore such investments should be favoured by federal, provincial and local governments over tax cuts and short-term spending programs.
2. World-class infrastructure is critical to maintaining the competitive advantage of Canadian workers and firms and therefore governments, supported by the private sector, should continue to invest in maintaining, upgrading, and adding new infrastructure as part of longer term investment programs.
3. Given that the emerging economies have a competitive labour cost advantage over Canada, it becomes even more important for Canada to invest in infrastructure for productivity growth so that the competitive advantage of Canadian firms is maintained while we sustain a high quality of life for workers.
4. The lack of sustained upkeep of existing infrastructure has created a situation where an infrastructure deficit exists in Canada. Experts have estimated that it will cost more than one hundred billion dollars to bring municipal infrastructure to a state of good repair. The scope of infrastructure investments should be broadened beyond investments in new infrastructure alone. Instead, investments must also be made to maintain existing infrastructure so that it is either replaced or refurbished immediately to avoid disasters. The state of the Gardiner Expressway in Toronto is an example of poor upkeep where the city engineers have warned that short of an immediate investment in the rehabilitation of the Expressway, one runs the risk of a catastrophic failure of a quintessential piece of infrastructure that will most likely threaten the well-being of citizens.
5. Governments should explore all facets of infrastructure investments, including the public-private partnerships for infrastructure investment, so that the risks and financial commitments of building new infrastructure are shared broadly between taxpayers and businesses.
6. User fees and those taxes that are likely to modify consumer behaviour should be implemented as preferred tools for revenue generation to support new infrastructure developments.
7. Greater coordination between various tiers of government will ensure that sustainable and sufficient funds are available to support infrastructure development and maintenance over the long run.

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### **Richard DiFrancesco**

Richard J. DiFrancesco, Ph.D., is a Professor Planning and Economic Geography at the University of Toronto. Dr. DiFrancesco has been conducting research and training the next generation of urban planners and civil engineers at the University of Toronto for the past 15 years. Dr. DiFrancesco is an expert in input-output models and has authored several reports for governments in Canada and abroad on the impact analysis of various investment scenarios using the IO modelling framework.

Dr. DiFrancesco is the President of Regional Analytics Inc., which represents a practical extension of his research interests in the social and economic challenges associated with rapidly urbanizing regions like the Greater Golden Horseshoe. Dr. DiFrancesco is an expert in regional economic analysis and forecasting.

Regional Analytics Inc. specializes in socioeconomic analysis and forecasting at all geographic scales—from individual municipalities, census metropolitan areas to regions as large as provinces, groups of provinces or nations.



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The Residential and Civil Construction Alliance of Ontario (RCCAO) is composed of management and labour groups that represents a wide spectrum of the Ontario construction industry. The RCCAO's goal is to work in cooperation with governments and related stakeholders to offer realistic solutions to a variety of challenges facing the construction industry and which also have wider societal benefits. For more information on the RCCAO or to view copies of other studies and submissions, please visit the RCCAO website at [www.rccao.com](http://www.rccao.com)

RCCAO members include: Carpenters' Union • Greater Toronto Sewer and Watermain Contractors Association • Heavy Construction Association of Toronto • International Union of Operating Engineers, Local 793 • International Union of Painters and Allied Trades, District Council 46 • Joint Residential Construction Council • LIUNA Local 183  
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