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Climate Finance for Canadian Cities: Is Debt Financing a Viable Alternative?

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Abstract

Municipalities are crucial stakeholders in the response to climate change. Cities are major sources of greenhouse gas emissions and, due to their higher building and population densities, will bear the brunt of the economic and social costs imposed by extreme weather and the impact of climate change. Ontario municipalities have traditionally funded their investments from property taxes, user fees, and transfers from higher levels of government, but these sources will not be sufficient to fund both current expenditures and future capital needs. This paper explores an alternative: climate finance, the provision of financing by private actors for projects intended to decrease carbon emissions or make cities more resilient to the impacts of climate change. It analyzes four climate financing tools used in other jurisdictions – green bonds, environmental impact bonds, catastrophe bonds, and green banks – and their feasibility under current Ontario regulations. Not all instruments would be equally suitable to Ontario municipalities; each offers trade-offs that must be weighed before implementation. Still, the potential for climate financing is huge and it has a role to play in long-term climate infrastructure projects requiring large upfront investments.

Keywords: climate finance, debt finance, green bonds, environmental impact bonds, catastrophe bonds, green banks

JEL codes: H23, H71, H74, Q54

Climate Finance for Canadian Cities: Is Debt Financing a Viable Alternative?

I. Introduction

Municipalities¹ are crucial stakeholders in climate change. Cities are major sources of carbon emissions and bear the brunt of the economic and social costs of extreme weather, given their higher building and population densities. However, they are still locked in a high-carbon-emission development path, too dependent on car-based transportation infrastructure and energy-intensive economic activities.

Although coordinated action by different levels of government will be necessary to address the challenges of climate change, municipalities themselves need to invest in new development strategies, curb carbon emissions, and increase their resilience to extreme weather that will likely become more common and destructive in the future.

Ontario municipalities have traditionally funded their investments from property taxes, user fees, and transfers from higher levels of government. These sources will not be sufficient to fund both current expenditures and future capital needs. Ontario is no exception; municipalities in other provinces face similar dilemmas and also need to find alternative funding instruments. Unfortunately, there is inadequate research on financing tools for climate investments, especially in the municipal context. This paper helps fill this gap by exploring climate finance – the provision of financing by private actors for projects intended to decrease carbon emissions or make cities more resilient to the impacts of climate change or both.

The paper analyzes four climate financing tools used in other jurisdictions that could be implemented by municipalities in Ontario:

- green bonds;
- environmental impact bonds;
- catastrophe bonds;
- green banks.

With the exception of green banks, these tools are either debentures or involve the municipality issuing a debenture. Debentures are a type of security that gives a creditor the right to receive a fixed number of payments over a pre-determined period of time.² They are the building blocks of debt financing.

1 The terms “municipality” and “city” are not necessarily synonyms. In Ontario, section 1(1) of the *Municipal Act, 2001*, defines a municipality in purely organizational terms as a “geographic area whose inhabitants are incorporated.” These can be urban areas, rural areas, or a mix of the two. For the sake of simplicity, I will use both terms interchangeably.

2 The term “debenture” is commonly used in Canada to describe municipal and corporate debt securities. In the United States and other international markets, these instruments are usually called “bonds.” I will use both terms interchangeably.

1.1 Green bonds

Green bonds are debentures, the proceeds of which are earmarked for projects with an environmental benefit. They are a fairly recent innovation and have been used by the Province of Ontario and by local governments and agencies abroad.³ They are also the low-hanging fruit in climate finance, as they do not require changes to current Ontario borrowing regulations, even though a few changes would strengthen their usefulness for municipalities.

The main obstacles in the way of their adoption are their issuance costs – which can be higher than those of a regular debenture – and the lack of a financial advantage that could justify their use to cost-wary officials. Still, the additional costs are not very high, and could decrease as the market for municipal green bonds develops and there is more competition in the selection of service providers. More important, green bonds can enhance the transparency of government spending because of their built-in monitoring requirements, which give policymakers an incentive to stick to their environmental commitments.

1.2 Environmental impact bonds (EIBs)

EIBs are an adaptation of social impact finance instruments to environmental purposes. They are not debentures *per se*, but a complex web of contractual relationships that include the issuance of debentures for financing environmental projects or providing environmental services by third parties.

EIBs are a recent innovation (the first such instrument was issued in January 2017), but their proponents argue that they can allow governments to pay for performance-based policy interventions while transferring performance risk to private investors. EIBs could be issued under current Ontario regulations, but some restrictions – such as the requirement that long-term borrowing be used only for the financing of capital investments – may limit their use.

As I will discuss later, EIBs raise important governance and equity questions for municipalities. Besides their cost, which could negate government savings on the provision of services, they may give investors too much influence on the policy interventions being funded.

1.3 Catastrophe bonds (CAT bonds)

CAT bonds are more complex than regular debentures and involve the creation of a special-purpose vehicle (SPV) to serve as the intermediary between the beneficiary of the CAT bond and private investors. Similar to an insurance contract, they were created in the 1990s and are well-tested financial instruments for transferring risk to capital markets in reinsurance operations or in situations in which insurance policies do not cover risks from catastrophic events.

CAT bonds bring challenges of their own. For example, their legal nature under Ontario law is unsettled, as it is not clear whether they should be defined

³ Ottawa has recently joined this group by issuing the first municipal bond in Canada.

as insurance contracts or regular securities. Still, they could become an important instrument in helping municipalities become more financially resilient to the effects of climate change.

1.4 Green banks

Green banks are financial institutions specialized in the provision of financing for projects with environmental benefits. They can focus on underserved entities and industry sectors and can help Ontario municipalities tap private capital markets for their climate investments. They do pose challenges. For instance, if publicly owned, they can be seen as picking winners, but if they follow the standards used by private banks, they may suffer from the same market failures that affect those institutions. In addition, they can compete with other public and private sources of financing. Nevertheless, their benefits outweigh the drawbacks, and a lot depends on their institutional design and the function they are intended to play. Although they are better left to either the provincial or federal governments, I will briefly analyze them in this paper since they can provide crucial services in support of climate financing at the local level, such as credit enhancements for green bonds.⁴

1.5 Organization of the paper

Each of these four tools offers trade-offs that must be weighed before any one of them is implemented. Moreover, municipalities should develop their own revenue sources. Although these tools are useful for investments requiring high volumes of financing up front, debt must be repaid and cannot be used to fund all types of public services.⁵

This paper begins by defining what climate finance is and why it is important for Ontario municipalities. In today's challenging municipal funding environment, both in terms of the limits of municipal revenue sources and the uncertain availability of transfers from higher levels of government, the paper focuses on debt financing tools that can be used by municipalities to tap private sources of capital.

I first analyze the advantages and disadvantages of borrowing in general, together with the current borrowing regulations in Ontario. I then analyze the four individual instruments: green bonds, environmental impact bonds, catastrophe bonds, and green banks. I describe each instrument, focusing on the legal restrictions to their adoption by Ontario municipalities, their potential benefits and drawbacks in terms of costs, accountability, and transparency, and what steps (if any) that could be taken to make them a feasible alternative for municipalities.

4 As of the writing of this paper, Ontario is working on the creation of its own green "bank," the Ontario Climate Change Solutions Deployment Corporation. See Ontario Regulation 46/17 for details on its mandate.

5 See Slack and Tassonyi (2017) for a summary of the different fiscal tools and their use in the context of municipal public finance.

The paper concludes by comparing the four different instruments, and offering suggestions for policies that could pave the way for the growth of a healthy provincial market for municipal climate financing.

2. Climate change

Climate change describes observed changes in weather patterns and natural systems around the world caused by human activity, in particular carbon emissions from the extensive use of fossil fuels in industry, transportation, and energy production. The scientific evidence on the extent and impacts of climate change in both human and natural environments is regularly assessed and consolidated by the Intergovernmental Panel on Climate Change (IPCC), a panel of international scientists established in 1988 by the World Meteorological Organization and the United Nations Environmental Program (Intergovernmental Panel on Climate Change 2014: 2–15; NASA 2017).

Since its creation, the IPCC has conducted five comprehensive studies of the available data on climate change, attributing different levels of statistical confidence to its conclusions. In its latest report, dated 2014, the IPCC found unequivocal evidence that human activity has affected the Earth's climate, from the unprecedented warming of the Earth's atmosphere and oceans since the 1950s to the rise in sea levels. The report also argues that it is extremely likely that human-originated emissions of greenhouse gases (GHG), in particular, carbon dioxide (CO₂) from fossil fuel combustion and industrial processes, are the main causes of climate change.

3. Climate finance

Climate finance is financing oriented specifically to climate mitigation and climate adaptation projects (OECD and Climate Policy Initiative 2015: 18; Schalatek and Bird 2014: 1, 2).⁶

Climate mitigation has the goal of reducing or capturing carbon emissions, while climate adaptation aims at helping communities to cope with the impacts of climate change by increasing their resilience to extreme weather and other destructive climate phenomena. As used here, the term climate finance has a narrower scope than “green” finance, which is generally applied to the provision of financing for projects with any environmental benefits.⁷

6 Climate financing is commonly used to describe the transfer of financial resources by developed countries to developing ones in the context of the United Nations Framework Convention on Climate Change (UNFCCC). These resources are usually transferred using grants or concessional loans (i.e., loans with subsidized interest rates), but there is a growing movement to engage private sources of capital in climate financing at the international level.

7 These can be as diverse as cleaning up contaminated sites and restoring natural habitats (Cochu et al. 2016: 8, 19).

Box 1: Climate definitions used in this paper

Climate adaptation: investments and infrastructure projects intended to help a community cope with the impacts of climate change or increase its resilience to extreme weather events, e.g., stormwater runoff and early warning systems, protection against flooding through infrastructure, reforestation, or watershed management, and sustainable forest management to avoid deforestation.

Climate debt financing: financing of climate projects by borrowing from banks or issuing debt securities in the capital markets.

Climate finance: financing oriented specifically to climate adaptation and climate mitigation projects.

Climate mitigation: investments and infrastructure projects that aim at reducing or capturing carbon emissions, e.g., the electrification of fossil-fuel based transportation systems; the provision of energy from renewable sources, such as wind and solar power; better waste management and methane capture; building retrofits for more efficient use of energy; and reduction of carbon emissions through reforestation.

Resilience: the ability of a community to resist, accommodate, and recover from the effects of a hazard in a timely and efficient manner.

Sources: Tanner et al. (2015: 11); Weaver (2011: 2); World Bank (2015: 5).

Local governments can tap different sources to finance climate projects, including fiscal transfers from higher levels of government. Nonetheless, municipalities must also access private sources of capital given the size of their needs and the funding challenges they face.

An important but still largely neglected strategy available to municipalities is debt financing – that is, financing climate infrastructure projects through borrowing. Debt financing is not a silver bullet, but its potential in the municipal context is immense. Global private capital remains largely untapped by municipalities. Moreover, municipalities already have experience with debt markets, and borrowing is a logical choice for capital projects requiring significant upfront investments.

Initiatives that fall under the exclusive jurisdiction of higher levels of government (such as the removal of fossil fuel subsidies) or that must be coordinated either nationally or internationally due to cooperation dilemmas (such as cap-and-trade systems or the implementation of more strict environmental standards), are beyond the scope of this paper (Berlin et al. 2012: 5; G20 Green Finance Study Group 2016: 6; UNEP 2015: 19, 23, 28, 44; Whitley and van der Burg 2015). They will be mentioned as appropriate if they support the climate

finance tools analyzed here. Likewise, this paper will not cover policies aimed at changing the behaviour of firms, households, and individuals, such as grants and subsidized loans for home retrofits and in-bill financing.⁸

4. Why is climate finance important?

The climate financing tools analyzed in this paper can help municipalities cover the “investment gap” between their traditional funding model and the financing they will need to tackle the challenges presented by climate change. Moreover, climate finance makes sense even in a context of scepticism about the urgency of climate change. Investments in climate mitigation and adaptation may have “co-benefits,” that is, positive social and economic effects in addition to their primary environmental objectives (Vorhies and Wilkinson 2016: 2). This section details these reasons.

4.1 Climate challenges and costs

Municipalities have a crucial role to play in climate mitigation and adaptation. Approximately 80 percent of the Canadian population lives in urban areas (Green Analytics and OCCAR 2015: 31).

Municipalities are major sources of environmental externalities directly related to climate change. Buildings and houses (which are large consumers of electricity) and the transportation sector are major sources of carbon emissions; cities concentrate these sectors. Cities around the world consume between 70 and 80 percent of the world’s energy (which in many cases is generated by fossil-fuel-burning power plants) and are responsible for approximately 70 percent of the world’s GHG emissions (CCFLA 2015: 8).

Toronto’s total GHG emissions alone, estimated at 20.5 million tonnes for 2013, represented approximately 12 percent of the Ontario total for that year.⁹ Energy consumption in Ontario is highest in urban areas such as Toronto and Ottawa.¹⁰ Although Ontario has recently phased out energy production from coal-fired power plants, 29 power plants across the province use natural gas and are responsible for the majority of emissions in the electricity sector (Province of Ontario 2015: 26). Emissions from other urban sources are also high; at least 41 percent of Toronto’s emissions originate in the transportation sector.¹¹

8 For examples, see City of Toronto (n.d.) and TAF (n.d.b).

9 Overall provincial emissions in 2013 were estimated at 171 million tonnes (Province of Ontario 2015: 11, 14). The latest GHG inventory for Toronto presents estimates up to 2013 only (Scioli 2015: 5).

10 These municipalities also have the highest potential for electricity consumption growth in the province. In comparison, province-wide energy demand growth has been practically flat since 2009 (Mowat Centre 2016: 3–4).

11 This percentage may actually be higher, as Toronto lacks recent accurate data on transportation emissions (Province of Ontario 2015: 15; Scioli 2015: 7).

The economic and social costs of extreme weather will also likely be high for urban residents and municipal governments. Some costs will be more visible and easier to measure, such as those related to infrastructure and property damage and repairs (Tanner et al. 2015: 9). In 2015, the total global annual costs of natural disasters were estimated at between US\$250 and US\$300 billion (UNEP 2015: 13), and there is evidence that losses have been increasing since the 1970s (Green Analytics and OCCIAR 2015: 33; Hallegatte, Bangalore and Jouanjean 2016: 2).

In Canada in 2011, the insurance industry paid a record CAD\$1.7 billion for property damages across the country caused by flooding, wind, and wildfire, only to break the record again in 2013 with CAD\$3.2 billion in insurance payments due to flooding in Alberta and Toronto in June and July, respectively, of that year (Green Analytics and OCCIAR 2015: 34).¹² In 2017, the Insurance Bureau of Canada estimated that the fires in Fort McMurray may cost the Canadian insurance industry approximately CAD\$3.5 billion (Amec Foster Wheeler Environment & Infrastructure and Credit Valley Conservation 2017: 5; Snowdon 2016).

These numbers are expected to rise, and extreme weather events in Canada may impose yearly costs ranging from CAD\$5 billion in 2020 to between CAD\$21 billion and CAD\$43 billion in 2050, depending on the extent of the rise in global temperatures and the overall value and number of exposed assets (NRTEE 2011: 40, 42). Considering that municipal governments own approximately 60 percent of Canada's core public infrastructure in the form of water systems, roads and bridges, public transit, and buildings (CCA, CPWA, CSCE and FCM 2016: 5), they will likely be the most affected by climate change in the future.

Table 1 depicts only insured losses, which are a fraction of the total costs of each disaster. Indeed, the quantifiable and visible costs may pale in comparison to the opportunity costs, in terms of economic growth and social well-being (Tanner et al. 2015: 9). Extreme weather damage ripples through the economy of a region and affects long-term economic growth and the fiscal health of municipalities (Hallegatte, Bangalore and Jouanjean 2016).¹³ It may even damage the credit rating of businesses and governments and thus affect the future affordability or availability of credit (Tanner et al. 2015: 25).

Depending on the severity of the dislocations, we could see municipalities struggling to recover as their population moves on; the example of the fires that destroyed parts of Fort McMurray suggests that the recovery of social bonds and community life can be equally or more challenging than the rebuilding of physical infrastructure (Markusoff 2017; Thurton 2016). These challenges may be

12 Another report calculates that the insured damage from the two floods combined reached between CAD\$4 and CAD\$6 billion (Amec Foster Wheeler Environment & Infrastructure and Credit Valley Conservation 2017: 5).

13 Vulnerable populations and the poor are particularly affected (Province of Ontario 2015: 5, 6).

*Table 1: Estimated insurance damages paid in Canada
(last 10 years, in Canadian dollars)*

Event	Costs in insured damages and compensation
St-Jean-sur-Richelieu flood, April 2011	\$52 million
Tropical storm Irene (Quebec/Atlantic Canada), August 2011	\$140 million
Calgary-area wind and hail storm, August 2012	\$535 million
Calgary flood, June 2013	Between \$3 and \$5 billion
Toronto flood, July 2013	\$1 billion
Burlington flood, August 2014 St	\$90 million
Calgary hailstorm, August 2014	\$450 million
Manitoba flood, June 2014	\$1 billion
Fort McMurray fire, May–June 2016	\$3.5 billion
Source: Amec Foster Wheeler Environment & Infrastructure and Credit Valley Conservation (2017: 5).	

compounded if the affected region is not able to fully recover between disasters, leading to a situation some specialists called “disaster-related underdevelopment” (Hallegatte, Bangalore and Jouanjean 2016: 10).¹⁴

4.2 The climate investment gap

Specialists have warned about a growing gap in climate-related infrastructure spending around the world. Experts note that countries need to invest US\$1 trillion per year until 2020 in energy efficiency, renewable energy, and low-emission vehicles to keep global temperatures from increasing by more than 2°C, and that investment needs may grow to US\$4.5 trillion between 2031 and 2035 (Cochu et al. 2016: 29).

Other estimates highlight a staggering US\$90 trillion needed globally to revamp transportation and energy infrastructures in the next 15 years – approximately US\$6 trillion a year (Godfrey and Zhao 2016: 3, 4). The United States alone may need investments in the order of US\$8 trillion until 2050 (approximately US\$240

¹⁴ According to Hallegatte, Bangalore, and Jouanjean (2016): “If the region is regularly affected, it may not have enough time and resources to rebuild its asset base between two events. As a result, it may end up in a permanent state of reconstruction, allocating resources to rebuild rather than investing in new additional infrastructure and equipment, preventing capital accumulation and infrastructure development” (10).

Box 2: Expected impacts of climate change in Canada and Ontario

Climate change may impact Canada by:

- increasing seasonal temperatures during winter in northern Canada and during the summer in southern and central Canada;
- increasing the length, frequency, or intensity of heat waves and hot extremes;
- increasing precipitation throughout the country with the exception of parts of southern Canada, where declines in precipitation are expected.

Government operations could be affected, with higher costs due to infrastructure damage and increased demand for healthcare, emergency management and response, and other government services. There is also greater risk of increased costs associated with potential lawsuits alleging negligence on the part of local governments in preparing for extreme weather events.

Infrastructure and planning in provinces and municipalities could be affected by:

- seasonal shifts in energy demand;
- less reliable forecasting;
- shortened life expectancy of highways, roads, and culverts;
- changes in corrosion rates due to increased humidity;
- damages from wind storms;
- potential increase in disruption or failure of electrical systems;
- increased pressure on stormwater systems;
- decreased durability of materials;
- increased risk of flooding.

Estimates vary depending on the projected emission scenarios. See Amec Foster Wheeler Environment & Infrastructure and Credit Valley Conservation (2017: 11, 39-41) and Province of Ontario (2015: 5-9).

billion a year) to reach its emission targets under the Paris Agreement (Chiang 2017; Heal 2016).¹⁵

Estimates for China range from US\$274 billion to US\$640 billion needed until 2020 (between US\$93 billion and US\$213 billion annually) to shift its economy

15 The willingness of the United States to keep its climate commitments has been questioned, and the decision by the Trump administration to abandon the Paris Agreement will contribute to the widening of the investment gap.

towards a low-carbon development path and address other environmental issues (Godfrey and Zhao 2016: 3; SynTao Green Finance and CBI 2017: 3).¹⁶ A considerable part of these investments must be made in urban areas. In terms of climate adaptation alone, the United Nations Environment Program estimates that the costs for urban areas may reach US\$120 billion a year in the next decade (Godfrey and Zhao 2016: 5).

Specific estimates for Canada are harder to find. The federal government recently announced plans to increase its investments in infrastructure, dedicating in an initial phase CAD\$3.4 billion for public transit, to be disbursed over three years, and CAD\$5 billion for water, wastewater, and green infrastructure projects, to be disbursed over five years (Amec Foster Wheeler Environment & Infrastructure and Credit Valley Conservation 2017: 4; Infrastructure Canada 2017). Even so, these numbers may fall short of covering the actual financing needs of Canadian municipalities. A recent study has suggested that overall financing needs for repairs, rehabilitation, and renewal of the aging infrastructure across Canada may reach CAD\$171.8 billion (Green Analytics and OCCIAR 2015: 34), and these numbers do not directly include investment needs for new climate mitigation and adaptation projects.

In Ontario, the City of Toronto estimates it will need to invest between CAD\$320 million and \$866 million in the next few years to achieve GHG emissions reductions between 455,000 and 857,000 tonnes by 2020 (Scioli 2017: 9). The best-case scenario will allow the city to reduce emissions by 24 percent, a considerable improvement relative to its original target for 2020 of 6 percent below 1990 emission levels, but much more will be needed if Toronto is to achieve its long-term emission reduction target of 80 percent below 1990 levels by 2050 (Scioli 2016: 15). These environmental investment needs come in addition to the CAD\$29 billion the City will need to finance other capital projects in the next 15 years (City of Toronto 2016: 16).

4.3 Funding context

Ideally, municipalities should be able to fund a sizable part of their capital projects and the services they provide with own-source revenues, but the reality is different. Toronto and other Canadian municipalities face increasing challenges to fund operational costs in a business-as-usual scenario, let alone make new investments for a low-carbon emissions future (C40 Cities Climate Leadership Group 2016: 5; Kitchen and Slack 2016: 2). This is not a problem unique to Canada. The People's Bank of China estimates that public funds will cover a maximum of 15 percent of the capital required for the building of climate change infrastructure in China (C40 Cities Climate Leadership Group 2016: 4; Gilbert and Zhou 2017: 6; SynTao Green Finance and CBI 2017: 3; UNEP 2015: 7).

¹⁶ Interestingly, the higher investment gap estimates come from the People's Bank of China.

Grants and fiscal transfers are an important part of any comprehensive climate change financing plan, as higher-level governments have a role in equalizing regional disparities and promoting investments that benefit regions and larger geographical areas. However, fiscal transfers may not be sufficient in view of the growing climate investment gap at the municipal level, in addition to the pressures higher-level governments face due to austerity measures, high debt-to-GDP ratios, and growing costs in other areas, such as healthcare (Berlin et al. 2012: 3, 5; SynTao Green Finance and CBI 2017: 6).

The space for experimentation may also be limited for legal and political reasons. Some innovative funding solutions, such as carbon taxes or carbon-related user fees, have been slow to catch on, even when fully implemented. For instance, British Columbia introduced a province-wide carbon tax in July 2008 but chose to make it “budget-neutral” to garner political support for the bill (Murray and Rivers 2016). This means that every dollar generated by the tax must be compensated for by a corresponding tax break or rebate (Province of British Columbia n.d.), decreasing the measure’s relevance for large infrastructure investments from a revenue point of view.¹⁷

At the local level, municipalities are usually barred from implementing carbon taxes on their own. This is the case in Ontario, where municipalities have limited powers of taxation and section 394(1)(e) of the *Municipal Act*, 2001, forbids them from imposing fees or charges based on or related to “the generation, exploitation, extraction, harvesting, processing, renewal, or transportation of natural resources.” Section 267(2) of *The City of Toronto Act*, 2006, adds to this general prohibition any tax on “the acquisition of any gas or liquid that may be used for the purpose of generating power by means of internal combustion” and on the “consumption or use of energy, including electricity.”¹⁸

Other, more radical, proposals at the international level, such as the institution of levies on international maritime and air transport fees or financial transactions taxes, have also failed to generate momentum.¹⁹

17 This does not mean that a budget-neutral carbon tax cannot also decrease overall emissions by pricing in carbon consumption (Canada’s Ecofiscal Commission 2016). However, it leaves much to be desired in view of the investment needs of local governments.

18 Toronto circumvented these prohibitions by creating a “personal vehicle tax,” also known as the “vehicle registration tax,” a fee connected with the licensing of vehicles, even if the proceeds went to the city’s general fund instead of being used to support the vehicle registration system.

19 Levies on international maritime and air transport could be charged directly from users, as for instance upon the sale of an air ticket or as a percentage of charged freight rates, and the proceeds used to finance climate investments (in fact, a voluntary version of this idea is already in place for air transport in the form of carbon offset schemes that passengers may choose to purchase with their tickets). A financial transaction tax could be levied as a percentage of the value of financial transactions such as money transfers, the purchase of foreign exchange, or the buying or selling of bonds, shares, and other financial market assets (Weaver 2011: 5–6).

4.4 Co-benefits

Structures designed to cushion the impacts of extreme weather and increase communities' resilience can serve multiple purposes, and may even mitigate urban problems not directly related to climate change, such as traffic congestion and smog. For example, flood protection structures can help with the provision of potable water or small-scale hydro-electric power, or double as carbon sequestration mechanisms. Stormwater runoff systems can help protect municipal infrastructure from flood damages (Hallegatte, Bangalore, and Jouanjean 2016: 2; Tanner et al. 2015: 10, 26). These co-benefits can provide a justification for action that may help engage an indifferent or climate-change-sceptical audience.

Investments in climate infrastructure also generate jobs in the technology, construction, and infrastructure sectors (Sahoo, Nelson, and Goggins 2015: 7), although more research is needed to determine how local governments can capture growth in green industries. Local investments in climate resilience may also strengthen community ties and enable long-term planning and investments from actors previously held back by the risks of extreme weather events and disasters (Godfrey and Zhao 2016: 3; Hallegatte, Bangalore, and Jouanjean 2016: 2; Tanner et al. 2015: 10, 15, 21). Instead of burning through savings or a surplus fund to repair damages from regularly occurring events, communities can invest to improve homes and productive activities, increasing local well-being, generating jobs, and improving the prospects of individuals and groups. Such investments could help decrease inequality in a region by protecting populations living in more vulnerable areas and, ultimately, by increasing tax revenues in tandem with land values (Tanner et al. 2015: 21, 24).

5. Debt financing and climate finance instruments

Using private capital to finance public projects is not a new idea. Many municipalities in Canada and Ontario already have ample experience with capital markets, whether by borrowing directly from banks or by issuing debentures to private investors in capital markets. The novel aspect of climate financing is the focus on financing for projects to make cities more resilient to extreme weather or to reduce GHG emissions. Climate financing can attract individual and institutional investors concerned with or required to invest in instruments with environmental, social, and governance (ESG) benefits.

Reliance on climate financing and private sources of capital does not necessarily mean that municipalities should transfer their responsibilities to private markets or privatize municipal assets, even though public private partnerships (PPPs) and privatizations may play a role in some types of investments. Moreover, useful as it might be, climate financing is not a "silver bullet" that can solve all the climate-change-related needs of our local governments. Relying on capital markets has advantages and disadvantages.

5.1 Advantages

First, borrowing for infrastructure investment can indirectly contribute to economic and revenue growth. Moreover, local governments can use tariffs and user charges to repay the debt, depending on the type of infrastructure project being built (Slack and Tassonyi 2017: 43).²⁰

Second, borrowing can be a fairer way of paying for climate infrastructure from an intergenerational perspective, that is, from the perspective of the distribution of gains and burdens between current and future beneficiaries of the investments. Since debt repayments are spread over a long period of time, future generations that benefit from infrastructure investments will also contribute by helping pay their costs, meaning that the onus is not placed exclusively on the current generation of taxpayers (C40 Cities Climate Leadership Group 2016: 9; Hanniman 2015: 3).

Third, debt payments can be more easily aligned to the lifecycle of an asset (Petersen and Valadez 2004b: 77).

Fourth, borrowing can help municipalities accelerate climate infrastructure investments; climate financing is a logical choice for complex capital projects with large upfront costs that require significant investments at once (C40 Cities Climate Leadership Group 2016: 9).

Fifth, it may be politically easier for Ontario municipalities to issue debt than to raise taxes or charge user prices. This may not be equally true in other jurisdictions, particularly in the United States, where taxpayer referenda and consultations are usually mandatory before a local government can issue debt (NASBO 2014: 85; Petersen and Valadez 2004a: 56). In Toronto, the decision to issue debt must ultimately be approved by City Council, but a large part of the debate may happen in less visible decision-making bodies, such as the Executive Committee or the Debenture Committee. This does not mean that there are no checks on the issuing authority of municipalities, or that the members of those committees are unaccountable to taxpayers, only that the debate on the sensitive topic of debt is less acrimonious.

Finally, debt financing can be financially advantageous, as the low interest rates prevailing in international and domestic markets at present make borrowing a relatively cheap option for municipalities. Even if interest rates rise, municipalities can still lock in medium- to long-term financing at affordable rates.

5.2 Disadvantages

First, although the municipal officials involved in the decision-making process are ultimately accountable to city councils and voters, borrowing can be less transparent than raising taxes. Ideally, financial decisions of any great magnitude should be widely discussed with the active participation of the public. Moreover,

20 I would like to thank a reviewer for highlighting this point.

because borrowing tends to be less visible and generates less debate and opposition from taxpayers, it is harder to enforce or promote fiscal discipline compared with regular funding alternatives and taxation. Policymakers could be tempted to use debt to finance unnecessary projects or operating expenses, or to finance projects that do not contribute to capital formation.

Second, debt financing may not be a solution for smaller municipalities, which might have limited experience, know-how, and resources to issue debentures or maintain a good credit rating. In fact, only a few Canadian municipalities are considered creditworthy and can directly access capital markets.²¹ Even experienced and creditworthy municipalities may face challenges, as factors beyond their control may influence credit ratings and the availability of credit and borrowing costs (C40 Cities Climate Leadership Group 2016: 11; Hanniman 2015: 15–18). Risk aversion among investors or a “flight-to-liquidity” movement in markets could make it difficult for municipalities with less liquid bonds to issue them in domestic or international markets.²²

Third, current taxpayers also benefit from infrastructure investments; moreover, they have more control over how the money is invested and which types of projects get funded, sometimes to the detriment of future taxpayers. “Pay-as-you-go” – the practice of paying for investments with available money rather than with borrowed funds – means that those who undertake the funding have the power to shape the future of the infrastructure project.

Fourth, risk aversion on the part of the investors may also affect which projects or technologies attract financing, as investors tend to prefer mature infrastructure projects and tested technologies (Barnard and Nakhoda 2015: 4; Weaver 2011: 4).²³ Stakeholders could be tempted to rely on short-term thinking and make investments that generate quick financial returns (Tanner et al. 2015: 13; Vorhies and Wilkinson 2016: 2, 7-8).²⁴

Fifth, debt servicing is a claim on future budgets and can limit spending flexibility (NASBO 2014: 86). In fact, depending on the characteristics and amount of debt, municipalities may be pushed to increase taxes to meet their repayment and sinking fund commitments.²⁵

21 Creditworthiness can be defined as an assessment, performed by an independent third party (for instance, a credit rating agency) of how likely a borrower is to default on its debt obligations. A good credit rating influences not only the willingness of investors to lend to a municipality, but also its costs (in terms of interest rates) (C40 2016: 4, 5).

22 I would like to thank a reviewer for highlighting this point.

23 Investments in proven fields such as the oil and gas industries may be less risky than in green energy or technologies (Cochu et al. 2016: 43).

24 The OECD and the Climate Policy Initiative estimate that 77 percent of the total available climate finance is allocated to climate mitigation projects, with only 16 percent allocated to climate adaptation, and 7 percent to projects that target both issues (OECD and CPI 2015: 21).

25 I would like to thank a reviewer for highlighting this point.

Sixth, there may be a mismatch between the characteristics of many climate projects and the incentive structure of financial markets. Private investors may have little appetite for financing crucial but commercially unviable projects to reduce the vulnerability of municipal infrastructure to extreme weather. Investors tend to prefer liquidity and low credit risk and may not be interested in small projects, or those that cannot provide stable revenue streams, or are less easily monetized (Mendelsohn, Urdanick and Joshi 2015: 2).²⁶

Finally, there are also regulatory and practical challenges to some of these instruments, although they are not insurmountable. Ontario legislation restricts the issuance of revenue bonds and the use of some debt instruments by municipalities, such as the use of long-term debentures for anything other than capital investments. In addition, municipal capital markets are still relatively small, therefore municipal securities are less liquid and borrowing costs are higher.

Nevertheless, the potential for the use of climate financing instruments in the municipal context of Ontario is immense. Private capital remains largely untapped by municipalities in Canada. Internationally, large institutional investors such as pension funds still dedicate very small percentages of their portfolios to infrastructure investment and could increase their participation significantly (Godfrey and Zhao 2016: 6). Public leadership will be needed in setting priorities and defending the public interest, but also in guaranteeing the viability of climate financing at the local level.

6. Borrowing regulations in Ontario

The extent to which Ontario municipalities can rely on climate financing instruments depends largely on current and future provincial regulations on local government borrowing. With the exception of green banks, the climate financing instruments analyzed in this paper are either debt securities, such as green bonds, or involve the issuance of a debt security, as in environmental impact and catastrophe bonds. Green bonds are the most straightforward option, as current regulations already accommodate their use by municipalities. EIBs and CAT bonds are tougher sells, as it is not clear whether they are feasible under today's rules.

Ontario law sets limits both on the type of debt obligations municipalities can issue and on the amount they can borrow.²⁷ As a general rule, municipalities can issue only fixed-rate debentures. The use of variable-rate debentures is restricted to entities rated by credit rating agencies above a very high threshold, and even if they meet this requirement, they cannot issue variable-rate instruments that

26 This explains why public-private partnerships (PPPs), which usually rely on debt financing, tend to focus on projects with clear revenue streams, such as roads. Not all PPPs, however, are structured as concessions that allow the private partners to collect and retain the revenues from user fees (see Siemiatycki 2017).

27 Ontario *Municipal Act*, 2001, sections 17(1)(b) and 17(1)(f).

sum up to more than 15 percent of their total indebtedness.²⁸ These rules protect municipalities from losses caused by unexpected changes in interest rates, but limit their ability to issue EIBs.

When borrowing, Ontario municipalities are also limited by their “Annual Repayment Limit” (ARL), which functions as a proxy for debt capacity. Except for the City of Toronto and the Regional Municipality of York, ARLs are calculated based on a formula that amounts to 25 percent of the operating, own-source revenues of a municipality in a year, minus debt payments and other financial liabilities.²⁹ Municipalities can exceed their ARLs only with the approval of the Ontario Municipal Board.³⁰ Toronto is the only exception in Ontario, as it has no formal debt limit; it does, however, follow a self-imposed limit of 15 percent of its property tax revenues.

Long-term debt is restricted to financing capital investments,³¹ a prudent rule that ensures municipalities will borrow for projects that provide benefits in the long run, but that may also make it more difficult for them to use green bonds to finance projects not strictly defined as capital investments (such as an early-warning system). In addition, these regulations may prevent municipalities from issuing EIBs and CAT bonds.

There are no comprehensive statistics for the number of local Canadian governments and other entities that have an active presence in debt markets, but it is reasonable to infer that the number is small. Canada has 3,750 municipalities across all its provinces and territories, and as of 2014 only 46 municipalities and local agencies had a credit rating.³² It is estimated Canadian municipal governments had CAD\$61 billion of debentures outstanding as of December 2014,

28 Sections 412(5) of the *Municipal Act*; sections 3(1) and 3(4)(a) of Ontario Regulation 247/01; sections 4(1)(b) and 8.2 of Ontario Regulation 276/02; and sections 19(1) and 20(1) of Ontario Regulation 610/06. The rating limitations are prescribed by section 5 of the Ontario Regulation 247/01, and section 22 of Ontario Regulation 610/06. The credit rating thresholds are “AA(Low)” or higher from the Dominion Bond Rating Service Limited, “AA-” or higher from Fitch Ratings, “Aa3” from Moody’s Investors Service, and “AA-” from Standard and Poor’s (although the amount in sinking or retirement funds is not counted towards this limit).

29 Ontario Regulation 403/02, section 3. Section 4.1 of Ontario Regulation 403/02 allows York to add to its ARL calculation a “cost supplement” of 80 percent based on development charges paid to the municipality.

30 *Municipal Act*, section 407(2); Ontario Regulation 403/02; Ontario Regulation 610/06, section 5(2).

31 Sections 245, 401(1) and 408(2.1) of the *Municipal Act*, section 247.1 of the *City of Toronto Act*, section 5.5 of Ontario Regulation 276/02, and section 3 of Ontario Regulation 610/06.

32 There is no reason to assume that the number has drastically increased since then (Hanniman 2015: 13). Granted, there are no statistics for the number of municipalities that had access to credit by borrowing directly from banks, but Canadian numbers still pale in comparison with the American market. Municipalities may be able to borrow from capital markets even if they do not have a credit rating, although this is the exception rather than the rule. I would like to thank a reviewer for highlighting this point.

representing only 3 percent of the total domestic fixed-income market.³³ The small size of the market helps explain lower liquidity levels, lower demand by investors, and higher borrowing costs to municipalities.³⁴

Box 3: Definitions of financing tools and instruments

Municipalities can borrow from banks or issue debentures. Bank loans tend to be short-term (although medium- to long-term loans are not unheard of), while debentures or bonds are typically used to finance long-term projects, as they are flexible and can be resold to other investors in secondary markets. Both may be classified in terms of their maturity, that is, the period before they must be repaid in full, and in terms of how interest rates and investor remuneration is calculated. Debentures can be further classified in terms of their repayment structure and the ultimate guarantee they provide to the creditors in case of default.

Maturity: Loans tend to be short-term, with a maturity of up to 13 months, while debentures may be either short- or long-term, in the latter case with a maturity of more than 13 months.

Investor remuneration: Interest rates can be fixed, predetermined in the loan or bond agreement, or variable, in which case they are calculated with reference to an index set by a monetary authority (such as the Federal Funds rate, from the Federal Reserve Bank in the United States) or by private market actors (such as the London Interbank Offer Rate, or Libor). There are also other, less common, variations. For instance, “zero-coupon” bonds do not have an explicit interest rate but are issued at a discount to investors, who benefit from the difference between the price at which they are issued and the face value of the bond.

Repayment structure: Debentures are called “bullet” debentures when their principal (the amount borrowed by the debtor without including interest payments) is repaid only at the end of the maturity period. In “serial” debentures, on the other hand, the principal is repaid in instalments as they mature.

Guarantee: Debentures are classified as “general obligation” (GO) when the full force of the credit and all the assets of the issuer provide a guarantee to creditor. They are called “revenue” debentures when repayment is guaranteed by specific sources of revenue.

Sources: *Municipal Act*, section 409(1)(a); Ontario Regulation 610/06, section 10(1)(a); Ontario Regulation 610/06, section 7(1)(b). See also the report by the Ontario Security Commission (2015).

33 In comparison, provincial debt represents 25 percent of the market with CAD\$530 billion of debt outstanding, federal debt accounts for 23 percent of the market with CAD\$479 billion of debt outstanding, and domestic corporations represent 22 percent, with CAD\$468 billion (OSC 2015: 6).

34 The market is too small to absorb larger issues, which also has an impact on investment banking fees and other costs (OSC 2015: 7).

This problem is compounded by the characteristics of the Canadian fixed-income market, which is highly decentralized. Fixed-income securities tend to be placed and negotiated privately, outside exchanges, through the “over-the-counter” (OTC) market. The OTC market is a “negotiated market,” meaning that investors access it through an intermediary (a dealer) who connects buyers and sellers, usually over the phone (Hildreth 2006: 97, 100; OSC 2015: 1, 3-4, 21, 24).

The Canadian fixed-income securities OTC market is also dominated by large institutional investors, such as pension funds, insurance companies, investment funds, and financial institutions (Hildreth 2006: 97; OSC 2015: 1, 17, 19, 20). The Canadian municipal market, and particularly the market for green municipal bonds, will likely remain small without official support. As I will argue later, green banks can strengthen climate finance and support the access of Ontario municipalities to capital markets.

Box 4: The municipal debt market in the United States

The American municipal debt market, the biggest in the world, provides an interesting point of comparison with Canada. There are nearly 89,000 “local governments” in the United States, a term used to describe not only municipalities but also state governments and agencies, school districts, and other local entities. Although only a minority of these entities access the American municipal debt market regularly, as of June 2016 there were approximately 31,000 issuers with debt still outstanding. In June 2017, the total market size was calculated at approximately US\$3.6 trillion.

There are also other major differences between Canada and the United States. In the latter, interest payments on municipal bonds are generally exempt from federal and state taxes. This could explain the prevalence of individual investors (between 42 percent and 67 percent of the total, depending on whether the estimates factor in investments made through money market funds). The exemption is credited with lowering borrowing costs for local governments, but it is potentially regressive (bonds are usually bought by richer individuals or households) and costly in terms of tax revenue.

In contrast to Canada, where municipalities are generally restricted to issuing general obligation bonds, most municipal bonds issued in the United States today are revenue bonds (67 percent of total outstanding as of June 2017). One explanation for their popularity is that revenue bonds tend to be exempt from borrowing limitations and taxpayer-approval requirements. Serial bonds are also popular among American municipal governments.

Sources: Hildreth (2006: 93-104), Hildreth and Zorn (2005: 133), Maguire (2011: 3-4), Maguire and Stupak (2015: 1-2, 7) and SIFMA (2016: 5; 2017: 12).

7. Green bonds

Green bonds are debentures used to finance projects that deliver environmental benefits (G20 Green Finance Study Group 2016: 16; Kim 2015: 15; OECD 2015: 5). They embody a commitment by the issuer to use the proceeds exclusively on green projects (including climate adaptation and climate mitigation projects) and assets. In all other respects, they function as regular debentures; Ontario municipalities must observe existing regulations and limits on borrowing when issuing them, as they would with any debt security or loan.

There are two types of green bonds. “Labelled” green bonds are those expressly labelled as green by the issuer (CBI n.d.b; Cochu et al. 2016: 22). It is assumed labelled green bonds will follow one of the existing standards and guidelines. “Climate-aligned” green bonds can be used for a wide variety of environmental projects but are not expressly labelled as green, even if the underlying assets or projects are climate-aligned or fall into accepted definitions of green projects (Cochu et al. 2016: 22; OECD 2015: 4).

There is no universal government-mandated set of rules governing green bonds. Apart from national standards in jurisdictions such as India and China (CBI 2016b: 1, 3),³⁵ the two major international sets of standards that serve as guidelines for the use of proceeds and their classification are voluntary: the Green Bond Principles, developed by the International Capital Market Association, and the Climate Bond Standards, developed by the Climate Bonds Initiative.

7.1 History and current market

The first green bond was issued in 2007 by the European Investment Bank (EIB); the World Bank followed suit in 2008. Multilateral financial institutions were the main issuers during this initial phase (they are still major participants in this market), but other entities eventually joined the market. The first local governments to issue green bonds, in 2012, were the French regions of Île de France (Paris), Nord-Pas-de-Calais, and Provence-Alpes-Côte d’Azur, followed by the City of Gothenburg (Sweden), the American states of Massachusetts and California, and the Province of Ontario.³⁶

The City of Ottawa was the first municipality to issue a green bond in Canada, in November 2017 (Critchley 2017). The first corporate green bonds were issued in 2013 (by Électricité de France, the Bank of America, and the Swedish real estate company Vasakronan). The first municipality in a

35 India has one set of voluntary guidelines, issued by the Securities and Exchange Board. China has two main guidelines: the *Guidelines for Issuing Green Bonds*, developed by the National Development and Reform Council and the Green Financial Bonds Guidelines, developed by the People’s Bank of China (CBI 2017c; SynTao Green Finance and CBI 2017: 7; Yu 2016).

36 The Province has successfully issued green bonds in 2014, 2016, and February 2017 to finance infrastructure projects. See Ontario Financing Authority (n. d.).

developing country to issue green bonds was the City of Johannesburg, in South Africa. Poland and France were the first national governments to issue green bonds of their own, in December 2016 and January 2017, respectively (CBI 2017b: 16; 2017f: 1; Cochu et al. 2016: 27; Kim 2015: 15; OECD 2015: 13).

Box 5: Green Bond Principles and Climate Bond Standards

Green Bond Principles (GBPs) are voluntary guidelines created by the International Capital Markets Organization. They focus on best practices and emphasize transparency and the use of external auditing whenever possible.

Their most recent version (2017) has four elements. First, the use of the proceeds must be clearly identified in the bond documentation, with a clear description of the project and, if possible, quantification of its environment benefits. GBPs work with projects in categories that include renewable energy, energy efficiency, and clean transportation, among others. Second, the issuer must provide clear information on the criteria for selection of the projects to be financed, their objectives, and how they fit within each of the broader GBPs' eligible categories. Third, the issuer must maintain internal management processes to allocate the proceeds in a transparent way, including hiring external auditors if possible. Fourth, all information on the projects and the use of proceeds must be kept up-to-date and readily available to investors. When possible, the issuer must also provide qualitative and quantitative performance indicators and measures for the project.

The Climate Bond Standard (CBS) has similar objectives and is aligned with the GBPs. Its most recent version (v. 2.1, published in 2017) has three elements in common with the GBPs: mandatory requirements for use of proceeds, tracking, and reporting; eligibility criteria for projects and assets; and a framework with clear procedures for independent monitoring and verification. In addition, the CBS incorporates a formal certification process by its Climate Bonds Standard Board, focusing on pre-issuance and post-issuance requirements (CBI n.d.b). Certification is not mandatory.

The CBS currently focuses on six areas: solar power generation and transmission infrastructure; wind power generation and transmission infrastructure; geothermal power generation and transmission infrastructure; water management and infrastructure; low-carbon buildings; and low-carbon transportation. New areas are under analysis for future implementation: bioenergy (biofuels), hydropower, marine power generation, waste management, and land use criteria.

Sources: CBI (2017d), Cochu et al. (2016: 32), ICMA (2017), and Kim (2015: 17).

Although there are different estimates of the size of the global green bond market, it has grown considerably since 2007. The total value of all green bonds (both labelled and climate-aligned) outstanding as of July 2016 was estimated at US\$694 billion (CBI 2017b: 2), and 2016 set a record for new issuances due in part to the impact of the growing Chinese market, which benefits heavily from official support (CBI 2017e: 1; Cochu et al. 2016: 8). Nevertheless, the volume of green bonds outstanding is still small, estimated at only 0.13 percent of the total global bond market³⁷; labelled green bonds constitute only 17 percent of all green bonds issued globally (Cochu et al. 2016: 22).³⁸

Internationally, the main issuers have been multilateral development banks, local governments and their agencies, and government-owned companies (accounting for about 60 percent of total green bonds outstanding), while the most active investors have been pension funds and insurance companies (CBI 2017b: 5, 16; Cochu et al. 2016: 25, 26-7). About 67 percent of all green bonds still outstanding are for transportation projects, 19 percent are in the energy sector, and the remaining 14 percent represent a mix of uses including water, waste and pollution control, and agriculture and forestry (CBI 2017b: 4, 8). The American market is an exception, as local governments and their agencies are the main issuers and approximately 50 percent of green bond issues have been bought by individuals (CBI 2017b: 5, 16; Cochu et al. 2016: 25-26).³⁹ American local governments are using green bonds for the financing of rail and transport infrastructure, renewable energy, energy efficiency, water quality improvement, water and wastewater infrastructure, and water efficiency projects (Cochu et al. 2016: 35).

7.2 Advantages and disadvantages

Green bonds are regular debentures with the trade-offs generally associated with debt financing instruments. However, their advantages and disadvantages are directly related to the explicit or implicit commitment made by their issuer to use the proceeds in projects with an environmental benefit.

Advantages

- Green bonds may provide reputational gains for their issuers who thereby associate their brands with environmental goals (Kim 2015: 15; OECD 2015: 11). The “green” label and the climate benefits of the underlying projects may make green bonds a popular choice among investors, taxpayers, and the general public.
- Green bonds offer an opportunity for investors to fulfil their environment investment mandate with adequate risk/reward ratios (G20 Green Finance Study

37 These numbers are similar to the estimates from the Climate Bonds Initiative (CBI 2017b: 2).

38 This estimate is backed by the Climate Bonds Initiative (CBI 2017b: 3).

39 The difference in investor profile in the United States can be explained by the fact that municipal bonds are usually exempt from federal and state income taxes.

Group 2016: 16; OECD 2015: 7). This advantage may be particularly important for institutional investors with environmental, social, and governance (ESG) investment requirements and could increase the participation of such investors in the municipal borrowing market (Kim 2015: 15; OECD 2015: 11). At present, large institutional investors dedicate very small percentages of their portfolios to infrastructure and climate investments.

- Green bonds tend to be more transparent than regular municipal bonds, as they can be subject to the external monitoring of the use of proceeds (G20 Green Finance Study Group 2016: 16; OECD 2015: 11). Monitoring may not be as strong with climate-aligned bonds, but investors concerned with ESG goals have an incentive to closely follow the funded projects and obtain information on the use of proceeds. More important, certified green bonds or those following principles such as the GBPs or the CBS may provide useful data on the effectiveness of the underlying climate projects and, with that, crucial information for policymakers and the public. The potential transparency benefits brought by green bonds are even stronger at the local level, given the proximity of policymakers and officials involved in planning, funding, and implementing the project with taxpayers and other important stakeholders.⁴⁰

Disadvantages

- Green bonds may create reputational risks if investors or the public perceive they are being used to “greenwash” business-as-usual projects with no or minimal environmental benefits (CBI 2017b: 7; Cochu et al. 2016: 20, 30; Kim 2015: 15, 17; OECD 2015: 4). The so-called brown-to-green bonds, issued for specific green projects by companies with poor environmental track records or whose main business depends on fossil fuels, are examples of greenwashing (CBI 2016a).⁴¹
- Many municipalities that could benefit from climate projects may not be rated by credit rating agencies and may not have easy access to financial markets. Since investors usually consider the credit quality of the issuer, not of the project, when buying a green bond, this may be an obstacle to the development of the green bond market (Cochu et al. 2016: 42), especially in the absence of aggregation mechanisms that can repackage small issues or issues by smaller municipalities (Cochu et al. 2016: 9–40).
- Green bonds are still a very small portion of the total global bond market. The limited number of issues has kept liquidity low, a potential barrier to the

40 I would like to thank one of the reviewers for this insight.

41 In May 2017 the Spanish oil company Repsol SA issued a green bond to finance energy-efficiency investments in some of its refineries in Portugal and Spain. Although the bond technically complies with climate standards, it raised some eyebrows, as the proceeds will be used for upgrades in a high-carbon-emitting industrial plant. Although the retrofits are expected to reduce emissions in specific units, they may do little to decrease the overall carbon emissions of the company (Benítez 2017; CBI 2017a).

participation of institutional investors (Cochu et al. 2016: 9, 39; G20 Green Finance Study Group 2016: 6).

- Since compliance with standards is voluntary, investors may require the intermediation of third-party service providers to monitor and verify that the proceeds are being applied in accordance with the purposes of the green bond (OECD 2015: 7). Although an important “assurance” mechanism, the hiring of external monitors may increase costs on top of the administrative burden of self-monitoring and reporting (Cochu et al. 2016: 8, 25–6; G20 Green Finance Study Group 2016: 16; Kim 2015: 16).
- The proceeds from green bonds may not be used in projects with real environmental benefit, partly because of the lack of information, and partly because the risks of less mature technologies are harder to assess, since performance data is scarce (Cochu et al. 2016: 29, 38, 41, 42; G20 Green Finance Study Group 2016: 17). This problem is aggravated by a lack of awareness about the benefits of green bonds and inconsistent definitions when domestic and international standards are compared (Cochu et al. 2016: 9, 29, 42; G20 Green Finance Study Group 2016: 10, 17).

7.3 Analysis

Green bonds provide a strong test for the feasibility of climate financing instruments in Ontario municipalities. They are the easiest option, as municipalities can issue them without changes in current provincial regulations. But there are limitations; green bonds are not the solution for all the financing needs of local governments.

With the exception of Toronto, Ontario municipalities are restricted to issuing general obligation bonds, which limits the types of projects they can finance. Debts must be repaid, municipalities must respect their borrowing limits or annual repayment limits, and municipalities should not borrow to pay for the operating costs of climate projects. Moreover, not all climate projects contribute to future revenue growth or generate user fees that can be used for debt repayment. However, such restrictions do not impose insurmountable obstacles to the development of a healthy market for municipal green bonds.

The small size and low liquidity levels of the Canadian municipal capital market pose a bigger obstacle to the popularization of green bonds in Ontario. These problems may be compounded by increased market segmentation if municipal green bonds become a niche investment. Anecdotal evidence also suggests that some municipal policymakers and stakeholders see green bonds as a fad that does not provide any real advantages to municipalities. Unfortunately, from a purely financial perspective, this view is not entirely false. So far, research has failed to show unequivocal evidence of the so-called “green premium,” in the form of lower borrowing costs for issuers of green bonds (CBI 2017g; Kim 2015:

15). When we consider the potential costs of certification, external monitoring, or internal administrative work, green bonds could indeed be less financially attractive than a regular debenture.

Nevertheless, green bonds have advantages that justify their use by municipalities. First, they may be more transparent than regular bonds, since the use of the proceeds can be monitored by investors and third-party service providers; this transparency, in turn, may lead to more accountability by local officials to taxpayers and other stakeholders. Second, green bonds provide strong incentives for issuers to remain committed to climate projects, as non-compliance with the stated objectives of the bond would constitute a “breach of contract” and raise the risk of a default or even litigation by bondholders. Third, they allow investors to make informed decisions about investing in ESG projects (Cochu et al. 2016: 19). Fourth, they help issuers to improve their environmental risk management because of the requirement for “green disclosure” (G20 Green Finance Study Group 2016: 16).⁴²

It is too early to say whether green bonds will become a consistent and effective financing alternative for climate mitigation or adaptation projects in Ontario. The first issue by the City of Ottawa provides a helpful precedent, but the Province could strengthen the market for green municipal bonds by reducing barriers to the development of climate finance instruments and offering interest rate subsidies, loan guarantees, credit enhancements, and priority lending requirements benefiting green investments (CBI 2017b: 18, 2017c: 2; Cochu et al. 2016: 9-10; G20 Green Finance Study Group 2016: 4, 18-19; OECD 2015: 7; UNEP 2015: 19, 23, 28, 44).

Green banks may help, but current provincial plans for the creation of the Ontario Climate Change Solutions Deployment Corporation suggest a very conservative approach to the use of financial aggregators in climate finance. I will return to this topic later. Regulatory changes, including allowing other municipalities besides Toronto to issue revenue bonds, could also broaden the scope of climate finance and increase demand by private investors.

8. Environmental impact bonds (EIBs)

EIBs are an adaptation of a financial innovation, social impact bonds (SIBs), to environmental projects (Balboa 2016: 34; Nicola 2013: 14). Like their inspiration, EIBs are not pure debentures, but debt financing instruments characterized by a

42 Although the enhanced transparency brought by green bonds focuses mostly on ensuring that the proceeds are applied as intended, nothing prevents the issuer or investors from conducting a broader analysis on the financial viability of the projects funded by a green bond. Still, there may be cases in which important and necessary projects are not financially “viable” from the point of view of financial returns. In such cases, the analysis of the climate effectiveness of a project, in terms of decreased emissions or quantity of carbon sequestration or the climate resilience it promotes, may be better suited than a more traditional analysis based on financial returns.

complex web of contractual relationships involving multiple stakeholders that may include issuing bonds to investors (Balboa 2016: 34, 35; Callanan, Law and Mendonça 2012: 15; Nicola 2013: 8, 14).

EIBs build on the concept of “pay-for-success” that has been increasingly used in development finance and the provision of social services in the United States (Birdsall, Mahgoub and Savedoff 2010; Savedoff, Perakis and Schwanke 2016; Stid 2013: 13-18). Pay-for-success gives service providers an incentive to adopt tested and effective methods or strategies to deliver their services. In other words, they allow governments to favour services or interventions that have a good chance of achieving their intended results.

The structure of a typical SIB or EIB goes a step further than pay-for-success contracts by involving private investors in the payment process. A local government or agency issues a debenture to pay for a policy intervention, and the investors’ remuneration depends on the achievement of the intended results by the service provider. The remuneration structure may vary in case of non-performance; depending on the contractual arrangements it can include, for the investor, a loss of principal (principal-at-risk), a loss of return (return-at-risk), or a bonus upon achievement of the conditions (annual bonus return-at-risk). EIBs may also offer different tranches, thereby segmenting investors according to their risk-tolerance profiles.

A typical EIB structure, based on SIBs, is shown in Figure 1.

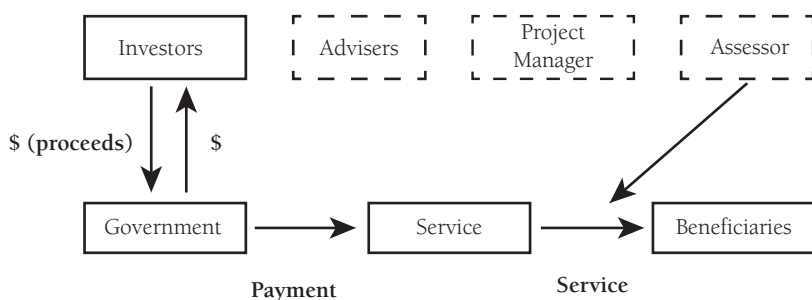
A local government or agency issues a debenture to investors and uses the proceeds to pay the service provider according to the terms of the service agreement. At maturity, the investors are paid back. How much they receive depends on whether the performance conditions are met by the service provider (interest payments may happen throughout the life of the debenture). Project managers and advisers (usually lawyers or consultants) may be involved, depending on the complexity of the structure. The nature of the environmental goods allows variations in this basic structure. For instance, an EIB designed to finance an energy-efficiency program can link investor remuneration to energy bill savings obtained after implementation.⁴³

8.1 History and current market

The first social impact bond (SIB) was launched in 2010 to provide funding for a project targeting recidivism in the City of Peterborough in the United Kingdom (Nicola 2013: 7; Warner 2013: 304). The first EIB was launched in December 2016 by the DC Water and Sewer Authority (Washington, D.C.) to finance the construction of infrastructure to “mimic natural processes to absorb and slow surges of stormwater during periods of heavy rainfall” (DC Water and Sewer

43 In such a situation, the EIB could be partially repaid out of the savings obtained with the reduced energy use (Nicola 2013: 14).

Figure 1: Representation of a typical EIB structure



Source: Based on Callanan, Law and Mendonça (2012: 13); Savell and Heady (2016: 4); and Warner (2013: 305).

Authority 2016: 1). Although not yet fully implemented, it provides an useful example of what future EIBs may look like.

8.2 Advantages and disadvantages

EIBs are not appropriate for all situations. Since they are new, there are no comprehensive analyses of their impact on local governments, but it is possible to draw some conclusions from the broader literature on SIBs, as both instruments are very similar.

Advantages

- SIBs and EIBs can align the interests of investors, local governments, and service providers behind a social or environmental objective. Investors can benefit from good returns while supporting a cause they believe in. As governments do not provide the services directly, they can achieve cost savings while also maintaining an adequate level of service. Finally, non-governmental organizations benefit from a stable source of funding that rewards results-oriented work (Balboa 2016: 34; Callanan, Law and Mendonça 2012: 7, 9; Nicola 2013: 7, 13; Warner 2013: 303).
- SIBs and EIBs allow local governments to tap into private capital, transferring performance risk to capital markets and engaging private investors in monitoring the quality and provision of environmental services (Callanan, Law and Mendonça 2012: 7; Nicola 2013: 13; Warner 2013: 303).
- EIBs allow for flexibility in their financing structure. For example, if the performance conditions set for the contract are not met, investors may lose their principal or forgo returns, or they may receive a bonus upon achievement of the contract conditions. A mix of these options may also be represented in different debenture tranches. They allow local governments to segment investors according to their risk tolerance, attracting a wider selection of potential buyers.

Box 6: The DC Water and Sewer Authority EIB

The DC Water and Sewer Authority EIB is part of a US\$2.6-billion long-term project to control sewer overflow in three river basins in the Washington region.

The two investors in the EIB were Goldman Sachs Urban Investment Group (an ESG/social impact investing group from Goldman Sachs), and the Calvert Foundation, also focused on ESG investments. The face value (or par value) of the debenture was US\$25 million, and it will pay the investors 3.43 percent in interest every six months for the first five years. The EIB debenture is considered a municipal bond for all legal purposes, meaning that it is exempt from state and federal income tax in the United States.

The maturity of the debenture is 30 years, but after the initial five years, a contingent payment (either a bonus to the investors or a penalty to be paid by them to DC Water and Sewer Authority) may be triggered based on an evaluation of the project's performance. The evaluation will follow three steps. First is a pre-construction analysis to monitor the stormwater runoff without the project. Second is effectiveness planning, including the range of expected reduction in stormwater runoff. Third is the measurement of the actual reduction after construction.

The contingent payment has three performance tiers. If the runoff reduction is higher than 41.3 percent of pre-construction levels, DC Water and Sewer Authority will make an additional payment of US\$3.3 million to the investors. If the runoff reduction falls between 41.3 and 18.6 percent, no contingent payment is due. Finally, if the runoff reduction is lower than 18.6 percent, the investors must pay US\$3.3 million to DC Water and Sewer Authority.

Sources: DC Water and Sewer Authority (2016: 1) and Water Infrastructure and Resiliency Finance Center (2017).

Disadvantages

- SIBs and EIBs may subordinate the public good to financial considerations and the incentives of private investors. Local governments must consider this tension when structuring an EIB (Balboa 2016: 37, 38; Callanan, Law and Mendonça 2012: 10, 19; Nicola 2013: 13; Warner 2013: 312).
- Despite their potential to generate savings, EIBs may be costly to the issuer, depending on their structure. Considerable transaction costs may be involved in their administration, especially when intermediaries such as project managers, advisers, and performance assessors are brought in (Callanan, Law and Mendonça 2012: 7; Warner 2013: 306, 310).

- EIBs may not be financially attractive to market investors. If they consider the performance risk of third parties in their profit expectations, they may demand higher returns, negating any savings the EIB might generate to the issuer (Balboa 2016: 37; Ciufo and Jagelewski n.d.: 9; Warner 2013: 308). Alternatively, the bar for the achievement of the service outcomes may be set too low, making it easier for investors to recoup their investment.
- There is a risk that the service providers may achieve the projected results but external and unrelated factors create additional costs for the government on top of the payment due to the investors according to the terms of the EIB (Warner 2013: 312).
- It may be impossible or inappropriate to use a standardized, rigid metric to measure the outcomes of certain interventions (Balboa 2016: 38; Callanan, Law and Mendonça 2012: 56; Warner 2013: 307). This is more of a problem for SIBs,⁴⁴ but could affect EIBs. For instance, the science and methodology for calculating carbon emissions is well-established, but there is room for debate on assumptions and methods in calculating carbon capture or the emissions-reduction potential of a project. For this reason, it may be difficult to measure performance, to establish the causal relation between interventions and outcomes, or to estimate the potential savings coming from the intervention.
- The emphasis placed by proponents of SIBs and EIBs on “proven” interventions can deter innovation. If investor returns and the remuneration of service providers depend on the achievement of conditions set out in the contractual arrangements of an SIB or an EIB, proponents may have an incentive to use tested interventions, even if new ideas would improve service provision.

8.3 Analysis

It is still early to evaluate the impact of EIBs and whether a proper market will ever develop for them. Their main selling point is the potential to align the interests of investors, governments, and service providers behind the provision of public services, allowing local governments to save money while transferring the risk of performance to capital markets. However, these lofty goals may never be met.

Mainstreaming these instruments will be a challenge. They tend to be more expensive to run than regular social government programs. There is also scepticism about the financial returns from such projects; investors in SIBs have predominantly been philanthropies and foundations, and the EIB issued by the DC Water and Sewer Authority has continued the trend (DC Water and Sewer Authority 2016: 1). As some commentators who are sympathetic to the concept of “pay-for-success” have noted in relation to SIBs:

44 Social impact bonds tend to use evaluation methods that rely on randomized assignment to control and experimental groups (Warner 2013: 314).

Currently, most interventions are not yet cost-effective enough to support the economics of mainstream capital markets. Nor are they proven enough for potential investors to understand the nature of the risks they present. That is why, for a period of time, the [pay-for-success] industry will need to tap into below-market sources of risk capital: philanthropic donors and impact investors (Overholser and Whistler 2013: 8).

In Canada, investors seem to be sceptical about working closely with governments in structuring and implementing SIBs, citing instability and a lack of commitment from elected officials, or a lack of flexibility and responsiveness from government bureaucracies (Ciufu and Jagelewski n.d.: 10). It is thus possible EIBs and SIBs will never achieve mainstream market acceptance and will remain a niche financing product for smaller projects.

This prospect raises the question of scalability, that is, whether social impact financing has the potential to provide capital for larger infrastructure projects. The SIBs created so far are small projects dependent on local conditions and initiatives, which are not easily transferrable to different contexts. Sometimes it is even difficult to evaluate the success of these smaller programs, as seems to have been the case with the Peterborough Prison SIB.⁴⁵ The DC Water and Sewer Authority EIB offers an interesting example of how EIBs can be structured for infrastructure financing, but the nature of many climate interventions, particularly when there are no clear revenue streams to guarantee profitability, may undermine market interest in climate EIBs.

There are also potential legal obstacles to their acceptance in Ontario. Current borrowing regulations restrict most municipalities to issuing fixed-rate-interest debentures. Even though an EIB agreement may pay investors based on a fixed interest rate, as in the DC Water and Sewer Authority example, the typical remuneration structure in an EIB depends on policy outcomes that are uncertain or, at best, variable. If so, EIBs may be restricted to the few municipalities in Ontario qualified to issue variable-rate debentures, undermining their potential as a large-scale source of financing.

It could be argued that an EIB allows a municipality to estimate the complete range of possible payments beforehand and thus to anticipate and prepare for different levels of disbursement. Alternatively, a remuneration structure could be devised that comes close to a fixed rate. However, it is still too early to know how provincial officials and the Ontario courts would interpret the terms of an EIB agreement.

SIBs and EIBs also raise concerns about the feasibility of external monitoring and whether they allow active public participation in their design. They may have complex and opaque structures, making them less transparent than green bonds.

⁴⁵ A special report on the experiment found that it met the limited objectives of the pilot program, but there were concerns with the methodology applied to measure the outcomes. It was also a challenge to retain participant engagement for the duration of the program, as most participants lost contact after a couple of months. For details, see Disley et al. (2015).

Moreover, investors, advisers, assessors, and project managers are not necessarily accountable to taxpayers and beneficiaries, and contractual arrangements between those actors could be protected from public scrutiny by confidentiality clauses.

Another problem, potentially less acute in the case of EIBs, is that the final beneficiaries of the policy interventions may have little or no say on the methods employed for service delivery or on the metrics used for the assessment of the results. It is worrisome that SIBs and EIBs may prevent those whose lives will be directly affected by them from having a say on program design and implementation.

Finally, EIBs pose important political questions about the proper role of the state in the provision of social services. This paper argues that the environmental challenges imposed by climate change, the size of the investment gap in climate mitigation and adaptation, and the funding challenges currently affecting local governments make the case for using private capital to finance climate projects and infrastructure in Ontario. This is not a defence of the privatization of municipal assets or the transfer of all government responsibilities to private markets. For instance, what happens with services or projects that cannot be financed with the social impact model, due to their complexity, scale, lack of tested interventions, or reliable solutions? Will governments still fund the provision of public goods? (Balboa 2016: 37; Warner 2013: 308). One commentator highlights this risk in an excerpt worth quoting:

EIBs underscore the popularity of the idea that the provision of public goods should *also be profitable*. This normative assumption could change the overriding vision of governance from that of providing public goods because it serves the public interest, to the idea that governance [should] provide *only profitable public goods* (Balboa 2016: 40).⁴⁶

These concerns should not disqualify EIBs from being considered by Ontario municipalities, but they highlight the need for careful planning and oversight. Given regulatory limitations in Ontario and the current development of such instruments, municipalities should err on the side of caution before committing to the use of EIBs.

9. Catastrophe bonds (CAT bonds)

CAT bonds are one of a range of securities known as insurance-linked securities. They resemble a regular debenture but have a default “trigger.” If a catastrophe occurs during its maturity and the trigger is activated, the debenture defaults, and the principal is used to cover the issuer’s losses or those of a third-party beneficiary (also known as the “sponsor” of the CAT bond). Otherwise, investors receive interest payments and the principal is repaid as it would normally be with a regular debenture (Edesess 2014: 3-4; McDowell and Christensen 2010: 1).⁴⁷

46 Italics in the original. See also Warner (2013: 309).

47 The proceeds from the sale of a CAT bond are usually kept in a segregated account used for payments in case of a trigger.

The two most-used types of triggers are “indemnity” and “industry loss” (Edesess 2014: 5-6; McDowell and Christensen 2010: 1). The former is activated if the financial losses of the issuer or sponsor exceed the defined amount in the debenture agreement or fall under a certain range (the lower limit being the trigger). This type of trigger is commonly used by insurers as protection against risks that exceed what their reinsurers would pay in the event of a catastrophe. The latter type of trigger is activated when losses in an entire industry reach a certain amount, as verified by an independent third party. If so, the issuer or the sponsor is entitled to an amount corresponding to its industry share.⁴⁸

CAT bonds are not designed to finance capital investments. They are used mainly by insurers and reinsurers to transfer risks stemming from insurance portfolios to financial markets,⁴⁹ although they can also be used by other actors, such as governments, pension funds, and corporations to obtain insurance against losses for amounts above what their insurance policies would cover, or against catastrophic events that may not be insurable. When involving a third party, CAT bonds require the creation of a special-purpose vehicle (SPV), which is responsible for the issuance of the CAT bond and for the payments to the beneficiary (also known as the sponsor) if and when the bond is triggered. The structure of a typical CAT bond is shown in Figure 2.

The SPV can be created by insurance companies or financial institutions, which provide intermediation services to other entities. One advantage of contracting out the issuance of the CAT bond to a specialized SPV controlled by a bank or insurance company is that, depending on the regulations in place in the sponsor’s jurisdiction, the SPV may be required to be licensed as an insurer; the use of the SPV allows the sponsor to circumvent that requirement.

9.1 History and current market

The first CAT bonds were created in the 1990s in the aftermath of Hurricane Andrew, which caused extensive material losses in the southeastern United States and led to the bankruptcy of several insurance companies (Edesess 2014: 3).⁵⁰ By the end of 2016, the global CAT bond market totalled US\$24 billion in bonds outstanding, covering a variety of natural disasters such as wind and earthquake risks in the United States, earthquake risks in Canada, storm risks in Europe,

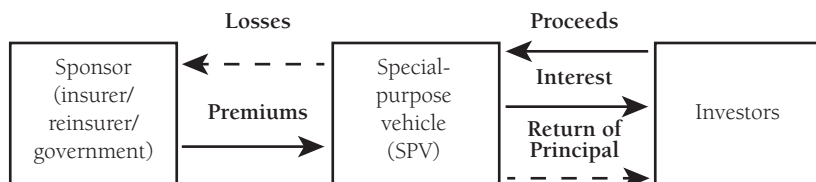
48 There also two other triggers: the “parametric,” which happens when a natural event with characteristics specified in the CAT bond occur (such as a hurricane or earthquake of a certain magnitude), and the “modelled,” which is based on the projections of a mathematical model prepared by an independent third party (Edesess 2014: 5; McDowell and Christensen 2010: 1).

49 Reinsurance is purchased by insurance companies to cover severe risks they would not be able to cover with their own reserves (Edesess 2014: 3; McChristian 2012: 13; McDowell and Christensen 2010: 1, 3).

50 Andrew was the costliest natural disaster in the history of the United States in terms of insurance payments and the second costliest natural disaster in overall terms after Hurricane Katrina (McChristian 2012: 2, 5).

typhoon and earthquake risks in Japan, and cyclone and earthquake risks in Australia (SwissRe 2017: 6–7). Canadian earthquake risk CAT bonds constituted approximately 10 percent of the total market (SwissRe 2017: 16), although these transactions tend to be packaged with other country risks and issued in foreign jurisdictions (McDowell and Christensen 2013).

Figure 2: Typical CAT bond structure



Source: Based on Edesess (2014: 3) and McDowell and Christensen (2010: 2).

So far, no municipalities and local agencies have issued or sponsored CAT bonds in Canada.⁵¹ The legal environment is not well-established; there are no laws or regulations in Ontario covering the issuance of insurance-linked securities in general, and it is not clear whether a CAT bond would be considered an insurance contract under provincial law. According to section 1 of Ontario's *Insurance Act*, 1990, insurance is "the undertaking by one person to indemnify another person against loss or liability for loss in respect of a certain risk or peril to which the object of the insurance may be exposed, or to pay a sum of money or other thing of value upon the happening of a certain event, and includes life insurance."

The interpretation that CAT bonds are debt securities and not insurance contracts under Ontario law is defensible; investors do not commit to indemnify the issuer of the bond, but provide funds upfront to the SPV. Any losses caused by payments made by the SPV to the sponsor of the bond could be characterized as investment losses instead of insurance payments, and CAT bonds would be subject to existing provincial securities laws. This is, however, still an open question in Ontario, awaiting clarification by provincial officials or the courts (McDowell and Christensen 2010: 5).

9.2 Advantages and disadvantages

Advantages

- CAT bonds can help governments transfer to capital markets risks that would not be regularly covered by insurers. In other words, CAT bonds offer a convenient way to spread risks away from the public sector and the insurance industry to more risk-tolerant investors (Edesess 2014: 3; McDowell and Christensen 2010:

⁵¹ Municipalities elsewhere have not issued CAT bonds directly, but other governments have experimented with the instrument. For example, the World Bank has helped small island nations in the Pacific issue CAT bonds (Mahul and Cook 2014).

1). This advantage is particularly important for Canadian municipalities because the federal disaster assistance program is under increasing financial pressure (Gollom 2017).

- CAT bonds can help municipalities and other local public agencies improve their fiscal and financial resilience, protecting them from the financial impact of extreme weather and other hazards.

Disadvantages

- CAT bonds are designed to complement insurance instruments, not to provide capital for infrastructure investments. Their use is thus more limited than that of either green bonds or EIBs.
- CAT bonds may contribute very little, if anything, to the social or economic resilience of communities after a disaster strikes, including social cohesion, long-term economic wellbeing, and employment opportunities for their residents.
- CAT bonds are less transparent than green bonds and there is no legal precedent for their use by Ontario municipalities.

9.3 Analysis

CAT bonds could be very useful at the municipal level in Ontario. They do not provide the same opportunity for the mobilization of private capital for investments as either green bonds or EIBs do, but they could improve the fiscal resilience of municipalities and thus represent a potentially effective way to mobilize private capital in the public interest.

Their low degree of transparency places CAT bonds at a disadvantage, especially in comparison to green bonds. The structure of CAT bonds is not as complex as that of EIBs, but neither the SPVs nor the investors involved in a CAT bond are accountable to taxpayers or the public at large; in fact, the contractual relationships and agreements in a CAT bond may be protected by confidentiality clauses. This is not an obstacle to their adoption in Ontario, as their contractual terms could be negotiated to allow monitoring and external control, but it may slow their adoption and could subject municipalities to legal challenges.

There are also two regulatory challenges to their adoption in Ontario, although they are not insurmountable. The first, addressed above, could be resolved if CAT bonds are classified as debt securities and not as insurance contracts. This classification would require provincial regulation or a court ruling and might generate legal uncertainty and take considerable time. An alternative for municipalities would be to sponsor CAT bonds and use SPVs incorporated by a bank or insurance company in Ontario, as that would not directly contravene the *Insurance Act*.

The second legal challenge is the regulatory restriction on the use of long-term debentures for anything other than capital investments. Municipalities could find it difficult to use a bond to transfer risks to third parties, but this restriction may not apply if they are the sponsors of a CAT bond. Still, some level of legal uncertainty would remain until provincial regulations explicitly regulate the use

of insurance-linked securities by municipalities and they become well-established in Canadian public finance.

Finally, there is a pragmatic obstacle in the way of the widespread adoption of CAT bonds by municipalities in Canada. CAT bonds are usually issued in tax havens or low-taxation jurisdictions because of their “pass-through” characteristics, meaning that transactions or payments are not taxed at their point of origin. Insurance companies and investors may use such schemes for tax-avoidance purposes, raising questions about accountability and fairness, but in a federal system there is a case to be made about avoiding unnecessary taxation of government entities. Municipalities, the Province of Ontario, and the federal government should study the feasibility of adopting specific taxation agreements for CAT bonds as they already exist for the property tax.

10. Green banks

Green banks are “public or quasi-public financing institutions that provide low-cost, long-term financing support to clean, low-carbon projects” (Mendelsohn, Urdanick, and Joshi 2015: 8). Green banks are not financial instruments *per se*, but can play a crucial role in any municipal climate finance strategy either as “financial aggregators” or as providers of financial support and services to municipalities.

A financial aggregator is a regulatory or institutional mechanism that mediates between municipalities (or other subnational actors) and capital markets. Financial aggregators vary in terms of institutional strength (whether they possess a bureaucratic structure and formal rules underlying their financial activities) and in terms of the degree of autonomy they allow to municipalities or other actors (whether or not it is mandatory to borrow through them). From the point of view of municipalities, they can be classified into four types, as shown in Table 2.

At the top left (financial aggregators that allow high municipal autonomy and are characterized by weak institutional strength) are coordination frameworks: sets of rules that establish the legal groundwork for cooperation between municipalities without the creation of formal institutions. They can be structured to provide maximum flexibility, for instance by allowing municipalities to exchange bank practices or to coordinate borrowing activities.

Table 2: Financial aggregator types

	Weak institutional strength	Strong institutional strength
High municipal autonomy	Coordination frameworks	Green banks
Low municipal autonomy	Financial “warehouses”	Financial authorities
Source: Table prepared by the author.		

At the bottom left (financial aggregators that limit autonomy but are institutionally weak) are financial warehouses, which can be used as conduits for the aggregation of smaller, illiquid loans, packaging the respective cash flows and re-issuing them as asset-backed securities or bonds to investors (Cochu et al. 2016: 50; Mendelsohn, Urdanick, and Joshi 2015: 1, 17, 18). They do not need to be full-fledged organizations and their main purpose is to remove transaction costs for participants. I know of no cases of financial warehouses directly providing municipal loans, but one of the most successful examples used for climate finance purposes at the local level is the Warehouse for Energy Efficiency Loans, or WHEEL, created by the State of Pennsylvania.

Box 7: Warehouse for Energy Efficiency Loans (WHEEL)

WHEEL was created by the Treasury of the State of Pennsylvania to help it securitize and sell to capital markets loans from its energy retrofit program for homeowners, called Keystone HELP.

The Pennsylvania Treasury had two concerns. First, the HELP program was highly successful and generated a high volume of loans that had the potential to exceed the Treasury's diversification rules for lending. Second, the loans were too small to be resold in a secondary market.

WHEEL solves both problems. It purchases the loans from Pennsylvania and aggregates them into an asset-backed security, which is resold to market investors.

Source: Energy Programs Consortium (2017: 14); Mendelsohn, Urdanick, and Joshi (2015: 6, 17).

At the bottom right (financial aggregators that limit municipal autonomy and are institutionally strong) are financial authorities, highly institutionalized, with their own legal personality and bureaucratic apparatuses. Although not all financial authorities are organized to function as mandatory intermediaries for municipalities, they can still influence rates and the overall market for municipal investments, indirectly constraining capital scarcity and the terms under which municipalities can borrow. Financial authorities are common in Europe (Peterson n.d.: 4). In the United States they are called “municipal bond banks” and are usually sponsored by state governments (Anderson n.d.; Governance Finance Group 1997). In Canada, the best-known example is the Municipal Financial Authority of British Columbia, but Alberta and Nova Scotia have also organized their own financial authorities.⁵²

52 Alberta's financing authority is the Alberta Capital Finance Authority, originally established in 1956. See Alberta Capital Finance Authority (n.d.). In Nova Scotia, the financing authority is the Nova Scotia Municipal Finance Corporation. See Nova Scotia Municipal Finance Corporation (n.d.). For other examples, see Slack and Tassonyi (2017: 45).

Green banks occupy the top right cell of the table (financial aggregators that do not limit municipal autonomy but are institutionally strong). Although at first glance they may look similar to financial authorities, there are two major differences. First, the *raison d'être* of green banks is to provide financing to projects that have an environmental benefit. Financial authorities, on the other hand, cater to the general financing needs of a municipality, within the limits specified under their establishing legislation. Second, financial authorities are usually created by higher levels of government to function as mandatory intermediaries between municipalities and capital markets (Kehew, Matsukawa and Petersen 2005: 50). In contrast, green banks can be organized by local governments, can finance projects from both private and public actors, and usually provide financial services to municipalities on a non-mandatory basis.

10.1 History and current market

Green banks are relatively new, although they draw inspiration from institutions and government programs that have been in use for decades in both developed and developing countries, such as development banks and public investment corporations. They can be structured in different ways. For instance, green banks in the United States are usually state-based and their main function is to provide financing for homeowners and renewable energy enterprises.⁵³ The first American green banks were created in 2011 by the State of Connecticut and in 2013 by the State of New York – the Clean Energy Finance and Investment Authority and the New York Green Bank, respectively (Berlin et al. 2012: 3; Leonard 2014: 199). The American model seems to be the model the Province of Ontario is pursuing for the Ontario Climate Change Solutions Deployment Corporation (OCCSDC).⁵⁴

In contrast, the Green Investment Bank in the United Kingdom was created by the national government with a broad mandate, which includes investing in selected green technologies and industry sectors, while promoting renewables in Britain's energy mix. Box 8 illustrates some of the pitfalls that may hamper the use of green banks for climate financing at any government level.

10.2 Advantages and disadvantages

Advantages

- Financial aggregators can lower borrowing costs and increase market access for municipalities.
- Depending on their mandate, green banks may cater to underserved municipalities and sectors of the economy. This is important, as climate mitigation and some climate adaptation projects may not attract the same levels of private financing

53 For examples, see the Connecticut Green Bank (<http://www.ctgreenbank.com>) and the New York Green Bank (<https://greenbank.ny.gov>).

54 Ontario Regulation 46/17 created the Ontario Climate Change Solutions Deployment Corporation, also known as the Green Ontario Fund.

Box 8: Green Investment Bank (GIB)

The United Kingdom's GIB started operating in 2012 as a government-owned institution, with a broad mission to mobilize private capital and support green projects that, even if feasible, had trouble securing financing. The British government debated possible investment areas during its creation and eventually adopted a conservative focus on established technologies. Initial funding for the GIB was provided by the British government.

Although the GIB is government-owned, it follows commercial practices to provide lending to projects falling into five areas prescribed in the *Enterprise and Regulatory Reform Act*, its establishing legislation: (a) reduction of greenhouse gas emissions; (b) efficiency in the use of natural resources; (c) protection or enhancement of the natural environment; (d) protection or enhancement of biodiversity; and (e) promotion of environmental sustainability.

In practice, its investments are confined to a more limited set of projects: (1) offshore wind power generation; (2) commercial and industrial waste processing and recycling; (3) energy from waste generation; (4) non-domestic energy efficiency; (5) biofuels for transportation; (6) energy from biomass; (7) carbon capture and storage; (8) marine energy; (9) renewable heat; and (10) community-scale renewables.

One of the GIB's major shortcomings is its funding structure. The bank cannot borrow in financial markets, even though one of its stated purposes was to leverage private financing. The main reason for this limitation was primarily political: as any borrowing by the bank would appear in the government's balance sheet, the government wanted to avoid criticism over a potential increase in the public debt. Another challenge was its contradictory goals; while it was designed to focus on projects that could not find private funding, one of its main investment guidelines was to restrict investments to low-risk projects that offer good return/risk ratios. This focus excludes unproven technologies and higher-risk projects that would benefit most from financing from a green bank.

In June 2015 the British government started a review of the privatization of the GIB, arguing that privatization would allow it to start borrowing and would be the best way to guarantee future funding. However, even when privatized, it may take some time before the bank can start borrowing. Another concern among opponents of privatization is that, in order to lift most of the public controls and effectively transfer it to private owners, the government would need to repeal the *Enterprise and Regulatory Reform Act*, thereby eliminating the GIB's green mandate. If it is privatized and becomes a regular "non-green" financial institution, there could be tension between the short-term interests of GIB shareholders and long-term public environmental goals.

Sources: Ares (2015: 6-7, 10-12, 14-15, 27); Environmental Audit Committee of the House of Commons (2015-16: 4-7, 14).

as other infrastructure projects. Investments in infrastructure projects tend to be public goods, benefitting even those who do not pay for their construction. Public green banks have a crucial role to play in the correction of market failures and the provision of such public goods (Berlin et al. 2012: 12).

- Financial aggregators can provide a range of financial services to municipalities, from managing and maintaining deposit accounts to more specialized services, such as credit enhancements, assistance with project design and financial modelling, assistance with bond issuance, and financial or policy risk insurance (Peterson n.d.: 4–6). Green banks can also develop a deeper business relationship with municipalities and provide a complementary range of green services, such as warehousing for energy efficiency home loans and credit enhancements for green bonds (Cochu et al. 2016: 51; Mendelsohn, Urdanick, and Joshi 2015: 3, 9).
- Green banks can have a flexible, dual role in lending to both the public and private sectors. Over time, they could strengthen and popularize the use of green debt financing and allow governments to scale back subsidies for green industrial sectors (Berlin et al. 2012: 3).
- Green banks and other financial aggregators can help local governments leverage private capital by using their own resources in support of private lending for climate projects (Berlin et al. 2012: 15).

Disadvantages

- Financial aggregators may compete with commercial banks and other lenders (such as infrastructure banks) as a source of financing for capital investments. They may also crowd out other investors.⁵⁵ This drawback may not be serious in the case of green banks, especially if their investment mandate focuses on underserved sectors of the economy.
- If financial aggregators are publicly owned, or if they implement public policy or operate in accordance with public plans, they may be seen as “picking winners” or caving in to political influence in their lending activities.
- On the other hand, if they operate according to commercial or industrial standards, they may rely too much on short-term credit (Sahoo, Nelson, and Goggins 2015: 16) and may not serve smaller municipalities or sectors of the economy that need capital the most but cannot easily access private capital markets. In this way, commercial standards may render financial aggregators and green banks ineffective in their role as financial catalysts or intermediaries.

Box 7 showed one way in which financial aggregators can provide intermediation services to market actors. Although financial warehouses can be run independently from specific financial aggregators, as with the WHEEL program, they could be created by green banks to complement other programs and

⁵⁵ This is a potential disadvantage of any public development bank or financial authority (see Sahoo, Nelson, and Goggins 2015: 16).

services. Box 9 presents two such mechanisms for credit enhancement and risk mitigation, both of which could be useful in kick-starting green capital markets in Ontario and Canada.

Box 9: Credit enhancement and risk mitigation mechanisms

Credit enhancement and risk mitigation mechanisms are programs or entities designed to mitigate or transfer default and liquidity risks. Their main purpose is to lower capital costs by improving the credit quality of a financial asset and by reducing the risks associated with an investment. These mechanisms can be created by the private or public sectors and can be internal (incorporated within the allocation of cash flows) or external to the debt instrument or securitization, although some securitization or debt deals can include both.

Internal credit enhancements include senior-subordinated structures, whereby certain tranches of the debt instrument are assigned a lower credit rating and serve as protective layers for the more senior, highest-rated tranche, meaning that the investors in the lower tranches are the first to absorb the losses from defaults. Other enhancements are minimizing excess spread (a difference between the interest rate received on the underlying assets and the yield on the issued security) or preventing overcollateralization, the posting of more collateral than actually needed due to information asymmetries or risk-aversion on the part of finance providers.

External structures include debt guarantees, letters of credit, and mechanisms for the provision of market liquidity (by buying up outstanding debt). One advantage of external enhancement structures is that they can have a catalyst effect: small amounts of funds from the public sector can be used to open up access to larger pools of private capital. In the context of climate finance, they can reduce financing costs, increasing the tenor and liquidity of municipal or infrastructure debt instruments, and improve capital markets by establishing green bonds as a viable and desirable asset class.

Sources: European Investment Bank (2012: 5); Mendelsohn, Urdanick and Joshi (2015: iv, 1, 10-13).

10.3 Analysis

Green banks are the most useful of all the instruments analyzed in this paper in terms of their potential to mobilize private capital for public investments and support the development of a healthy market for green bonds, EIBs, and CAT bonds. Besides intermediating market access to municipalities – by issuing their own bonds in capital markets and lending the proceeds to local governments and

other public entities – green banks can function as catalysts for private investment, lending in syndication with other investors or using their own capital in the type of risk mitigation mechanisms described in Box 9. Moreover, if necessary, green banks can have a dual role, providing similar intermediation and credit enhancement services to private actors that, for a number of reasons, may not be able to easily borrow or issue debentures.

Green banks can help develop a market for climate finance instruments by, for instance, issuing green bonds or EIBs, or creating SPVs to support CAT bonds. They may also cater to underserved entities and industry sectors. In this way, they should be integral to provincial and federal climate strategies in Canada. In fact, publicly owned and non-profit institutions may help Canadian governments to achieve their climate policy goals. The benefits outweigh the drawbacks: for instance, the claim that publicly owned green banks can crowd out private investors rings hollow in the face of market failures and the limited availability of private capital for certain climate mitigation and adaptation projects.

Green banks specialize in a niche sector that may not be financially attractive to private institutions, or that involves smaller projects that are not exclusively from municipalities or public entities.⁵⁶ Moreover, competition with other sources of capital, whether private or public, is not in itself a bad thing and may decrease borrowing costs across the board. Finally, green banks can help governments gradually replace grant programs sustained by taxpayers' money with market-based lending, ameliorating the pressure on public budgets and ensuring the growth of financing pools over the long term.

Decision-making and policy-implementation processes in green banks can be transparent and their officials accountable to taxpayers or the public. Naturally, much depends on key characteristics, such as their bureaucratic and ownership structures, or the principles guiding bank investments; a privately owned green bank is potentially less accountable than a publicly owned one, although both accountability and transparency must be reinforced by external oversight mechanisms in the public interest. Although technically it is not a green bank or financial aggregator, the Toronto Atmospheric Fund (TAF) could be a model for such institutions, as it has a board of directors and investment supervisory committee made up of city councillors and Toronto residents (TAF n.d.a).

It is not clear whether municipalities in Ontario could create their own financial aggregators. The City of Toronto designed TAF to perform some of the functions usually attributed to green banks and its model could be adopted by other municipalities, but expanding the role of such institutions beyond the

⁵⁶ A common critique of green banks is that they are not really necessary when there are other institutions that can provide financing to municipalities. In the case of Ontario, Infrastructure Ontario could fill this role, but it is unlikely. As previously mentioned, green banks can play a dual role by providing financing to municipalities and private entities and may provide aggregation services to smaller projects.

provision of small home-energy grants or loans would require analysis of their legal and commercial limitations. The creation of a green bank is better left to higher government levels. Ontario municipalities could help in the creation of a powerful provincial green bank, which would be better able to achieve economies of scale and savings in transaction costs. A provincial bank could also act as an equalizer of the disparities among municipalities in the province.

Unfortunately, the Province has pursued a very limited vision for its Ontario Climate Change Solutions Deployment Corporation (OCCSDC). Ontario Regulation 46/17 does not say whether the OCCSDC will provide financing to municipal projects, although it is possible that it was designed to complement, and not to compete with, the work of other provincial agencies that provide that type of financing, such as Infrastructure Ontario. Its general mandate is also unclear, including whether it can finance green private-sector companies.⁵⁷ Ontario Regulation 46/17 is also silent on climate adaptation and resilience projects, as the main mandate of the OCCSDC is to focus on absolute GHG emission reductions.⁵⁸

The OCCSDC is still under development and its overall mandate may yet change but, as things stand in early 2018, the Province has missed the opportunity to create an institution with a bold vision for the future and a broad mandate extending to investments in green infrastructure and support to municipalities.

11. Conclusion

Municipalities in Ontario need to tap private sources of capital to invest in climate mitigation and climate adaptation projects, given the size of their investment needs and the limited sources of funding at their disposal. They can rely on climate finance instruments and on the services of financial aggregators such as green banks to bridge the gap between their capital shortfall and the investments that will be vital for their future livability.

It cannot be stressed enough that municipalities must make smart use of any climate financing tools; debt must be repaid and is not a sustainable funding source in the long term. Moreover, financing should not be used for operating expenditures. Local governments must focus on developing their own sources of funding, either by pressuring the provincial governments for other revenue options or by expanding, where feasible, their use of land-based financing tools, user fees, and other funding instruments. Climate financing should complement public funding and the public interest should always guide the allocation of private capital for climate projects. Still, the potential for climate financing in Ontario is huge and debt financing has a role to play in long-term infrastructure projects that require large upfront investments.

57 According to section 3(d) of Ontario Regulation 46/17, the OCCSDC may provide incentives and engage in financing activities, including to individuals, but section 4(2)(b) prevents it from providing incentives or financing the development of green technology.

58 Ontario Regulation 46/17, section 5(3)1.

Among the instruments analyzed in this paper, green bonds are the easiest and the most immediately available to Ontario municipalities. They have disadvantages, such as the reputational risks associated with “greenwashing” and the additional costs that municipalities may incur with green bond certification or by hiring third-party service providers to verify the use of the proceeds. Moreover, green bonds may not be a feasible financing alternative for smaller municipalities or for those without ready access to capital markets.

However, the main obstacle in the way of their adoption may be the reluctance of city councillors and city staff to pay for those additional costs, especially when green bonds offer no financial advantage to issuers in the form of a “green premium.” One city official told me that it was difficult to justify issuing a green bond when a general obligation bond delivered the same financial results for a similar or lower cost. This caution is commendable, but it can also be countered in two ways.

First, the additional costs associated with green bonds are not very high. For instance, the Climate Bonds Initiative charges 0.001 percent of the face value of a green bond for its certification program (CBI n.d.a). This means that a municipality issuing a USD\$100 million green bond will need to pay only USD\$1,000 for the certification. Granted, verification, advisory services, and monitoring services would also be needed, but it is reasonable to assume that the “green” part of such services can be provided by the same third-party service providers that advise municipalities on the issuance of regular bonds and, when that is not possible, additional service providers can be hired to perform limited tasks that will not significantly increase the final costs of a bond.

Second, and more important, green bonds can enhance the transparency of government spending because of their built-in monitoring requirements. When properly done, verification or monitoring of the use of proceeds can help stakeholders ensure that the money borrowed by a municipality is being invested in the intended environmental projects. In other words, green bonds give policymakers an incentive to stick to their environmental commitments.

CAT bonds are an interesting alternative, despite the regulatory uncertainty about their legal nature under Ontario laws. Municipalities could circumvent this problem by issuing CAT bonds through an SPV owned by a third party. Nevertheless, uncertainty about taxation would remain. Municipalities and other levels of government should explore the feasibility of adopting specific taxation agreements to make CAT bonds more attractive in future.

Environmental impact bonds face even bigger challenges in Ontario. It is questionable whether they can be scaled up to benefit larger projects and their costs are potentially higher than those of green bonds and may cancel out any savings the government obtains in the provision of services. It may also be difficult to counter investors’ scepticism about the risk-benefit ratio of such projects.

There are also potential legal obstacles to the adoption of EIBs in Ontario. Current borrowing regulations restrict most municipalities to fixed-rate debentures,

Table 3: Comparison of the main climate finance instruments

	Legal restrictions	Costs	Accountability/transparency	Potential for adoption by Ontario municipalities
Green bonds	Same restrictions as regular bonds, such as debt/payment limits.	So far, no observed “green premium” and potential additional costs related to certification and monitoring.	Accountable and transparent, although they may not raise the same scrutiny as taxes. Transparency can be enhanced by external monitoring.	Highest potential, with no significant change in regulations.
EIBs	Restrictions on the use of variable-rate interest rate debentures may create obstacles to their use.	Complex structure is potentially costly, with many intermediaries. Returns may be higher to attract investors.	Accountability may suffer due to their complex structure. Investors and service providers may not be accountable to taxpayers or the public in general.	Limited. Some changes in current borrowing regulations may be necessary. Municipalities must weigh costs and benefits, depending on the structure proposed and the goal of the EIB.
CAT bonds	Some restrictions. CAT bonds may be classified as insurance contracts, limiting their use by municipalities. Additional restrictions relate to the use of long-term debentures for anything other than capital investments.	Additional costs. Not strictly eligible for capital investments.	Accountability and transparency may suffer due to the structure of CAT bonds and potential confidentiality of contracts.	Limited. Some changes in current regulations may be necessary. Potential taxation conflicts between government levels (federal, provincial, municipal).
Green banks	Potential legal restrictions, but mostly practical limitations.	Can be costly depending on the funding structure. Ideally, they should be able to borrow directly from private markets. Provincial and federal banks may be better at eliminating transaction costs.	Decision making and policy implementation can be transparent and officials accountable to taxpayers, depending on the bureaucratic and ownership structures or the principles guiding investments.	Better left to the province and the federal government.

and the typical remuneration method in EIBs may lead to questions about their legality. If EIBs are considered to be variable-rate debentures, their use may be restricted to the few municipalities in Ontario qualified to issue such debentures under current regulations. Table 3 compares the main climate finance instruments.

The provincial and federal governments have both a direct and an indirect role to play in municipalities' adaptation to and mitigation of climate change. Indirectly, they have a broad set of policy tools that can be used to change incentives and internalize environmental costs to polluters. These include the elimination of subsidies that disproportionately benefit the fossil-fuel industry, the implementation of more strict environmental standards, or the implementation of a carbon price and carbon trading systems. Ontario and the federal government have already shown initiative in some of these policy areas; it is particularly noteworthy that Ontario is joining the cap-and-trade system created by Québec and California.

However, the federal and provincial governments could do more to help municipalities prepare for and adapt to the effects of climate change, especially by helping establish and strengthen a healthy market for climate financing instruments. For instance, the provincial government could provide incentives or credit enhancements for green bonds, or act as an intermediary for municipalities that do not have market access but can issue their own debt securities. Alternatively, the Province could cover some of the administrative costs municipalities incur when issuing green bonds, at least until market solutions become available to Ontario municipalities. These measures would facilitate the entry of new players into the climate financing market, increasing its liquidity and potentially decreasing borrowing costs in the long term.

Finally, green banks could support a healthy green capital market by directly issuing green bonds and EIBs, creating SPVs to support CAT bonds, or catering to underserved entities and industry sectors. They involve some difficult policy trade-offs for governments. On the one hand, they may compete with other public and private sources of financing and, if publicly owned, they may be seen as trying to pick winners. On the other hand, if they are mandated to use private banking standards in their financing activities, they may fall prey to the same market failures that affect private financial institutions. Nevertheless, their benefits outweigh their drawbacks, and much depends on their institutional design and intended function. Unfortunately, Ontario has pursued a very limited vision for its proposed green bank, the OCCSDC. The bank needs a broader mandate extending to investments in green infrastructure and, more importantly, it needs to take a more active stance in providing financial support to help municipalities with climate change mitigation and adaptation.

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