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The Institute on Municipal Finance and Governance (IMFG) at the Munk School of Global Affairs at the University of Toronto focuses on developing solutions to the fiscal and governance problems facing large cities and city-regions. IMFG conducts original research on Canadian cities and other cities around the world; promotes high-level discussion among Canada’s government, academic, corporate, and community leaders through conferences and roundtables; and supports graduate and post-graduate students to build Canada’s cadre of municipal finance and governance experts. It is the only institute in Canada that focuses solely on municipal finance issues and large cities and city-regions. IMFG is funded by the Province of Ontario, the City of Toronto, Avana Capital, and TD Bank.

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Papers on Municipal Finance and Governance


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Abstract
Increasingly, compact and sustainable development has become a priority for Canadian municipalities. In order to realize these growth objectives, it is possible to look not only to conventional land use and growth management policies, but also to fiscal instruments to achieve planning goals. Existing literature suggests that development charges, which are financial tools used by municipalities in several Canadian provinces to pay for the growth-related capital costs associated with new development or redevelopment, can influence how land resources are consumed and developments are designed. Drawing on information from the literature and interviews with key informants, this research analyzed how development charges are used in British Columbia, Alberta, and Ontario, as well as the Halifax Regional Municipality, to understand how jurisdictions employ development charges and what role these charges currently play in achieving growth objectives.

The research found that few municipalities use their development charges proactively to meet planning goals. Moreover, the research revealed a divide among practitioners, with some maintaining that development charges were a revenue-raising tool and a poor mechanism by which to achieve planning objectives. Others recognized that development charges could be—and were being—used as a tool to encourage compact growth, but identified several barriers to more effective and widespread use as a planning tool. Suggested recommendations for policy changes include more flexibility within legislation to collect for transit and other services, ongoing support from provincial officials to assist municipalities in designing development charge programs with policy goals in mind, and further exploration of how fiscal tools can best be used as planning tools.

Keywords: development charges, smart growth, compact growth, sustainable development, transit
JEL codes: H23, H27
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This research and paper also formed the basis for my Current Issues Paper, which was completed to fulfil the academic requirements for the Master of Science in Planning program at the University of Toronto, and research papers completed for Sustainable Prosperity.
Development Charges across Canada: An Underutilized Growth Management Tool?

1. Introduction
Development charges—also called development cost charges, capital cost charges, off-site levies, or development impact fees— are financial instruments used by municipalities to pay for the growth-related capital costs associated with new development or redevelopment. These charges are levied by municipalities in Ontario, British Columbia, and Alberta, and by the Halifax Regional Municipality (HRM) on the principle that development related to growth should pay for itself and not impose a burden on existing residents.

The literature suggests that the way development charges are structured affects how land resources are consumed and developments are designed (for example, whether they will take the form of compact development or sprawl). However, as Tomalty and Skaburskis (2003) argue in their study of municipalities in Ontario, most municipalities do not coordinate their development charges and planning goals, and consequently are underutilizing development charges as a planning tool. Similarly, Slack (1994) argues that while it may be complex to use development charges to influence land use patterns, they should support planning objectives and not subsidize one form of development at the expense of another.

Encouraging more compact and sustainable forms of development has increasingly become a priority as development constraints, environmental concerns, and fiscal pressures necessitate an alternative to the prevalent low-density, post–Second World War suburban growth patterns. Researchers have studied the extent and implications of these patterns. For example, a Neptis Foundation study of the Vancouver, Toronto, and Calgary areas reported that between 1991 and 2001, gross urban housing density fell by 5.2 percent in Toronto and by 12.1 percent in Calgary (Neptis Foundation 2010, 33). IBI Group (2002) estimated that if the region of Toronto were to continue with “business-as-usual development,” by 2031, population growth in the Toronto region would require the urbanization of an additional area almost double that of the current City of Toronto. Policies designed to stop sprawling, inefficient growth—such as the Growth Plan for the Greater Golden Horseshoe in Ontario—are increasingly employed to legislate more compact, sustainable, and transit-oriented development.

The question remains, how can municipalities implement these policies and shift the way a community is planned and growth occurs? As growing “out” is giving way to growing “up and in,” municipalities need to look not only to conventional land use and growth management policies, but also to fiscal instruments to achieve planning goals. Although development charges are currently used by many municipalities to pay for new infrastructure, their use as a

1. In this paper, “development charges” will be used as a generic term. When development charges in specific jurisdictions are being described, the context-appropriate term will be used.
planning tool, as the literature suggests, remains less clear. A study completed by Skaburskis and Brunner (1999) showed that only 8 percent of surveyed planning officials used development charges and cost-sharing agreements as a part of their growth management programs.

How do municipal officials perceive the utility of development charges as a planning tool? Are there reasons municipalities do not or cannot use development charges as a growth management tool? Would changes to the legislative framework make them both an effective finance tool and planning tool? Comparing the literature with how municipalities actually perceive, implement, and use development charges will provide insight into the role they do—and could—play in practice.

This research builds upon existing literature to identify the specific development charge models employed in Canada, how jurisdictions use development charges, and whether they are used to achieve more compact forms of development. Understanding the context in which different jurisdictions use development charges will assist in identifying what role development charge programs could play within broader planning and policy initiatives related to compact growth and sustainability. Specifically, I will explore how development charges can be used more fully as a planning tool, but also recommend changes to their structure to ensure they support growth management initiatives and compact growth patterns while mitigating sprawl.

This report provides an introduction to the current state of knowledge on sprawl, growth management, and development charges, as well as the history and structure of development charges in the jurisdictions studied. I will present the main findings from the interviews with key informants and conclude with the implications for policy and recommendations regarding proposed changes to the structure of development charge programs that would increase their effectiveness and broaden their appeal as a growth management and planning tool.

### 2. Approach and Method

To understand how development charges are being used in Canada and to what extent they are—or are not—being used to encourage more compact growth patterns, I conducted 15 semi-structured interviews with key informants in four jurisdictions: British Columbia, Alberta, Ontario, and the Halifax Regional Municipality (HRM). These jurisdictions were chosen because their development charge programs are widely employed and well-established. The interviews included seven with municipal officials and eight with provincial officials and development charge consultants.

Additionally, I conducted a content analysis of the current literature, in order to review the broader context of development charges in Canada. Further, I evaluated the current regulatory framework within which the programs are based,

2. Skaburskis and Brunner (1999) mailed their surveys to planning directors of municipalities in English Canada with populations of more than 10,000 (1991 Census) that had a positive growth rate between the census years of 1986 and 1991.
including the history and legislative background. A summary of development charge characteristics in each of the provincial jurisdictions studied can be found in Table 1.3

The research was guided by the following questions:
- How are development charge systems currently employed across Canada?
- To what extent are municipalities interested in using development charges as a growth management tool?
- Do municipalities try to use development charges as a way to achieve certain growth patterns?
- Have municipalities studied the impacts of development charges on their jurisdictions’ growth patterns?

3. The Current State of Knowledge

3.1 Urban Form, Sprawl, and Growth Management

Debate on how cities should grow and the form this growth should take is not new, and the matter has acquired some urgency: between 2001 and 2006, 90 percent of population growth in Canada occurred in metropolitan regions (Blais 2010, 1). Increasingly, governments—whether provincial, regional, or local—are developing growth management tools and strategies and greater importance is now being placed on ensuring that growth is orderly, compact, and efficiently uses existing infrastructure and services.

The most frequently term used to describe the currently dominant form of urban growth is urban sprawl, defined by Soule (2006, 3) as “low density, auto-dependent land development taking place on the edges of urban centers, often ‘leapfrogging’ away from current denser development nodes, to transform open, undeveloped land, into single-family residential subdivisions and campus-style commercial office parks and diffuse retail uses.” In the Greater Toronto Area, more than 80 percent of housing in areas outside Toronto and parts of Mississauga is in the form of either single-family or semi-detached houses—that is, low-density development (Blais 2000). Blais (2003) also found that in 2001, of the four regions surrounding the City of Toronto, only 3 percent of proposed residential development was directed to already built-up areas. In Calgary, between 1991 and 2001, medium-density housing as a share of the total housing stock declined by 4.5 percent; apartments by 10.4 percent; these changes were accompanied by an increase in low-density housing forms (Neptis Foundation 2010).

3. This research also formed the basis of a larger paper completed to fulfil the academic requirements for the Master of Science in Planning program at the University of Toronto. As a part of that larger paper, I reported on a questionnaire sent to 23 municipalities. This paper will not include an in-depth discussion of the results of the questionnaire. The survey, however, helped me identify the municipal officials who participated in the interviews reported here. The questionnaire response rate was 83 percent and the list of municipalities that responded can be found in Section 10.
Low-density, inefficient development on the urban fringe has resulted in fragmented, automobile-dependent communities in which transit is not viable and the loss of open and agricultural space. Persky and Wiewel (1996) argue that “at the level of society as a whole, the efficiency benefits of suburban growth are just about wholly offset by the inefficiencies of increased traffic congestion, duplication of infrastructure, decline and abandonment in the central city, and other externalities and public costs” (as cited in Wiewel, Persky, and Sendzik 1999, 96).

Many studies point to the benefits of moving towards more compact forms of growth. In particular, infrastructure and service provision for higher-density development is more cost-effective than for lower-density development (Burchell 2005; Burchell and Mukherji 2003; Canada Mortgage and Housing Corporation n.d.; Slack 2000). For example, the Canada Mortgage and Housing Corporation (CMHC) compared the cost of infrastructure provision for a traditionally built postwar development and that of a New Urbanist development and concluded that the initial costs to provide infrastructure and services to the New Urbanist development would be $5,301 less per housing unit (CMHC n.d.b). Furthermore, the New Urbanist development was projected to provide $10,977 in savings per unit over the infrastructure’s life-cycle. Similarly, CMHC studied a project in the East Clayton neighbourhood of Surrey, B.C., which was designed with increased density, mixed uses, and an integrated road system (CMHC 2001 2-3). The study concluded that when compared to development in a traditional postwar neighbourhood, even with similarly sized housing units, the East Clayton project’s total land, building, and infrastructure costs would be 20 percent lower (CMHC 2001, 7).

Some commentators have questioned the benefits of compact growth (Gillham 2002, chapter 4; Gordon and Richardson 1997; Windsor 1979). For example, Gordon and Richardson (1997), contend that many of the arguments for compact cites, namely that they will stem the loss of open space and agricultural lands, reduce traffic congestion, and lead to greater efficiency, are not fully supported by the data. Nevertheless, the negative consequences of sprawl have been well studied, such as work by Burchell et al. (2002) in the Costs of Sprawl—2000.

Several alternative development forms have been popularized and promoted as solutions to low-density development and the segregation of land uses. These alternatives have been called “smart growth,” “transit-oriented development,” and “New Urbanism,” among other terms. Despite variations in name, these models generally promote many similar features and types of urban form. These key elements are summarized by Blais (2003, 3), who suggests that in order to counter sprawl, municipalities and regions should promote development with “(1) higher densities; (2) a wide range of choice in building types; (3) a closer mix of

4. The Ontario Farmland Trust reports that more than 18 percent of Class 1 Agricultural land in Ontario has been urbanized and that between 1996 and 2001, farmland in the Greater Toronto Area decreased by 50,000 acres (Ontario Farmland Trust n.d.).
employment and residential uses; and (4) a greater share of development in nodes and on already-urbanized lands.”

Several jurisdictions have introduced growth management policies to encourage land use intensification, as well as more coordinated, compact forms of growth. Generally implemented at the regional level, such policies are not limited to land-use issues, but commonly include coordinated transportation and infrastructure planning, housing issues, and protection of employment lands. Examples in Canada include:

- the Province of Ontario, which passed the Places to Grow Act (2005) to support the Growth Plan for the Greater Golden Horseshoe (2006), the latter intended to direct growth in the Greater Toronto Region to 2031;
- Metro Vancouver, which is in the process of adopting a new Regional Growth Strategy to direct and coordinate growth through 2040;
- the Edmonton Capital Region, which has adopted a Regional Growth Plan—approved by the Province—to direct and coordinate growth in the region.

The importance of these policies should not be underestimated. As Burchell et al. (2005, 15) note, “While sprawl is typically believed to result from market forces expressing consumer preferences, in fact a web of local zoning ordinances, state policies, and federal laws and programs has encouraged sprawl to such a degree that it is often difficult to build anything else.” This opinion is echoed by others who point to failures in the market and inadequate policies that have contributed to a status-quo development form (single-detached housing) and exacerbated some effects of sprawl (Blais 2003; Brueckner 2000; Slack 2002; Wiewel, Persky, and Sendzik 1999).

While these factors are most often discussed in the American context, the parallels to Canada are clear. The growth management policies adopted by various jurisdictions are all important components of shifting prevailing development patterns. However, as growth management polices are implemented at the regional level, municipalities are required to conform to them. While some argue that regional policies remove some of the autonomy municipalities have to make decisions about local development, as Kelly (1993) notes, regional coordination is crucial. Without it, growth management policies at the municipal level may be ineffective because they do not facilitate change in urban form, raise local housing prices, and shift new growth to neighbouring communities (cited in Wiewel, Persky, and Sendzik 1999).

How can municipalities comply with growth management strategies and change the type of growth in their communities? What tools are available for jurisdictions to help achieve more compact growth patterns? One tool cited as an option to help encourage efficient growth patterns is development charges. Already employed in many Canadian jurisdictions as a fiscal tool, development charges have the potential to act as a planning tool as well.
3.2 Development Charges as a Planning Tool

Using fiscal instruments as planning tools to encourage more compact, dense growth is not a new concept. McFarlane (1999, 416) asserts that “fiscal policy, when uncoordinated with urban planning, is an element that could bring about an inefficient urban structure.” Therefore, how can governments ensure that they effectively coordinate their fiscal policies to support efficient growth patterns, instead of subsidizing inefficient, sprawling growth?

The literature indicates that if designed appropriately, development charges can play a role in growth management and support more compact urban forms. In both Canada and the United States, development charges are used by municipalities to recover hard and soft infrastructure costs related to development projects. The way in which these charges are implemented can vary greatly; however, generally they are levied to pay for the off-site infrastructure necessitated by new development, and occasionally redevelopment as well.

Development charges are often cited as an appropriate option to pay for infrastructure related to new growth, because they place the onus on those who require this infrastructure, instead of the existing tax base (Skaburskis and Tomalty 2000; Slack 2002; Wiewel, Persky, and Sendzik 1999). Researchers have argued that using development charges that reflect the true cost to provide services “can reinforce planning goals by steering development away from high-cost sites to more efficient locations” (Skaburskis and Tomalty 2003, 144; see also Nicholas, Nelson, and Juergensmeyer 1991; Snyder and Stegman 1986). Skaburskis (2003, 197) asserts that “pricing policies can be effective planning tools because they directly engage developers, they make them accept the full project costs, they recognize and publicise the need to correct for the external costs of development by increasing the cost of land, and they raise funds for infrastructure development and compensation programmes.” Another study by Wiewel, Persky, and Sendzik (1999, 111), which looks specifically at sprawl, concludes that using development charges as a growth management policy is not only feasible, but also can combat the expansion of sprawl.

Yet research by Tomalty (2000) and Tomalty and Skaburskis (2003) indicates that municipalities are underutilizing development charges as a way to discourage inefficient—and costly—land uses. Tomalty’s study of municipal officials and developers in the Vancouver and Toronto regions, as well as in Calgary and Saskatoon, found that municipalities were not “structur[ing] charges so as to actively use them as planning and growth management instruments” (Tomalty 2000, 50). The paper concluded that:

In fact, we found that most municipalities were focused on the role of development charges in generating revenue to help cover their capital needs: they had little interest in land use or planning implications. It was not unusual to encounter officials during the research we undertook for this project who denied that development charges had any implications for development activity or urban form (Tomalty 2000, 50).
This finding was echoed by Tomalty and Skaburskis in their Ontario study. They noted, “most municipalities do not design their development charge schedules to reflect these planning goals” (Tomalty and Skaburskis 2003, 144).

3.3 Designing Development Charges Effectively

The literature suggests that the way in which development charges are structured affects how land resources are consumed and how developments are designed (for example, whether they take the form of compact development or sprawl). It has been argued that area-specific pricing\(^5\) encourages more efficient land development and equitable distribution of costs related to development (Nicholas, Nelson, and Juergensmeyer 1991; Skaburskis 1991; Tomalty and Skaburskis 2003).

In a municipality that uses area-specific charges, districts that already have been developed should have lower development charges, encouraging intensification and redevelopment in these areas. Therefore, developers who choose to develop in such areas would benefit from lower development charges. Development that is farther away from existing infrastructure or that requires extensive service or infrastructure provision should bear the cost burden of such a location decision. Conversely, a system that uses uniform or average-cost development charges subsidizes development that has higher growth-related capital costs, while raising costs for higher-density development compared to low-density development (Amborski 2011; Bird and Slack 1991; Blais 2003; Blewett and Nelson 1988; Skaburskis and Tomalty 2003; Slack 2002).

When development charges reflect the true cost of service provision, development shifts to land that is less costly to develop, because those lands would be subject to lower development charges. Slack (1993) argues that “a development charge that is the same magnitude per lot regardless of where it is located in the municipality will not reflect the true costs associated with any one development and will not lead to efficient development decisions” (36; see also Nicholas, Nelson, and Juergensmeyer 1991).

While setting development charge rates to ensure full cost recovery based on the type or size of development and location is important, it is not the only factor that will influence developers’ decisions. Many development conditions influence where and how developers choose to build. And while the influence of development charges should not be minimized because of poor design, the role of other policy and planning initiatives such as the shift to mixed-use zoning is also critical.

However, area-specific charges are not used for various reasons, including the belief that they are difficult to administer when segmented by geographic area. While intuitively this may make sense, Skaburskis and Tomalty, studying the Ontario context, conclude:

\(^5\) Area-specific pricing means calculating and assigning the costs to develop within a specific part of a municipality. Conversely, a uniform charge averages the costs of all development within a community and apportions those costs to all new development, regardless of its location or the services it requires.
We could find no evidence that a municipality-wide approach was more efficient in terms of the administrative resources needed to negotiate the charges with developers. Interviews with municipal officials that had experience with both the earlier site-specific and the current municipality-wide approaches revealed that the latter required more consulting studies and extensive negotiations with developers over the development charge bylaw (Tomalty and Skaburskis 1997, 1991).

In addition to using area-specific charges to appropriately reflect true development costs, the literature also suggests that municipalities should vary their development charges based on the type of development and density. Blais (2010, 92–95) notes that many municipalities do not vary their charges based on the location, intensity, or type of development and argues that a blanket approach means that “low-cost areas subsidize high-cost areas,” “small lots subsidize large lots,” and “smaller residential units subsidize larger units.” As a large component of development charges is infrastructure calculated on a linear basis—such as roads, sewers, or water—factors such as lot size, density, and development design will affect how much infrastructure is required. Slack (2002, 4) echoes this observation, noting, “the denser the neighbourhood, the smaller the increment of development costs that these services represent.”

Both the Province of British Columbia, through its Development Cost Charges Best Practices Guide (2005), and a report completed by Coriolis Consulting for West Coast Environmental Law (2003), advocate for development charges based on density. The Best Practices Guide states that charges based on a density gradient are effective because they encourage more compact growth patterns and “compact forms and higher density contribute to sustainability, as these types of development reduce the amount of roads built, make transit more viable, and have smaller ‘ecological footprints’” (Province of British Columbia 2005, 2.16). Moreover, Tomalty and Skaburskis (1997, 1991) cite studies such as that by C.N. Watson and Associates, which indicates that in addition to higher-density development requiring less linear infrastructure, they also “tend to use less water and sewer capacity per capita and generate less waste.”

Other studies have evaluated the impact of varying development charges on a square-foot basis. A report prepared by Energy Pathways, titled Levying Development Cost Charges on a Square Foot Basis (1997) concludes that when development charges do not account for unit size and are charged on a per-unit basis, this structure may encourage the construction of large homes versus smaller

6. This report was prepared in conjunction with the Urban Development Institute (Pacific Region) with a grant through the Affordability and Choice Today Program. It was prepared for the Federation of Canadian Municipalities, the Canadian Home Builders’ Association, the Canadian Housing and Renewal Association and the Canada Mortgage and Housing Corporation.
units. Specifically, the authors note “when development costs increase in direct relationship to the number of units created, a greater number of smaller homes becomes more expensive to build than fewer, larger homes” (Energy Pathways Inc. 1997, 2). Accordingly, municipalities should calculate their development charges based on unit size, and not the number of units. This sentiment is echoed by Amborski (2011, 34), who argues “even where a development charge by-law differentiates apartment units by the number of bedrooms, within each bedroom class, it does not take the unit size into consideration in the quantum of the charge.”

Opting to calculate development charges based on the type, location, or size of development, in addition to discouraging inefficient growth patterns, is also more equitable because developers building more efficient urban forms do not subsidize those who are not. However, in many jurisdictions, such considerations do not factor into the calculation of development charges.

4. Development Charges across Canada
The following section reviews the development charges programs in each jurisdiction studied, including an overview of how the charges are structured and implemented and the types of services for which they can be collected. A summary of development charge characteristics in each provincial jurisdiction studies can be found in Table 1.

4.1 British Columbia
Beginning in 1958, the province has made several legislative moves to shift the onus of new development costs from municipalities to developers (Province of British Columbia 2005). Early methods used to recoup infrastructure costs were ultimately found to be invalid by the courts and by the 1970s a system emerged whereby municipalities negotiated land use contracts with developers to ensure the provision of infrastructure and services (Province of British Columbia 2005; Tully 1996). The land use contract system was eventually phased out in 1977 and the system was modified to resemble the current structure in place.

Under the current system, fees known locally as development cost charges (DCC) are imposed under the Local Government Act, according the Province, “to assist local governments in paying the capital costs of installing certain local government services, the installation of which is directly or indirectly affected by the development of lands and/or the alteration/extension of buildings” (Province of British Columbia 2005, 1.1). The system permits municipalities—with the exception of Vancouver and Whistler7—to collect for roads, sewage, water,

7. The City of Vancouver will be discussed in a latter section. The legislation allows Whistler to impose charges to assist in providing employee housing (Province of British Columbia 2005).
<table>
<thead>
<tr>
<th>Province/Jurisdiction</th>
<th>Local Legislation Governing Development Charges</th>
<th>Identified Locally As</th>
<th>Services Development Charges can be Levied For</th>
<th>Development Exempted from Development Charges in Legislation</th>
<th>Services Exempted from Development Charges in Legislation</th>
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<tr>
<td>British Columbia</td>
<td>Local Government Act</td>
<td>Development Cost Charges</td>
<td>Sewers, water, drainage, roads, parks</td>
<td>Places of worship; Development of fewer than 4 residential units; Residential development which is less than 29m²; Residential development which is valued at less than $50,000; Development which has already paid charges or does not impose new burden on infrastructure.</td>
<td>No services identified in legislation</td>
</tr>
<tr>
<td>City of Vancouver</td>
<td>Vancouver Charter</td>
<td>Development Cost Levies</td>
<td>Sewers, water, drainage, transportation facilities, parks, replacement of affordable housing, child care facilities</td>
<td>Places of worship; Development which does not increase total floor area of a building; Building additions less than 500m² in size and with fewer than 4 residential units; Residential unit less than 29m² in size</td>
<td>No services identified in legislation</td>
</tr>
<tr>
<td>Alberta</td>
<td>Municipal Government Act</td>
<td>Redevelopment and Off-Site Levies</td>
<td>Sewers, water, parks, drainage, roads</td>
<td>No development identified in legislation</td>
<td>No services identified in legislation</td>
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<tr>
<td>Manitoba</td>
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<td>No services identified in legislation</td>
<td>No development identified in legislation</td>
<td>No services identified in legislation</td>
</tr>
<tr>
<td>Winnipeg</td>
<td>Winnipeg Charter Act</td>
<td>Development Agreements</td>
<td>No services identified in legislation</td>
<td>No development identified in legislation</td>
<td>No services identified in legislation</td>
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<tr>
<td>Ontario</td>
<td>Development Charges Act</td>
<td>Development Charges</td>
<td>Growth-related capital costs; Development charges collected for growth-related capital costs will be discounted by 10%, with these exceptions: sewers, water, roads, electrical power, fire and police protection, Toronto-York subway extension</td>
<td>Development charge exemptions available for the enlargement of industrial buildings, when the proposed building expansion is less than 50% of the existing gross floor area.</td>
<td>Development Charges cannot be collected for: Cultural or Entertainment facilities (i.e. museums, theatres, art galleries); tourism facilities (including convention centers); land for parks; hospitals; waste management; buildings for administration of municipalities or local boards.</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>Municipal Government Act</td>
<td>Capital Cost Charges</td>
<td>Water, sewers, stormwater, streets, solid waste management, traffic signs and signals, transit facilities</td>
<td>No development identified in legislation</td>
<td>No services identified in legislation</td>
</tr>
<tr>
<td>Halifax Regional Municipality</td>
<td>Halifax Regional Municipality Charter</td>
<td>Capital Cost Charges</td>
<td>Water, sewers, stormwater, streets, solid waste management, traffic signs and signals, transit facilities</td>
<td>No development identified in legislation</td>
<td>No services identified in legislation</td>
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1. Development cost charges may be levied on projects of fewer than 4 residential units if the charges are levied at the building permit stage.
2. Municipality may increase value exempt from development charges.
3. Capital costs are defined as (1) Costs to acquire land or an interest in land, including leasehold interest, (2) Costs to improve land, (3) Costs to acquire, lease, construct or improve buildings and structures, (4) Costs to acquire, lease, construct or improve facilities including (i) rolling stock with an estimated useful life of seven years or more, (ii) furniture and equipment, other than computer equipment, and (iii) materials acquired for circulation, reference or information purposes by a library board as defined in the Public Libraries Act, (5) Costs to prepare studies related to growth related capital costs and development charge background studies, (6) Interest charges (Province of Ontario 1997, Part II, S(3)).
drainage, and parkland acquisition and improvement (Province of British Columbia 2005, 1.1).

The charges for services may include the costs required for “providing, constructing, altering or expanding facilities,” including the debt incurred in providing the services (Province of British Columbia 1996). In addition to the legislation governing DCCs, the Province has also produced a Development Cost Charge Best Practices Guide (revised in 2005) to provide guidance and clarify how DCCs should be applied, ensure consistency and flexibility within the system, provide municipalities with scenarios and options for implementing their DCCs, and explain how varying the design of DCCs may produce different effects.

The legislation mandates the exemption of several uses or types of development from DCCs including buildings for public worship, development where the value is less than $50,000, buildings with fewer than four residential units, and developments in which it can be demonstrated no new capital costs are created or where the charge was already levied for the same development (Province of British Columbia 2005, 1.3–1.4). Additionally, the Province has included provisions permitting a municipality to either exempt or reduce the development cost charges levied on “(1) not-for-profit rental housing, (2) for-profit affordable housing, (3) a subdivision of small lots that is designed to result in low greenhouse gas emissions and (4) a development that is designed to result in low environmental impact” (Province of British Columbia 1996, 933.1 [1]).

The process to impose development charges in a locality is fairly straightforward. The legislation requires the municipality to use development cost charge revenue only for approved services and adopt a development cost charge bylaw reviewed and approved by the Provincial Inspector of Municipalities (Province of British Columbia 2005). Moreover, the Local Government Act states that a municipality must consider if its development cost charges, “(1) are excessive in relation to the capital costs of prevailing standards or services, (2) will deter development, (3) will discourage the construction of reasonably priced serviced land, or (4) will discourage development designed to result in a low environmental impact” (Province of British Columbia 1996, Section 934 (4)(e)).

While this is not a requirement, the Best Practices Guide also suggests that municipalities ensure that there is a clear link between the development cost charge bylaw and other municipal policies such as Official Community Plans—which direct land use policies—and Financial Plans—which provide a framework for future infrastructure projects (Province of British Columbia 2005). Flexibility within the act also allows municipalities to decide whether charges will be levied on a uniform or area-specific basis, when charges will be collected, and how DCCs will vary (e.g., on a density gradient or per-unit basis) (Province of British Columbia 2005).

8. See Table 1 for complete list of exemptions.
4.1.1 City of Vancouver

In the City of Vancouver, development charges are governed by the Vancouver Charter and are known as development cost levies (DCL). The legislative framework is generally similar to that of British Columbia’s Local Government Act, however, there are some key differences. The main difference is in the types of services for which Vancouver is permitted to collect the levies. In addition to collecting development charges for roads, sewage, water, drainage, and parks, Vancouver is also permitted to include the capital costs associated with childcare provision and replacing any low-cost rental units lost during development (City of Vancouver 1953; 2004, 9). Vancouver has a citywide DCL, seven area-specific charges, and three areas that are subject to layered charges (where both the citywide and an area-specific charge applies). With limited exceptions, these are calculated on a square-metre basis (City of Vancouver 2011). The land use categories for which the City levies development charges include:

- residential floor space ratio (FSR) under 1.2;
- residential over 1.2 FSR, commercial, and most other uses;
- industrial uses;
- day cares and temporary buildings (levied on a per building permit basis);
- a number of specific uses such as parking garages and schools (City of Vancouver 2011).

DCLs are levied at the time the building permit is issued, but allow for staggered payments if a letter of credit is provided to the City.

The City of Vancouver also has a parallel program for acquiring community amenities through the rezoning process, called Community Amenity Contributions (City of Vancouver 2004). Community Amenity Contributions are considered to be different from development cost charges, as “their importance is not as a large revenue source, but rather to address specific impacts of a rezoning—and on large sites, providing significant in-kind assets” (City of Vancouver 2004). Comparable to Section 37 provisions in Ontario, Community Amenity Contributions, “are voluntary in-kind or cash contributions provided by developers when City Council grants additional development rights through rezonings” (City of Vancouver 2010).

4.2 Alberta

Legislation authorizing development charges in the Province of Alberta is the Municipal Government Act (MGA). In this context, development charges have been used since approximately 1979 (Interview with B. Symonds 2010). However, a report for the Halifax Regional Municipality on development charge programs in other jurisdictions, explains that for much of their history in Alberta, development

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9. Where the area-specific levy applies, only this development cost charge is paid.
charges have been limited to larger communities, but recently, growth pressures have necessitated their use in more communities (SGE Acres Limited 2006).

Amborski (2011) notes in his paper, Alternatives to Development Charges for Growth Related Capital Costs, the magnitude of development charges levied in Alberta are generally much lower than in other Canadian jurisdictions such as British Columbia or Ontario. He explains that “most high density developments do not pay any kind of charge in the Province; however lower density developments have been subject for some year to acreage assessment fees. These tended to be applied to large tracts of land designated for low density development” (2011, 21).

Two types of charges are imposed in the Province. First, redevelopment levies are imposed when a development permit is issued in a redevelopment area. A redevelopment levy may be collected to provide lands needed for parks and schools, as well as new or expanded recreational facilities. Second, off-site levies are imposed on subdivided lands and can be collected to provide the land or infrastructure required for new or expanded water, sewage, stormwater management facilities, as well as roads (Province of Alberta 2000).

Aside from requiring municipalities to pass a bylaw imposing charges in their community, the Municipal Government Act is not highly prescriptive and has few regulations governing the implementation or calculation of charges. However, the Province has also implemented Regulation 48/2004, Principles and Criteria for Off-Site Levies Regulation, which determines how municipalities administer and calculate charges. The development charge rate is established through consultation with landowners, developers, and the municipality and is required to include “a description of the specific infrastructure facilities, a description of the benefiting areas, supporting technical data and analysis, and estimated costs and mechanisms to address costs increases over time” (Province of Alberta 2004). The Regulation also provides guidelines to facilitate the development charge negotiations (Province of Alberta n.d.). A report by IBI Group for CMHC summarizes the guiding principles in the Regulation, as requiring municipalities to:

1. “maintain full and open disclosure of all levy costs and payments;
2. share the responsibility between the municipality and the developers for the costs of providing and installing infrastructure for future and existing requirements;
3. coordinate with neighbouring municipalities where possible;
4. have a clear correlation between the levy and the impacts of the new development;
5. be consistent across the municipality (while recognizing variations of infrastructure types)” (IBI Group 2005, 32–33).

4.3 Manitoba
The least prescriptive legislation of the five jurisdictions studied, the Manitoba Planning Act allows municipalities to establish a development charge to recover capital costs associated with land subdivision. The Act does not include any further
guidance as to how the charge should be calculated or the timing of the charge, but it does require municipalities to establish a reserve fund, into which the charges are paid (Province of Manitoba 2005).

Discussions with a provincial official revealed that development charges or levies are not used by municipalities in the province; instead, development agreements are used to collect capital costs related to development (Interview with J. Platt 2011). The provincial legislation permits municipalities to impose development agreements as part of a zoning bylaw amendment, variance application, or conditional use and to collect monies to pay for various hard services or require landowners to install the services themselves (Province of Manitoba 2005).

4.3.1 City of Winnipeg
The Winnipeg Charter Act regulates the city’s ability to collect capital costs related to development. When land is subdivided, the city can impose, as a condition of approval, that a development agreement be signed. The agreement can include provisions that the landowner provide either lands or monies for roads and “pay to the city some or all of the cost of existing or future public works, including the cost of any related environmental, engineering or other studies or reports, which benefit or will benefit the proposed subdivision” (City of Winnipeg 2002b, S.259(1)(f)(i)). These agreements are negotiated on a case-by-case basis, and the City has adopted Development Agreement Parameters, to “ensure that all parties pay their equitable share of the costs of development, that development agreement obligations are consistent for all developments and that development occurs in accordance with current City of Winnipeg construction specifications” (City of Winnipeg 2002a, 4).

4.4 Ontario
As early as the 1950s and 1960s, Ontario municipalities began requiring developers to pay a portion of the costs for the hard services necessitated by new development, and shortly thereafter began requesting funding for related soft services as well (Doumani and Macaulay 1998). These charges were known as lot levies. The development charge system was not regulated provincially and while implemented by municipalities, the levies were often shaped by decisions of the Ontario Municipal Board and the court system. Doumani and Macaulay (1998, 1.4) note that this resulted in a muddled process because, “the Courts, in fact created government policy where none existed.”

In 1989, the Province adopted a legislative framework through the Development Charges Act to guide how development charges were to be implemented, allowing municipalities to collect for the hard and soft services of “growth-related capital costs associated with development” (Slack 1994, 14). The legislation permitted both upper- and lower-tier municipalities, as well as public and separate school boards, to levy development charges. The resulting process was more regulated and predictable, largely ending the system of “outrageous standards of services (‘gold plating’) in return for ‘uncomplicated’ subdivision
approval” (Skaburskis and Tomalty 2003, 150).

The Province reformed the Development Charges Act in 1997, and while the resulting legislation was generally in the same spirit as the previous act, it contained further clarification as to how development charges could be levied and the services for which they could be levied (Province of Ontario 1998). The Development Charges Act 1997 allows municipalities to collect for growth-related capital costs, which include:

1. “Costs to acquire land or an interest in land, including leasehold interest;
2. Costs to improve land;
3. Costs to acquire, lease, construct or improve buildings and structures;
4. Costs to acquire, lease, construct or improve facilities including
   i. rolling stock with an estimated useful life of seven years or more,
   ii. furniture and equipments, other than computer equipment, and
   iii. materials acquired for circulation, reference or information purposes by a library board as defined in the Public Libraries Act;
5. Costs to prepare studies related to growth related capital costs;
6. Costs to prepare development charge background studies;
7. Interest charges paid to borrow for growth related capital costs” (Province of Ontario 1997, Part II, S(3)).

The Development Charges Act also did away with charges for many soft services, such as cultural facilities, hospitals, and waste management (Province of Ontario 1998). Moreover, the new legislation stipulated that aside from water, sewer, roads and related services, fire and police protection, electrical power, and development charges for the Toronto-York Subway line, the amount collected for all other services must be discounted by 10 percent (Province of Ontario 1998).10

Requiring that municipalities discount the amount collected for some services by 10 percent, “reflects the concern that new residents should not be expected to pay for the entire cost of new facilities as well as contributing, through their property taxes, toward the cost of existing facilities and their renewal” (SGE Acres Limited 2006, 4-2).

Each municipality is required to produce a background study outlining its projected growth and providing justification for its development charges, which will shape the municipality’s development charges bylaw. The Development Charges Act also specifies that for the purposes of calculating its charges, the municipality must base the amount collected on an average level of service for the preceding 10 years. The timing of development charge collection is generally at the building

10. For example, if a municipality determined that new development necessitated $100.00 per unit in transit investments, it could use its development charges to collect only $90.00 of those costs.
permit stage or, if specified in a municipality's bylaw, can also be required when a subdivision or consent agreement is executed. However, if agreed upon by the parties involved, there is flexibility within the legislation to allow the charges to be paid at another time. Once enacted, a development charges bylaw is valid for five years; the bylaw, however, can be appealed to the Ontario Municipal Board. Skaburskis and Tomalty (2003) have found that this final provision has often resulted in unpredictable and conflicting decisions.

4.5 Nova Scotia

Coming into force January 1, 1999, Part 6, Section 81, and Part 9, Sections 274-6, of the Municipal Government Act, gives municipalities the authority to collect charges to pay for growth-related infrastructure. Section 81 of the act allows municipalities to impose bylaws to collect development charges, while Section 274-6 outlines the regulations for how infrastructure charges are to be calculated and used. The legislation permits the collection of charges, referred to locally as capital cost contributions (CCC), to pay for new or expanded water, wastewater, stormwater, solid waste, and transit facilities, as well as streets (Province of Nova Scotia 1998).

The charges are imposed through a subdivision bylaw and may vary based on land use, zoning, lot size, or number of lots. They are to be used only on infrastructure for which they have been collected, while the timing of the collection of the charge is to be specified in the implementing bylaw. Moreover, the subdivision bylaw passed by the municipality must identify the areas benefiting from the charge, the amount and types of infrastructure for which the charge will be used and finally, the method used to determine the charges (Province of Nova Scotia 1998, Part IX).

4.5.1 Halifax Regional Municipality

While the Halifax Regional Municipality (HRM) is governed by specific legislation—the Halifax Regional Municipality Charter—the framework “contains identical provisions for development charges” (Interview with P. Duncan 2010). The provisions regulating CCCs came into force on January 1, 1999; however, the HRM did not adopt a policy framework for imposing charges until 2002 (Interview with P. Duncan 2010).

To facilitate the adoption of the policy, the municipality commissioned a report titled Infrastructure Charges Best Practice Guide, which was “designed to facilitate a constructive and practical approach to adopt an effective policy for a municipality” (Regional Municipality of Halifax n.d., 2). Much like the Best Practices Guide for British Columbia or the Principles and Criteria for Off-Site Levies Regulation in Alberta, Halifax's Best Practice Guide includes nine principles meant to provide consistency and predictability within the system.

Discussions with HRM staff indicate that the municipality has implemented two types of charges: a region-wide charge collected at the building permit stage and intended to pay for solid-waste facilities and wastewater treatment; and area-specific charges, collected at the subdivision stage to support new or expanded
### Table 2: Total Development Charges for Singles/Semis Units in the GTA (2010)

<table>
<thead>
<tr>
<th>Region</th>
<th>Regional Development Charge</th>
<th>Educational Development Charge</th>
<th>GO Transit Development Charge</th>
<th>Local Municipality</th>
<th>Local Charge</th>
<th>Total Charge</th>
</tr>
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<td>$970.15</td>
<td>City of Burlington</td>
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<td></td>
<td></td>
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<td></td>
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<td>$39,023.00</td>
</tr>
</tbody>
</table>

Source: David, Amborski, *Alternatives to Development Charges for Growth-Related Capital Costs*, 2011
water, sewer, and transportation services. Legislation also allows HRM to collect for transit services; however, this development charge is still being finalized and will be included in HRM’s regional CCCs in the future (Interview with P. Duncan 2010).

5. Discussion with Key Informants and Research Observations

Fifteen interviews were conducted with municipal officials, provincial officials, and consultants who have experience reviewing development charge programs and writing background reports for governments. The information from the interviews provided a comprehensive understanding of development charges in the jurisdictions studied and the role they do—and do not—currently play as a growth management or planning tool.

While some jurisdictions reported using development charges as a growth management tool, the research raised several issues that warrant further analysis. These issues will be discussed in the recommendations section.

5.1 Financing Tool versus Planning Tool

One of the most significant discussions which emerged from the research was the debate over whether development charges are a finance tool, a planning tool, or both. Those who have studied the topic note that many jurisdictions are missing out on an opportunity to have development charges work in concert with their planning objectives. Notably, a report by Tomalty and Skaburskis (2003, 158) concluded, “development charges in Ontario are geared almost exclusively to their revenue-raising role and disconnected from planning goals.”

The research also revealed challenges with shifting the role of development charges. One obstacle was the mindset of key informants. The questionnaires and interviews revealed that many jurisdictions are trying to use development charges proactively and view them as both a finance and planning tool. In particular, the Province of British Columbia has been promoting the role that development charges can play in achieving wider policy objectives. However, although others acknowledged the value of development charges as a planning tool, this view was frequently prefaced by the opinion that their primary role is to raise revenue.

The role of development charges as a revenue-raising tool should not be understated: as financial pressures on municipalities grow, these charges are one of the few methods most municipalities have to pay for growth-related services. In Ontario the fiscal pressures faced by municipalities have resulted in more jurisdictions “try[ing] to increase development charges to the greatest extent possible,” while “recommendations to increase development charges tend to come from the chief administrative officers, finance departments and politicians, often without due consideration to other policy objectives, or the unintended impacts of the increase in development charges” (Amborski 2011, 9 [emphasis added]). Municipalities need to recognize that development charges can have a dual purpose.

Some municipal representatives stated that development charges could not be used to direct growth patterns because the revenue is still needed to provide the
services necessitated by new development. Others noted that in cases where development charges were waived or reduced for particular types of development or urban forms, the infrastructure was still needed, even though they could not collect development charges to provide it. Although beyond the scope of this research, it is important to consider to what extent financial pressures have contributed to municipalities’ ability to use development charges as a growth management tool. For example, how much do municipalities rely on development charges as revenue? Does this reliance impede their ability to use development charges to meet planning objectives?

As provinces amend their legislation to encourage municipalities to consider exempting or waiving development charges for subdivisions with small lots or development designed for low environmental impact, as in British Columbia, can municipalities afford to offer these exemptions? Consultant Fraser Smith remarked that municipalities in British Columbia often consider reducing or waiving development charges to encourage rental housing construction. But when they are reminded that infrastructure still needs to be built and paid for, “then the enthusiasm goes away a little and we are not having as many people getting excited about it” (Interview with F. Smith 2010). While his comment was not in reference to exemptions for growth management purposes, it highlights similar issues. The provincial legislation is generally similar in all jurisdictions studied, as municipalities are free to discount their development charges as they see fit, but they cannot recoup that lost revenue by increasing development charges for other uses or geographic areas.

As development charges play an ever-increasing role as a revenue source in many jurisdictions, this loss of revenue may be a significant obstacle restricting municipalities’ capacity to structure development charges to support policy objectives. The disconnect between how a municipality structures its development charges and its policy objectives results in a missed opportunity to leverage its charges as a planning tool. For example, Amborski (2011) points to the example of the Greater Toronto Area. The Province’s Places to Grow document has identified several growth centres and the transportation authority Metrolinx has proposed several transit routes where higher-density development is to be encouraged. Yet “the current application of development charges is not structured to support or encourage these land-use objectives” (Amborski 2011, 33) and municipalities are missing an opportunity to use development charges to achieve the policy objectives of Places to Grow or Metrolinx.

Moreover, decisions made now about the type of urban built form constructed—whether compact or sprawling—will affect not only how much money needs to be spent immediately on infrastructure and service provision, but also what will be required for future maintenance and renewal. Little consideration is usually given to the lifetime requirements of a particular type of urban form, in
terms of future financial impacts. But as the life-cycle costs of maintaining the infrastructure and services necessitated by inefficient growth patterns become more pronounced in the coming years, the importance of using development charges as a planning tool to encourage more efficient growth patterns should not be minimized. Therefore, if development charges are not restructured to meet current planning objectives for more intense growth, not only do municipalities squander a chance to use their charges proactively now, but miss an opportunity to reduce their future infrastructure costs.

The research showed that some municipalities are willing to forgo revenue by reducing or exempting their development charges to encourage intensification and redevelopment of their downtown cores. For example, the Town of Ajax has reduced the development charges in its Downtown Community Improvement Plan area for some types of development. The development charge reductions are only one part of a larger strategy, but one that the Town characterizes as very important. Discussions with planning staff indicated that two projects have benefited from these reductions and the developers have advised the Town that without these reductions, the developments would not have been possible. When asked how the municipality has grappled with the loss of revenue, the municipal representative responded:

We take a bit more of a global approach on this, in that if there is development on these sites in the long term, the Town is going to be benefitting, in terms of millions of dollars of additional [property tax] assessment based on development of these lands that wouldn't otherwise [be] occurring. So we don't take an immediate approach, we take a bit more of a long-term approach on these things. And so the [forgoing of] development charges…it's a short-term concession for essentially a long-term or ultimate-term gain (Interview with G. Muller 2011).

Ajax's approach may not be an option for all municipalities. Other approaches are needed to show provincial officials, municipalities, and consultants alike how designing development charges can effectively advance land use objectives without necessarily reducing or waiving charges. Other options include density gradients or area-specific charges.

Promoting a greater understanding of the role development charges can play in achieving planning objectives—especially to those who have a part in designing the programs, but might not have a planning background—is important. If the planning department does not have a strong role in a municipality’s development charges program, there may not be a clear or cohesive connection between the program’s design and strategic goals or planning objectives that could be achieved with well-designed charges.

Municipalities such as Markham and Halifax, which both indicated they use development charges as a growth management tool, have recognized the value and importance of removing any institutional barriers that may prevent development charges from being used to their greatest potential. A representative from the Town
of Markham noted, “DCs do have a role as a planning tool as long as the municipality thinks of them in this way…the trick is to get your finance staff to understand the planning implications of fiscal tools. I’ve found that once provided that perspective, they are supportive” (Interview with Town of Markham staff, 2011). Furthermore, the interviewee added, “the use of DCs can have growth management consequences if the charges promote compact mixed-use development. The Ministry of Housing, together with Finance could do a lot to promote the use of DC methodologies to reduce sprawl.”

These observations can easily be applied to jurisdictions outside Ontario. Often it is not just the planning department that has a role in establishing development charge programs, so planners should work to ensure that non-planning staff understand the role development charges can play in urban form and growth management. Halifax planners reported that collaboration between departments and having a common policy document—in their case a regional plan—have been key to ensuring that goals are achieved and conflict is mitigated.

Finally, a few key informants indicated that they do not believe development charges are a significant part of total development costs. Although the proportion that development charges represent varies from jurisdiction to jurisdiction, it seems imprudent not to design a community’s development charges in a way that promotes efficient growth patterns, no matter how small the impact. Further, studies looking at development charges and their effects on urban development in Toronto and Ottawa, found that “Fourteen of the 19 developers who expressed an opinion agreed that development charges affect their decision on building type and lot size” (Skaburskis & Tomalty 2000, 318).

While the magnitude of their effect may be debated, development charges are not likely to be the only tool municipalities use for growth management, but one of many which can be layered to achieve planning objectives, as in downtown Ajax. Removing subsidies for sprawl will be one important way to ensure future development is cost effective.

5.2 Challenges to Using Development Charges to Direct Growth
The second theme that emerged in the research was the number of challenges in implementing development charges to direct development patterns. In particular, key informants noted the challenges of working within the constraints of provincial legislation. Provincial frameworks governing development charges are essential because they ensure consistency in application at the municipal level. The research did not find that municipalities in provinces with less prescriptive legislation—such as Alberta—use development charges more proactively as a growth management tool compared with those with more prescriptive legislation. However, several challenges emerged.

First, the issue of how development charges are calculated and the types of services for which they can be collected is problematic in many jurisdictions. For
example, in Ontario, municipal representatives commented that being required to discount many services by 10 percent and base service levels on a historical average for the previous 10 years is difficult. For example, this requirement usually precludes municipalities from collecting development charges for improved and expanded transit service levels. Similarly, the key informant from the Town of Ajax commented that the Town needed to make improvements to its trails network to increase service levels so it could raise the amount collected through development charges. The rationale for using an average service level in Ontario is to prevent municipalities from trying to “gold plate” their services; however, in the case of transit, this restriction should be reconsidered.

Meanwhile, legislation in British Columbia and Alberta does not permit municipalities to collect for transit services. Given that providing transit is an important component of compact communities, funding through development charges seems crucial for growth management.

Second is the issue of timing, that is, when the money can be collected. A consultant for IBI Group indicated that in Ontario, taking better advantage of municipalities’ ability to adjust when they collect their development charges would be beneficial, particularly for high-rise development. Generally, in all the jurisdictions studied, development charges are collected at either the subdivision or building permit stage. However, because high-rise projects can take longer to complete—and thus longer to close on the units—developers of high-density residential development have to carry those costs for a longer time.

The development context varies greatly in the municipalities studied and not all had a large number of high-rise projects at the time of this research, so it was difficult to gauge the importance of timing. However, some municipalities did agree that the timing of the collection of development charges poses a potential problem. This finding is supported by Skaburskis and Tomalty (2000), who note that developers believe development charges affect both project timing and cash flow. Moreover, British Columbia’s Best Practices Guide also indicates that delaying the collection of development charges “can also reduce carrying costs for developers, savings that can be passed on to the home purchaser” (Province of British Columbia 2005, 1.4). While some municipalities, such as Vancouver and Halifax, allow developers to stagger the payments of their development charges, more municipalities may want to consider offering this option.

Finally, there is the issue of area-specific charges. According to the literature, development charges can be designed as a growth management tool if municipalities use area-specific charges instead of a uniform charge for the entire municipality. However, a key informant suggested that perhaps many municipalities did not use area-specific charges because they were too onerous from an administrative standpoint. When I asked municipalities to verify this assertion in follow-up interviews, the answers varied.

The Town of Ajax and City of Lethbridge—both of which employ a uniform charge—indicated that based on municipality size and development context, employing area-specific charges did not make much sense. The Town of Markham,
which until 2008 had 31 different area-specific charges, did find management quite burdensome, because it requires careful accounting of the reserve accounts and ensuring that the money collected is allocated appropriately. The Town has since reduced the number of area-specific charges to 19 and limited the types of services calculated on an area-specific basis to stormwater management and sewer services only. Vancouver, which has both area-specific and city-wide charges, reported that the administration is not very onerous, as the City employs a staff member to coordinate development charges. The respondent from Vancouver did, however, remark that some developers have complained that the system is confusing. In addition, as some areas that have area-specific charges in place are now fully built out, Vancouver indicated it would be reducing the number of area-specific charges in the future.

While no smaller or mid-sized municipalities were contacted specifically about area-specific charges, they likely face challenges administering such charges because of a lack of staff and other resources to dedicate to their administration. In particular, staff from the City of Oshawa indicated in comments accompanying the questionnaire that because Ontario’s Development Charges Act requires that development charge bylaws be updated every five years, having multiple bylaws is both time-consuming and expensive. Furthermore, municipalities’ development charge bylaws can be challenged at the Ontario Municipal Board, which would involve additional staff time and costs. Although some of these concerns and requirements are specific to Ontario, all the jurisdictions require some form of study and consultation when setting a development charge rate, so this concern is valid.

6. Implications for Policy

As the costs related to inefficient growth patterns and sprawl have grown, there is greater support for more compact growth patterns. Increasingly, governments are adopting growth management policies to legislate change, as in Ontario, the Greater Vancouver Regional District, and the Edmonton Capital Region. The need for a cohesive, regional approach to coordinate growth, infrastructure provision, and transportation is apparent; but despite literature suggesting that development charges can serve as a policy instrument to achieve more efficient and intensive growth patterns, they are generally not used in this way. This is a lost opportunity to meet the objectives set out in many regional growth management strategies, but also to influence how communities develop.

Blais (2010, 174) notes, “As currently structured, development charges result in a situation in which efficient uses are overcharged while less efficient uses are subsidized, creating distortions in the land development process and promoting sprawl.” And as studies by CMHC cited earlier demonstrate, in developments designed at higher densities or according to smart growth principles it is less costly to provide infrastructure and services (n.d.; 2001). However, many municipalities do not structure their charges to reflect the true cost of pricing or in a way which aligns with their land use planning goals. Despite the link between the form
development may take and the cost to provide infrastructure and services to that
development, municipalities have been slow to employ charges to promote smart
growth outcomes and reduce subsidies for inefficient development.

Some common themes have emerged from this research. First, there remains
a municipal mindset that development charges are primarily intended to raise
revenue and are not a policy tool. Even those who have embraced development
charges note that the revenue lost from waiving charges to encourage more
compact growth cannot easily be recovered and that there is a need for alternative
revenue streams, such as tax-increment financing. Municipal reliance on
development charges for revenue may affect staff’s ability to see how these charges
could also be used as a planning tool. Additional study of this issue will be
important to understand the role financial pressure may play.

Second, although municipalities stress that they want to change how they
grow, many development charge programs are still structured in ways that subvert
the provision of more compact and sustainable development. To ensure
development charges are designed effectively, Blais (2010, 175) argues that, “any
restructuring of DCs should be based on the principle that the charges reflect
actual servicing costs as they vary with location, development pattern, and type of use
—that is, based on true cost pricing.” Other important issues include making
changes at the provincial level, including amending the legislation governing how
development charges are implemented. Examples include modifying how transit
services are funded through development charges and allowing for the timing of
the collection of charges to be flexible to reflect the development context in the
community.

Third, education and research is needed about the impact of development
charges, how they can be designed effectively to meet their current planning
objectives, and generally, how municipal finance tools can play a role in how a city
grows and develops. Because the development context varies greatly across
Canada, growth management may be a top concern in many urban centres, but in
others it may not. Some jurisdictions might not yet see the need to use their
development charges to direct growth patterns. Initiating further research into the
long-term benefits of designing development charges more effectively may provide
some perspective on the importance of modifying the structure of the development
charge programs. Over the long term, it will be important to present officials with
evidence that low-density, sprawling developments require much more
infrastructure and services compared with what is required for compact
communities. Thus factors such as lot size, density, and development design will
affect not only how much infrastructure is needed and how much must be spent
immediately to provide these services, but also the revenue needed to maintain and
upgrade this infrastructure in the future.

There also needs to be a greater understanding generally about the impact of
development charges on land use decisions and the outcomes of designing
development charge programs in particular ways. Moreover, municipalities need to
remove institutional barriers that prevent development charges from being used to
their greatest benefit. These efforts may include structuring development charges in ways which complement a municipality's existing growth objectives and policies or ensuring that all departments affected by development charge programs or revenue are aware of the impacts of fiscal decisions. There may also be an opportunity for the provinces to help municipalities and government departments understand the effects of designing development charge programs in a particular way—not through further legislation, but by undertaking research, developing best practices guides, and acting as a resource centre.

7. Recommendations
Development charges cannot solve all growth-related problems. Nonetheless, if used in conjunction with other growth management strategies, they can be an effective and powerful tool. As development charges are already used in many jurisdictions to pay for costs related to new development, the opportunity to restructure them to work in concert with other tools and strong policy initiatives should not be wasted.

Although provincial governments may be hesitant to play a larger role in the process, their leadership is crucial in guiding change. The need for more research—studying issues such as how development charges can be used more effectively with other policy tools—and providing best practice guidelines will be important in ensuring that municipalities understand how to restructure their development charge programs to use them as growth management tools. The following recommendations are intended to promote needed change.

1. Provincial governments should amend development charge legislation to include the costs of providing transit services related to growth.
Transit provision is essential to successful compact development and should be a component of growth management policies. Allowing municipalities to include transit within their development charges will help finance the higher-order transit needed to support more compact, transit-oriented communities. In British Columbia and Alberta, this will mean expanding the types of services eligible for development charges to include transit. In Ontario, this will require changes to the legislation mandating that municipalities discount the amount they can collect by 10 percent and giving them the flexibility to collect for improved service levels.

2. Municipalities should provide the option for delayed or staggered payment schedules for development charges.
Municipalities usually collect development charges at the subdivision or building permit stage. However, high-rise projects can take a longer time to complete, which requires that developers carry the costs of development charges for a long period, in comparison with low-rise development. Consequently, the longer period between the time at which development charges are paid and the completion of a project may affect financing for projects and discourage some developers from pursuing these forms of compact development. Municipalities—especially those
with an established or emerging high-rise market—should be encouraged to be more flexible as to when they collect development charges and should offer a staggered payment schedule.

3. Municipalities should remove internal barriers preventing development charges from being used as both a planning and finance tool. The department with the greatest influence in the design and implementation of development charge programs varies according to the municipality. Finance, planning, and engineering departments are all involved and may have different—and competing—interests.

If the planning department does not have a strong role in development charge planning, there may not be a clear connection between the program’s design and planning objectives that could be achieved with well-designed charges. A more cohesive and integrated approach is needed when preparing development charge programs, which includes all relevant departments (and even perhaps other outside key stakeholders) to resolve issues of competing interests and ensure that all are aware of the impacts of any fiscal decisions. Municipalities should also conduct a comprehensive review of the structure of their development charge programs to ensure the way they are structured to complement any land use policies or growth management strategies.

4. Provincial governments should undertake ongoing studies of policy issues related to development charges.

Provincial leadership in the form of ongoing support and guidance is needed to ensure development charge programs are designed effectively and used to their fullest extent. The approach recommended is not the introduction of more regulation, but instead more guidance and further research. Specific solutions that may be considered include providing information and background studies demonstrating how designing development charges can produce a different outcome depending on the desired planning goal. An example would be the Best Practices Guide produced by the Province of British Columbia.

Another approach could include a mechanism for ongoing policy research on issues related to development charges, municipal finance, and infrastructure provision generally. Research could include further study of the lifecycle costs of infrastructure and whether municipalities can reap future benefits—realized through lower lifecycle infrastructure costs—if they forgo some revenue now by reducing development charges to encourage more compact growth. Lastly, further study is needed into how much municipalities rely on development charges as a revenue tool and whether other sources of revenue are required.

Works cited


Interviewees
Anonnymous, Town of Markham. February 2011.
Buzunis, B., Urban Construction Manager, City of Lethbridge. February 2011.
Member of Financing Growth Team, City of Vancouver. February 2011.
Weston, L., Special Projects Engineer, City of Surrey. February 2011.

Questionnaire Respondents

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13. While it initially appeared that the City of Winnipeg has a development charge system that was comparable to those in the other jurisdictions, the questionnaire response and subsequent interview, as well as discussion with provincial officials, revealed it is not. Winnipeg's use of development agreements to recoup for on-site and off-site services is completed on a case-by-case basis, unlike the predetermined or standardized charges found in the other jurisdictions. As a result, the questionnaire completed by the City of Winnipeg and interview with the Provincial official are not included in the discussion of the key findings from the interviews.
Preparing for the Costs of Extreme Weather in Canadian Cities: Issues, Tools, Ideas

Cayley Burgess

Abstract
This paper reviews the risks to Canadian municipal finance from extreme weather and analyzes the financial tools that cities can use to prepare for extreme weather events: insurance, weather reserves, weather derivatives, and budget provision. Despite the threat of climate change, Canadian cities are not substantially increasing their use of these tools. However, improvements could be made to accounting procedures and disaster assistance regulations, and amalgamating smaller cities could improve their ability to manage risk, all of which will ameliorate the financial impacts of extreme weather. The paper proposes reasons why Canadian cities have failed to fully adapt their infrastructure to extreme weather: lack of information, low fiscal capacity, externalities, moral hazard in disaster assistance arrangements, and poor program design. It concludes by discussing how these arrangements may be overhauled to better prepare Canadian municipalities for extreme weather, including new provincial legislation and the creation of a federal infrastructure fund modelled on the United States’ Pre-Disaster Mitigation program.

Keywords: climate change, extreme weather, insurance, budgeting, disaster assistance, risk management
JEL codes: D81, G22, H29
1. Introduction
The scientific basis of climate change is well known but, given its importance, bears repeating. While some energy from the sun is reflected by the earth's atmosphere and surface, the rest is absorbed and then re-emitted as infrared energy. Naturally occurring “greenhouse” gases (GHGs) such as carbon dioxide and methane, in turn, absorb some of this energy, warming the earth to habitable temperatures. Human activities, such as fossil-fuel combustion and deforestation, however, produce additional GHGs. As the concentration of GHGs in the atmosphere increases, global average temperatures rise.

Climate change poses a variety of challenges to Canadian public policy, including sea-level rise, crop failures, and global instability. In particular, however, climatologists predict that extreme weather events will grow increasingly common.

Extreme weather can affect municipal finances when infrastructure is damaged. In the Canadian system of federalism, municipalities are responsible for such critical and expensive infrastructure as sanitary and storm sewers, water supply systems, and local roads. While provincial and federal governments often provide funding for such infrastructure and, increasingly, the private sector may be involved in its provision, the responsibilities of municipal governments are still substantial (Gagnon, Gaudreault, and Overton 2008, 6).

Considering that nearly all municipal infrastructure in all Canadian cities is at risk from extreme weather and that Canadian municipal infrastructure is currently valued at $1.1 trillion (MacLeod 2010, 3), the effect on municipal finances could be extremely high. After a single rainfall in 2005 washed out roads and sewers in Toronto, the municipal government was forced to spend $44 million to restore them to their previous condition (Oates 2008, 11). Furthermore, in an era of globalization, the quality of Canada's municipal infrastructure is more important than ever: empirical evidence reveals that countries with excellent infrastructure are more productive and competitive internationally (Gagnon, Gaudreault, and Overton 2008, 3). Simply deferring maintenance on damaged infrastructure will not be sufficient.

With this in mind, governments have tried to limit the costs of extreme weather by improving infrastructure, modifying land-use patterns, and updating response plans. Public servants suggest that infrastructure and services in Toronto, in particular, are much better prepared for extreme weather than they once were. Many commentators, however, have suggested that despite recent steps, Canada's municipalities have still not sufficiently adapted their infrastructure for extreme weather events (Henstra and McBean 2009, 4), and the impact of extreme weather on municipal finance has been understudied.1 If cities are not prepared, expenses

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1. Extreme weather can also raise the costs of services: in January 1999, Toronto was forced to spend more than twice its snow-clearing budget for the entire winter (Penney and Dickinson 2009, 4).
from extreme weather will crowd out other municipal responsibilities such as libraries, arts and culture programming, and public health. Because of the current strains on municipalities from provincial downloading and public resistance to tax increases (Bird and Slack 2008, 73), this financial burden will be all the more challenging.

The following section of this paper reviews why, despite provincial disaster assistance, Canadian municipalities must prepare financially for extreme weather. It then outlines financial tools that they can use to handle these costs and suggests potential improvements to municipal and provincial governance. Since adapting infrastructure to extreme weather, rather than simply repairing it when damaged, will mitigate strains on municipal finances, the last part of the paper also examines barriers to adaptation and proposes policies to overcome these barriers.

2. Disaster Assistance and Canadian Municipalities

In Canada, as in many nations, municipalities stricken by weather disasters are typically supported financially by higher orders of government. Municipalities must still be concerned with the financial impacts of extreme weather, for the following five reasons.

First, not all costs of extreme weather disasters are covered by provincial legislation. In Ontario, for example, insurance deductibles are not eligible for provincial reimbursement (Ministry of Municipal Affairs and Housing [MMAH] 2009, 9). In British Columbia, if a public facility needs to be relocated following an extreme weather event, the costs of acquiring land cannot be recovered (Government of British Columbia 2006). These exemptions can be substantial: Nova Scotia declared a state of emergency in Halifax after Hurricane Juan in 2003, but only an estimated $17 million of a total $23.8 million in costs will be recovered through disaster assistance; as of its 2010 budget, not all of the projected assistance had yet been received, as will be discussed below. Some of that shortfall was covered by insurance and charitable donations, but the rest will have to be absorbed by the city’s operating budget (Halifax Regional Municipality 2010, C9).

Second, municipalities may experience financial pressures from weather events that are costly but do not constitute disasters as defined by provincial governments. For example, a succession of heavy snowstorms may damage infrastructure and increase snow-clearing costs just as much as a single, disastrous event, but cities may not be compensated for these costs (City of Toronto 2008). Alternatively, a provincial government might declare a disaster, but define the affected area narrowly, refusing to reimburse costs to municipalities outside that area.

Third, provincial assistance is discretionary. Guidelines vary between provinces. In Ontario, financial assistance “may” be provided to affected municipalities “when damage is so extensive that it exceeds the capacity of the affected municipality to manage” (MMAH 2009, 8). Considerations include “current financial capacity, debt ratio, and capital commitments of the affected municipality; local economic impact, e.g., tourism and ability to recover without
provincial assistance; and future financial pressures resulting from response and recovery costs” (MMAH 2009, 8). Public servants at the City of Toronto report that its relatively large fiscal capacity means that the damage that it would have to sustain to receive provincial disaster funding would be nearly unthinkable—certainly in the hundreds of millions of dollars. Similarly, public servants at the City of Edmonton suggest that Edmonton cannot rely on aid from the province, since the amount of aid provided would depend both on the funding available and the number of other affected municipalities with which it must be shared.

Fourth, receiving aid through government bureaucracies takes time, while the financial burden from extreme weather events is immediate. It is now clear that after Hurricane Katrina, American municipalities that had financial resources to cope with the effects of weather disasters were far better off than those without. Marc Landy (2008, S189) points out that after the storm had passed, the titanic struggles with nature morphed into prosaic problems of public finance and service contracting. These efforts were greatly complicated by the voluminous and often mutually contradictory requirements and limitations that the Federal Emergency Management Agency (FEMA) placed on the use of its aid funds. [Mississippi municipalities] were able to progress far more rapidly [than those in Louisiana]. They had rainy day funds that they could tap to pay for their immediate needs.

While, as discussed above, Halifax anticipates the recovery of $17 million from provincial disaster assistance for Hurricane Juan, seven years after the hurricane they had received only $11 million and had to wait for the final accounting to be completed (Halifax 2010, C9). Edmonton also reported a significant lag time in disaster assistance from the province after its July 2004 thunderstorm, although its fiscal capacity was great enough that the lag was not a serious problem.

Finally, disaster-assistance legislation in Canada typically excludes coverage for the loss of revenue by municipalities. Depending on the weather event, municipal revenue losses could be negligible: Toronto public servants suggest that the possibility of revenue loss is not currently considered important enough to necessitate much planning, and they have recommended that Toronto’s extreme weather reserve (described below) not be used to cover departmental revenue losses (City of Toronto 2008, 7). Natalie Cohen points out, however, that extreme weather can hurt municipal revenue through the decline of the tax base (1996, 1). For example, with slight hyperbole, Landy notes that after Hurricane Katrina, New Orleans had “no inhabitable property to produce real estate taxes” (2008, S192). While, in principle, property taxes must be paid regardless of habitability, in reality, municipal tax revenues may shrink because of increased exemptions. For example, in Ontario, according to Section 364(1) of the Municipal Act, property taxes on abandoned industrial or commercial sites are reduced 30 and 35 percent, respectively (Government of Ontario 2001). Also, under Section 365(1) of the act, if citizens are left in financial straits because of extreme weather damage and their property taxes become “unduly
burdensome,” municipalities may need to pass tax relief by-laws (Government of Ontario 2001).

Municipalities may lose revenue from other sources as well. Since Toronto's land transfer tax is based on market value, a decrease in property values due to damage from extreme weather events could lower revenues. Toronto staff have also raised the concern of reduced transit use after an extreme weather event (City of Toronto 2008, 3). Profits from public utilities will fall if there are service outages, and lease payments on city-owned property may be abated because of flooding or other conditions (Cohen 1996, 1). Vancouver staff have also noted that the revenues of certain programs, like Parks and Recreation, will be particularly affected by unpredictable weather (City of Vancouver 2008, 191). Edmonton’s golf courses lost substantial revenue when they were closed following its July 2004 thunderstorm. Conversely, of course, if government facilities that purposely run at a loss are closed, a municipality may in fact save money, although service levels will suffer.

3. Financial Tools for Canadian Municipalities
For all these reasons, municipalities cannot ignore the financial implications of extreme weather events, but must analyze risks and consider using financial instruments to reduce these risks.

3.1 Insurance
Canadian municipalities have often dealt with severe weather risks to public infrastructure through private insurance. This is in contrast to some countries, like Sweden, where municipalities are not legally allowed to insure their assets (Hochrainer and Mechler 2010, 4). However, coverage in Canadian municipalities is incomplete: after Toronto's 2005 rainstorm, only $2 million was recovered from insurance out of a total loss of $44 million (Oates 2008, 11). Similarly, very little of the municipal infrastructure that sustained damage in Edmonton's July 2004 thunderstorm was insured.

In general, however, Canadian municipalities are not increasing their reliance on insurance to respond to climate change. Halifax has not significantly altered its insurance purchases, and Toronto is actively moving away from relying on private insurance by raising its deductible in order to reduce the premiums it is required to pay. After Edmonton's 2004 storm, the city began insuring the revenue stream from its golf courses, but otherwise it has not changed its insurance strategy in several years.

The reason for the limited role of insurance in preparing for climate change–driven extreme weather is that public servants anticipate higher premiums on existing policies (City of Toronto 2008, 3; Halifax 2007, 77), as extreme weather will increase the number and size of claims. Halifax's premiums certainly went up after Hurricane Juan. The rise of premiums, however, may not always be entirely rational. Premiums on public infrastructure in Barbados jumped 1,000 percent after Hurricane Andrew devastated the Bahamas and Florida in 1992, even though Barbados is not in a hurricane path (Hochrainer and Mechler 2010, 4). Moreover, even if a city's own risks have not changed, premiums rise if insurance providers
experience losses elsewhere. Thus, relying on private insurance leaves municipalities at the mercy of skittish insurance providers and external events.

3.2 Weather Reserves

Another important financial tool available to Canadian municipalities is the extreme weather reserve. If a municipality can maintain an adequate reserve, it may be cheaper to pay for infrastructure damages out-of-pocket—a practice known as “self-insuring”—rather than paying the premiums of insurance policies. After all, Yuhua Qiao estimates that private insurance providers spend 150 to 200 percent of what they pay in claims on their own overhead costs (2007, 37). Furthermore, some low-value, high-risk municipal assets are uninsurable in practice, and the loss of insured assets still requires municipalities to absorb the cost of deductibles. These costs are usually funded through reserves.

In 2009, Toronto created an Extreme Weather Reserve Group to offset deficits in Toronto’s operating and capital budgets caused by uninsured extreme weather costs (Oates 2008, 11). The Toronto Environment Office recommended that the City contribute an “appropriate” annual target to the reserve based on projected expenditures on extreme weather events, to be funded through “unspent program budgets, or fixed direct contributions, or a combination of both” (Oates 2008, 11).

Other Canadian cities, however, have not taken this approach. In 2007, Halifax considered establishing a reserve to both prepare for and respond to extreme weather events, but did not institute it, deciding instead to focus on preventive infrastructure upgrades (Halifax 2007, 92). Currently, Halifax maintains a weather reserve aimed primarily at winter snow and ice control, but not infrastructure damage. Similarly, while Edmonton created a snow removal reserve in 2010, public servants suggest that it is intended simply to improve the level of service and not to deal with extreme weather per se.

There are two significant, although not insurmountable, problems with the use of weather reserves. First, the appropriate balance for a weather reserve is difficult to determine. Municipal departments may not actually know how much extreme weather events will cost them. For example, while an extreme heat wave may necessitate keeping swimming pools open for longer, a Parks and Recreation department may not have a policy for exactly how long pools will be kept open, and they may not even know how much each hour of extra operation will cost. Moreover, the changing climate makes past expenditures on extreme weather events less relevant for predicting future costs. Both of these problems make financial planning challenging. Toronto, in particular, has taken important steps to quantify the costs of extreme weather, but municipalities with smaller research capacities may be less prepared.

Second, maintaining an appropriate balance in a weather reserve is politically difficult. Toronto City Council ruled that, contrary to the advice of the Toronto Environment Office, the Extreme Weather Reserve Group would be supplied by budget surpluses only and not necessarily receive annual contributions. The Group also does not receive funds left over from years in which there were few weather-
related costs. As a result, Toronto Transportation Services, for example, concludes that their subreserve in the Extreme Weather Reserve Group does not have a sufficient balance ($19.1 million in 2010) to handle a winter similar to 2008’s 207-cm snowfall, let alone an even more extreme weather event (Djergovic and MacLeod 2010). As of 2010, the balance of all the other subreserves was zero. Thus, since the Extreme Weather Reserve Group is not adequately funded, resources may have to be diverted from other municipal programs in the event of extreme weather.

Municipalities maintain general reserves, of course, that may be used to fund the costs associated with extreme weather. They too, however, are often poorly funded and may not be able to support particularly costly weather events. Toronto staff note that “many existing reserves and reserve funds are significantly under-funded” (City of Toronto 20 08, 6). In particular, public servants suggest that Toronto’s fund for insurance deductibles is approximately half of what it should be. After Toronto’s amalgamation, the political leadership refused to increase taxes or cut services, so many reserves, including the insurance reserve, were drawn down. Similarly, Edmonton's Financial Stabilization Reserve, which is intended for both “revenue instability and unforeseen costs,” is funded only out of surpluses (McDougald 2009). Because of the 2008 recession, it has a “significantly” lower balance than the targeted amount and is thus less capable of covering the costs associated with extreme weather events (McDougald 2009).

3.3 Weather Derivatives

Some municipalities, including Toronto, use derivatives to hedge against fluctuating energy and fuel prices. These are securities whose value depends on measurable weather conditions such as temperature or precipitation, either through derivative exchanges like the Chicago Mercantile Exchange (CME) or through private negotiations. For example, a municipality could reach an agreement with a financial institution whereby the municipality receives a payout if the temperature in a given year reaches a certain level for a certain number of days. In exchange, the financial institution would receive a smaller, upfront payment.

Conventional insurance pays out only when specific hazards damage specific assets, but extreme weather imposes other financial burdens on municipalities. Weather derivatives could therefore play a unique role in municipal adaptation to climate change (Labatt and White 2007, 188). In particular, municipalities that depend heavily on revenue streams from certain weather-dependent activities, especially smaller cities with less capacity to self-insure, may benefit. The financial infrastructure is in place for purchasing exchange-traded derivatives: the weather derivatives market at the CME now includes various weather conditions in Calgary, Edmonton, Montreal, Toronto, Vancouver, and Winnipeg (CME 2010). Public servants have suggested that as long as weather derivatives are structured as insurance, not as speculative investments, provincial governments would likely permit their purchase.

One early municipal use of weather derivatives was by the Sacramento Municipal Utility Department, which can generate hydroelectricity during
relatively wet years, but must rely on more expensive sources of electricity in dry years. To keep energy rates at predictable levels, in 2000 Sacramento began negotiating agreements by which it receives payments in dry years and pays out in wet years. This system has successfully stabilized energy prices for consumers (Mathews 2009).

Weather derivatives, however, are not appropriate for all cities. In particular, they may not be suitable for large cities with diverse weather risks and a high capacity to self-insure. Tellingly, weather derivatives are typically purchased by corporations with very specific, weather-dependent product lines, but Toronto, in particular, has no major revenue source that depends on certain weather conditions.

There are also considerable practical problems with the use of weather derivatives. First, weather derivatives are complicated financial products that can strain the institutional competency of smaller cities. While buying exchange-traded derivatives is easier than negotiating private agreements, derivatives are publicly traded only on the weather in larger Canadian cities. Second, when negotiating private agreements, both municipalities and their partners must be confident that the weather condition underlying the derivative can be accurately measured. If a certain condition is not measured by Weather Canada or by a trusted private institution (as is more likely for smaller municipalities), potential partners might not trust municipalities to measure it themselves. Therefore, while smaller municipalities might gain the most benefit from weather derivatives, perversely, they are the least prepared to use them. Third, since weather derivatives are derived from weather conditions and not actual municipal losses, their payout may not be enough to cover a given loss, or damage may be incurred without the specific weather condition's having occurred at all.

For these reasons, weather derivatives are not yet popular among Canadian municipalities; in fact, none of the municipalities surveyed used them. However, Toronto City staff suggest that when the weather derivative market matures, the products may improve and Toronto may re-examine their use. In any case, research into the municipal use of weather derivatives continues. Brock University Professors Don Cyr, Joseph Kushner, Martin Kusy, and Tomson Ogwang (2010) have suggested that Canadian municipalities could effectively manage the risk of heavy snowfall through weather derivatives.

3.4 Budget Provision

Extreme weather risks could be handled by making regular budget allocations towards extreme weather costs. Halifax has considered such regular budgeting (Halifax Regional Municipality 2007, 86). However, in Toronto, regular budget provision has been found to be impractical because of the difficulty of predicting both the weather and its associated costs. Snowfall, in particular, is both erratic and expensive, and even with a budget provision, municipalities are still likely to spend more or less than the budgeted amount (City of Toronto 2008). Therefore, Toronto has rejected the idea of a budgeted contingency fund for extreme weather.
3.5 Improved Governance

There are numerous opportunities, of varying political feasibility, to lessen the financial impact of extreme weather on municipalities through improved intergovernmental coordination and new governance structures.

Municipal governments may want to ensure that their accounting procedures for emergency management are sufficiently robust for their provincial government. Provinces typically request detailed accounting of the costs of extreme weather events. The Ontario Disaster Relief Assistance Program, for example, requires that municipalities provide claim forms with receipts, authorized by senior officials (MMAH 2009, 7). Halifax city staff have called for new accounting procedures “to be better able to track and allocate costs related to extreme events to support requests for post-event relief funding from the provincial and federal government” (Halifax Regional Municipality 2007, 92).

Provincial legislative and regulatory changes could help. Current disaster relief legislation generally focuses on vulnerable individuals, not local governments, and loosening the criteria by which aid is provided to municipalities could help them recover. Alternatively, the existing assistance process could be streamlined. As mentioned above, Halifax received no immediate financial aid after Hurricane Juan, since the province insisted that accounting be completed before funds were delivered. Moreover, Nova Scotia does not provide interest on disaster assistance payments. Assuming 5 percent annual interest, a loss in 2003 that is not compensated until 2010 will be worth only 71 percent of the value of a prompt compensation payment. Interest rates have been low in recent years; in more turbulent times, the difference between prompt and delayed payments would be far greater. By contrast, insurance companies have strict legal deadlines by which they must pay out.

Amalgamation also helps. Although amalgamation is a contentious issue in Canadian political debates, the advantages of size in preparation for extreme weather are worth noting. The larger the municipality, the more effective self-insurance will be, since risks are spread over a larger citizen base and geographic area. Larger municipal governments can thus maintain higher deductibles, saving on the cost of private insurance. While the former City of Toronto had a mere $250,000 deductible on insurance claims, the amalgamated Toronto was able to save on insurance premiums by raising that 20 times, to $5 million. Halifax city staff are particularly enthusiastic about the effects of amalgamation on financial preparation for extreme weather: they report that the wider pooling of resources made possible by amalgamation allowed Halifax to dramatically raise its deductibles.

Larger municipalities also benefit from the fact that insurance policies with higher deductibles have proportionally lower premiums, since the work needed to administer a few large claims is much less than the work needed to administer many small claims. Finally, significant economies of scale exist for municipal risk management and insurance departments: larger cities can hire fewer people to do the same work and those people will develop more expertise. This is especially
important as climate change continues to alter the traditional rules of risk management, requiring municipal managers to stay abreast of new research in the field.\(^2\)

4. Barriers to Adaptation

As outlined above, the financial impact of climate change on municipal governments can be addressed partly through mechanisms such as insurance policies, self-insurance, weather reserves, and more exotic options such as weather derivatives. However, the most effective way to reduce this impact and the impact on provincial and federal governments that provide disaster assistance is to focus on preventive efforts, such as stronger building codes, stricter land-use controls (for example, prohibiting the building of infrastructure in flood zones), and regular testing of extreme-weather procedures (Henstra and McBean 2003, 7). Such preventive efforts are largely considered more cost-effective than reconstruction after the fact (Henstra and McBean 2009, 3).

Preventive measures, however, often have low take-up by municipalities. As climate change threatens to increase the costs of disasters, this lack of attention to prevention is not sustainable. The novel challenges presented to Canadian municipal infrastructure by climate change will thus require not only more funding but also new intergovernmental arrangements.

4.1 The Information Challenge

A first principle of effective federalism is “subsidiarity”—the idea that “the efficient provision of services requires that decision-making be carried out by the level of government that is closest to the individual citizen” (Slack 2009, 17). Not only can local governments respond to people's needs with customized levels of services and taxation (in contrast to the federal government, which typically provides uniform levels across the country), but local governments often understand better how to work in local conditions. From this point of view, while macroeconomic stabilization and income redistribution are the proper tasks of the provincial and federal governments, intrusion by these governments in other areas, such as preparations for extreme weather (through infrastructure programs or building codes), is undesirable. As long as municipalities have the fiscal capacity to prepare, the logic goes, they will do the best job.

In the case of adaptation to climate change, however, the subsidiarity principle is less relevant for four reasons.

First, despite intense interest in the subject, the potential effects of climate change on municipal infrastructure are still not well understood. Public servants in both Toronto and Edmonton have suggested that their municipalities do not

2. Many smaller municipalities are members of reciprocal insurance organizations like the Ontario Municipal Insurance Exchange and the Municipal Insurance Association of British Columbia. This type of risk-pooling lowers insurance costs and offers more stability. Such organizations can provide benefits similar to amalgamation, although their effectiveness depends on political cooperation, similarity of risks, and elimination of moral hazards.
know enough about the dangers posed by climate change to plan effectively. Canadian municipalities’ previous experiences with extreme weather will not help them prepare for climate change, since, by definition, climate change will bring entirely novel weather challenges. The experiential advantage of local governments is therefore reduced.

Second, more research is needed on climate change-related extreme weather threats, but the relatively small policy research capacity of municipal governments in Canada—even the largest ones—makes them unsuited to prepare independently for extreme weather. As Daniel Farber (2009, 13) observes of the United States, even “some states may be lacking in the technical capacity to do their own adaptation planning effectively.”

Third, an implication of rational choice theory is that the efficiency advantage of local governments in being able to provide unique levels of goods hinges on citizens’ having good information about the marginal utilities of those goods. If citizens have this information, they can maximize the overall well-being of the community by voting for politicians who promise to fund goods so that the marginal utilities of each good are equal. Climate change-driven extreme weather threats, however, are not just unfamiliar to governments; they are unfamiliar to citizens too. Therefore, while the marginal utility of a flood-prevention strategy might be enormous, for example, if citizens do not know this, they will not vote for its provision. Thus, this advantage of local governance is lost. (While the same logic could apply to the provision of adaptive infrastructure by higher orders of government, the point is that the subsidiarity principle is, in this case, less relevant than for other government-provided goods.)

Finally, the subsidiarity principle is often endorsed for allowing experimentation, innovation, and inter-jurisdictional learning (Rosen et al. 2008, 158). For example, if one municipality introduces a new influenza vaccination program, other municipalities can wait until the program has run for one influenza season, examine the morbidity and mortality reports, and decide if they should copy the program. Unfortunately, experimentation in the case of extreme weather may yield little helpful information: while many extreme weather events will...
become more common because of climate change, they still may not happen very often. For example, storm surges that might traditionally occur once every 1,000 years might, after climate change, occur every 25 years. This dramatic increase in probability is alarming and requires action, but Halifax can hardly wait for decades to determine the effectiveness of preventive infrastructure in Vancouver, Victoria, and Saint John before building its own. Here again, the subsidiarity principle provides little advantage.

4.2 The Fiscal Challenge

Canadian fiscal arrangements hinder the ability of cities to prepare for extreme weather for two major reasons. First, the current taxation powers of municipalities are limited and inelastic: unlike income and consumption taxes, property taxes do not expand automatically with economic growth, and their highly visible nature (unlike income taxes, which for most people are deducted automatically from their paycheques) makes tax hikes politically difficult (Bird and Slack 2008, 72). Furthermore, the budgets of municipalities have been recently strained by the repeated downloading of services from provincial governments and the imposition of unfunded service standards (Bird and Slack 2008, 72). Thus, despite the urgency of doing so, Canadian municipalities are least able to prepare for and respond to extreme weather events. Moreover, this limited capacity has already resulted in an accumulated “infrastructure deficit” of $60 to $125 billion, which makes cities even more vulnerable to the damage and costs caused by extreme weather events (Bird and Slack 2008, 73).

Second, Canadian cities typically have strict limits on capital borrowing set by provincial governments. In Ontario, for example, municipalities (Toronto excepted) may not allow debt-servicing payments to exceed 25 percent of their own-source revenues without obtaining permission from the Ontario Municipal Board (MMAH 2007). These limits on capital borrowing were created for a good reason, but they mean that municipalities cannot necessarily build the adaptive infrastructure they need, even if a project is clearly cost-effective. For example, sewer systems in major cities are hugely expensive: Ottawa’s combined sewer and sanitary systems are valued at $5.1 billion (City of Ottawa 2011), which is far more than its annual budget, let alone its borrowing limits. Sewer systems can be built, however, through long-term planning and gradual construction.

Unfortunately, cities may not have the luxury of time for building adaptive infrastructure, since the threat of climate change-related extreme weather is both unexpected and immediate. Provincial and federal governments, by comparison, can go into debt to pay for necessary upgrades with legal if not political ease. Even so, at least in Ontario, this is still only a hypothetical problem, as most Ontario cities are not approaching their borrowing limits (Slack 2003, 10). As the threat of extreme weather becomes clearer, however, this issue may become more pressing.

4.3 The Externality Challenge

Extreme weather may also cost Canada more than it should because of unresolved externality problems. In economic theory, an externality occurs when a market
transaction between two parties causes a change in welfare for a third party in a way that is not accommodated through the price system, thus distorting the market. Externalities in the provision of extreme-weather infrastructure are common. For example, flood control infrastructure in one municipality may affect another, since such infrastructure might either prevent the flood from reaching the second municipality (a positive externality) or channel the flood right to it (a negative externality). As Hurricane Katrina demonstrated, extreme weather disasters may also impose service costs on surrounding municipalities from displaced populations, or damage to roads or power lines in a city may adversely affect the populations of surrounding cities who also use them (Farber 2009, 11).

Without negotiations or a single government unit that controls the provision of infrastructure in all affected municipalities, these externality effects will not be considered in the municipal policy-making process. Furthermore, the more mundane difficulty of coordinating infrastructure policy (and disaster-response policy) between even cooperating municipalities may lead to increased costs from extreme weather events (Wildasin 2008, 2). It is difficult to know whether these theoretical concerns have a real-world influence on policy making, although some public servants in Ontario suggest they do. Further empirical research on this topic is needed, but it is likely that externalities will create at least some inefficiencies in the provision of adaptive municipal infrastructure in the Canadian federation.

4.4 The Moral Hazard Challenge
Another possible explanation for the lack of effective extreme-weather adaptation strategies in Canadian municipalities is the presence of moral hazard. If municipalities know that they can rely on provincial aid after extreme weather events, they will be tempted to under-invest in extreme weather adaptation. Similarly, provinces will be reluctant to help municipalities develop infrastructure if they expect federal payments under Canada’s Disaster Financial Assistance Arrangements (DFAAs). As Dan Henstra and Gordon McBean (2005, 308) note:

in their current form, Canada’s disaster-assistance programs do not encourage mitigation... Paying for disaster losses without addressing root causes sets the stage for repeat losses and can create perverse incentives that reinforce high-risk decisions and behaviour.

More dangerously, assistance criteria in Canada often include the fiscal capacity of municipalities to respond independently to weather events. For example, legislation in Ontario states that in adjudicating disaster-assistance payments to municipalities, ministers may consider “current financial capacity, debt ratio and capital commitments of the affected municipality... [and] future financial pressures resulting from response and recovery costs” (MMAH 2009, 9). Thus, municipalities with larger fiscal capacity and more debt room, who are better able to absorb the costs of an extreme weather event, may not be compensated or not compensated as much as others. This could be a perverse incentive leading to municipal fiscal profligacy.
Finally, the structure of taxation in Canada may exacerbate this moral hazard problem. Some of the most costly climate change–related extreme-weather events are floods and storm surges, which afflict very specific areas. However, if municipalities are funded primarily by property taxes, they will hesitate to deny developers permits to develop high-risk areas (often, as they are, scenic and highly valued) if the municipalities are confident that they will be bailed out by provincial governments (Farber 2009, 12).

The actual effects of moral hazard are hard to demonstrate empirically, especially because of the difficulty in assessing the effectiveness of municipal action on adapting infrastructure. Certainly, in the words of one public servant, some Canadian municipalities “will do nothing and then beg for help from the [disaster] funding that is available.” At the same time, the division between political spheres and non-partisan, professional public services may help; another public servant points out that the seriousness with which public-service engineers and planners undertake their work allows municipalities to avoid some of the moral hazard that might afflict purely political decisions. Moreover, if municipalities know that provinces will compensate them only for extremely serious disasters, they still have to plan well for weather events in which the damage incurred is below the threshold for disaster assistance, because the cities themselves will have to pay.

While moral hazard in Canadian federalism existed long before climate change, climate change raises the stakes, not only in the costs of damage-prevention measures, but also in reconstruction. Canadian policymakers have been able to ignore the issue thus far, but it will become increasingly expensive to do so.

4.5 The Program Challenge

The presence of moral hazard, externality problems, and municipal fiscal and policy capacity challenges all suggest that federal and provincial involvement in providing adaptive municipal infrastructure is necessary. While some provincial programs fund adaptation projects, they are generally inadequate; one public servant lamented the lack of an Ontario program aimed at replacing vulnerable municipal infrastructure. A thorough accounting of all Canadian infrastructure programs and projects is beyond the scope of this paper, but particularly relevant federal programs include the following:

a. Joint Emergency Preparedness Program (JEPP). This program provides matching grants of up to 75 percent of project costs to municipalities for disaster preparation. However, much municipal infrastructure would be ineligible under the program rules: ineligible costs include those “relating to events and equipment which are considered to be the routine responsibility of provincial ministries; [...] ongoing operating and maintenance costs; [...] and major capital construction costs” (Public Safety Canada 2010, 14). The JEPP also has limited funding—a mere $7.9 million in 2010 (Treasury Board Secretariat 2010).

b. Green Infrastructure Fund (GIF). While the GIF is better financed than the JEPP, providing $1 billion over five years to provinces and cities from the federal...
government on a cost-shared basis, funding is directed mostly at emission-reduction projects, not adaptation (Infrastructure Canada 2009).

c. Canada Strategic Infrastructure Fund (CSIF). With a total funding of $4.3 billion, the CSIF supports major infrastructure projects with national and regional benefits to Canadians (Infrastructure Canada 2010a). However, most funding has already been committed.

d. Gas Tax Fund (GTF). The GTF will distribute $13 billion from 2005 to 2014 “to support environmentally sustainable municipal infrastructure projects” (Infrastructure Canada 2011). However, the GTF is not a matching fund, but is distributed on a per-capita basis. Therefore, not only do the funds not necessarily go where they are most needed—Halifax and Vancouver, potentially—but municipalities will not necessarily use them for the nominal purpose of the grant. Rather, municipalities will spend them on sustainable infrastructure only where they anticipate increased demand for the infrastructure.

e. Green Municipal Funds (GMF). This program is administered by the Federation of Canadian Municipalities and funds up to 80 percent of approved sustainability projects to a maximum of $1 million. GMFs are not currently available for energy, waste, water, and transportation capital projects (currently, only brownfields reclamation capital projects are eligible), indicating, perhaps, an administrative capacity problem (FCM 2010). Moreover, they focus on mitigation, not adaptation, requiring projects to “improve environmental performance” (FCM 2010). This would seem to preclude many adaptation projects.

f. Building Canada Fund (BCF). Canada’s “flagship” infrastructure program, the BCF will distribute $8.8 billion over seven years towards cost-sharing for infrastructure projects. Like the GTF, it is allocated by population instead of by merit (Infrastructure Canada 2010b). Disaster-mitigation projects are eligible, but are explicitly not a priority funding area (Infrastructure Canada 2010b).

Current federal and provincial funding programs, therefore, have some serious shortcomings for adapting municipal infrastructure to climate change–related extreme weather.  

5. Solutions

5.1 Federal Adaptation Programs

Canadian municipalities are not opposed to working with other governments to adapt better than they do now to climate change. The Federation of Canadian

6. Even to apply for funding, municipalities must know what projects they really need to prepare for extreme weather. Without sufficient policy capacity, this may be unclear.

7. Provinces in Canada, however, have historically resisted federal attempts at centralization, even if it is merely through federal spending power, not legislation. Therefore, since municipalities are the responsibility of provinces, even if some problems are resolved by federal help for municipalities, new ones may be created.
Municipalities (2011) points out that “the complexity of [climate change] requires a renewed governance approach, with strengthened intergovernmental co-ordination, and clear, committed federal leadership.” While provincial infrastructure programs could certainly help, there are several reasons why a federal role may be particularly important. Many of the previously discussed challenges, such as policy capacity and externalities, can apply to provinces as well. Most important, however, is that only a federal program can truly correct for moral hazard, since the federal government is the Canadian insurer of last resort.

A critical review of the empirical literature on moral hazard at this level of government is beyond the scope of this paper, but David Wildasin (2006) concludes that moral hazard is present in provincial-federal relations in the United States. Furthermore, he suggests that this finding should encourage new federal programs aimed at promoting adaptation. Other American studies suggest that federal funding for adaptive infrastructure reduces future reliance on federal funds by a factor of four (FEMA 2010, 1). Theoretically, a federal infrastructure program could also address the differential threat that climate change poses to municipal infrastructure in different provinces. Moreover, whenever a national carbon-management scheme is implemented—either a carbon tax or an emissions trading scheme—a federal infrastructure program could be an appropriate tool to distribute revenue from those who produce greenhouse-gas emissions to those who are hurt by climate change (Wildasin 2006, 17). Provincial schemes, by contrast, could not redistribute income from, for example, the Alberta energy industry to the municipality of Halifax.

What would a well-designed federal adaptive infrastructure program look like? The FCM has recommended two programs. The first would address the limited research capacity of municipalities, and to the extent that the study of climate-change adaption experiences economies of scale, this would be a more efficient solution than current practice. In the aftermath of Hurricane Katrina, Canadian policymakers reflexively avoid looking to Federal Emergency Management Agency in the United States as a model, but Dan Henstra and Andrew Sancton note its effectiveness as a central resource for information, advice, and leadership (2002,11).

The FCM’s second recommendation is an “adaptation fund to assist municipal governments in understanding and responding to the effects of climate change” (FCM 2011). Unfortunately, adaptation funds can be difficult to design. Besides the specific problems with Canada’s federal infrastructure programs noted above, the efficiency of such a fund would depend on the transparency of municipal efforts to reduce disasters (Goodspeed and Haughwout 2009, 29). For example, if the federal government was going to effectively support the construction of a breakwater in Halifax, it would have to accomplish the following:

a. Confirm independently that the project is actually needed for climate change–related extreme weather.
b. Consider the worth of the project in terms of both adaptation and intergovernmental politics. While an economically efficient distribution of funds would require that the marginal utility of funds given to every municipality be equal, such blindness to regions is politically untenable. If, for example, an efficient allocation were to result in more funds being given to Vancouver and Halifax than to Edmonton and Calgary, an efficient matching fund could create intergovernmental tensions.

c. Confirm that the breakwater would not be built were it not for the federal matching funds. In economic terms, this is known as avoiding “free-riders.” If one-third of the projects a federal program funds are free-riders, then the fund is only two-thirds effective at creating new adaptive infrastructure.

d. Distinguish between the adaptive function and other functions of a project. A breakwater could also be used as a beachfront promenade, for example. While there is nothing wrong with dual-use infrastructure per se, municipalities should be responsible for funding projects to the extent that they have other uses.

Potentially, however, an adaptation fund could be modeled after FEMA's Pre-Disaster Mitigation program, which

is designed to assist States, Territories, Indian Tribal governments, and local communities implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding from future disasters (FEMA 2010, 2).

Notwithstanding a per-state $575,000 funding minimum, it is run on a competitive process, awarding 75 percent matching funds to the most deserving projects (Congress 2009). Moreover, the range of eligible projects is extensive, from retrofitting existing buildings to vegetation management to controlling forest fires (FEMA 2010, 12). While some might argue that its $200 million annual funding is inadequate for a nation the size of the United States, the bill enjoyed wide bipartisan support in its 2009 House of Representatives reauthorization vote (Office of the Clerk 2009). The final bill declared that Pre-Disaster Mitigation “saved Federal taxpayers from spending significant sums on disaster recovery and relief that would have been otherwise incurred had communities not successfully applied mitigation techniques... [and] increasing funds appropriated for the program would be a wise investment” (Congress 2009). No strictly comparable program exists in Canada.

5.2 Uploading and Regulations
There are, of course, other solutions. Provinces could upload services so that cities would have more budget room to prepare for extreme weather; some Toronto public servants suggest that this is an appropriate response to the need for adaptive

8. Note that here “mitigation” refers to adaptation and preparation for disasters, not to the reduction of greenhouse gas emissions.
municipal infrastructure. Ontario, for example, is planning to upload certain services from 2010 until 2018, thus freeing up an estimated $1.5 billion for municipal budgets (MMAH 2008). In other jurisdictions, however, this approach may be less likely, given the deficit positions of all Canadian provinces (including Alberta). Furthermore, as in the case of non-matching grants like the Gas Tax Fund, uploading services will increase infrastructure adaptation only according to the level of demand for adaptation by municipalities.

A more likely solution is stricter regulations. For example, Québec and Ontario have legislation requiring municipalities to fulfil certain requirements for risk assessments and emergency planning (Henstra and McBean 2003, 8). Certainly, the increased threat of extreme weather from climate change is an excellent reason for other provinces to follow suit, and doing so could go a long way to solving certain moral hazard and policy capacity problems.

Deborah Harford, Nancy Olewiler, and John Richards (2010, 16) see this lack of legislation as a serious gap in Canada’s disaster management. While some Toronto public servants suggests that if Ontario improved building standards, there might be some short-term political angst from municipal governments, they opine that it would die down quickly.

There are several disadvantages to regulations, however. First, regulations may not always come with the provincial funding required for municipalities to comply with them. Thus, the fiscal challenge of municipalities remains.

Second, regulations are only as good as the capacity of provinces to monitor the actions of municipalities and to penalize nonperformance. As provinces may try to reduce program spending to eliminate their deficits, this capacity may diminish.

Third, as with all command-and-control regulations, infrastructure legislation can give rise to inefficiencies when they hold municipalities to identical standards. For example, the Ontario Emergency Readiness Act requires municipalities to conduct “public education on risks to public safety,” which might be an excellent use of funds in one city, while another city might have a greater need for money to be spent on additional infrastructure improvement (Government of Ontario 2006).

Finally, the science behind infrastructure adaptation—not to mention the climate itself—is quickly changing. Therefore, legislation may quickly become out of date. By comparison, as long as federal or provincial infrastructure fund managers have some discretion over how they distribute money, they would be able to adjust their decisions as soon as new research emerges, instead of waiting for new regulations to emerge from the glacial political process.

6. Final Thoughts
The impact of climate change on Canadian municipal infrastructure will be large. While there are numerous financial tools, with various advantages, that can help Canadian municipalities handle the financial impacts of extreme weather, for the most part, these tools are not being used: municipalities are relying on a combination of general reserves and luck. Moreover, the current structure of
Canadian federalism makes it difficult for municipalities to adapt their infrastructure to extreme weather. Therefore, this paper suggests that increased uptake of financial planning tools for extreme weather, combined with a well-crafted, well-funded, dedicated federal infrastructure program using matching grants and evidence-based distribution, would be an appropriate starting place to prepare Canada's cities for climate change.

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