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Papers

METCALF
FOUNDATION

Incenting the Nature of Cities

Using Financial Approaches to Support Green Infrastructure in Ontario

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by Stephanie Cairns, Pomme Arros, and Sara Jane O'Neill

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Metcalf Foundation

The mission of The George Cedric Metcalf Charitable Foundation is to enhance the effectiveness of people and organizations working together to help Canadians imagine and build a just, healthy, and creative society.

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About Sustainable Prosperity

Made up of business, environment, policy and academic leaders, Sustainable Prosperity (SP) is a national green economy think tank/do tank. We harness leading-edge thinking to advance innovation in policy and markets, in the pursuit of a greener, more competitive Canadian economy. At the same time, SP actively helps broker real-world solutions by bringing public and private sector decision-makers to the table with expert researchers to both design and apply innovative policies and programs. We believe that achieving the necessary innovation in policy and markets for a stronger, greener Canadian economy requires a new knowledge base and new conversations. SP's approach is to promote both by generating policy-relevant, expert knowledge to inform smart policy solutions and fostering innovative conversations and connections.

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FOREWORD

The goal of the Metcalf Foundation's Environment Program is to help build a low-carbon, resource efficient, and resilient Canada. Given the scale and complexity of the task of envisioning and realizing such a transformation, the Foundation sought to elicit a multiplicity of views and opinions, with a particular focus on southern Ontario.

In 2014, Metcalf commissioned a series titled *Green Prosperity Papers*. The aim was to contribute to the emerging policy conversation by connecting Ontario's robust university-based research capacity to timely public policy challenges. We invited proposals from a select number of researchers at Ontario-based universities who have a track record of producing research for public dissemination.

The six resulting *Metcalf Green Prosperity Papers* all address intersections of the environment and economy while taking up a range of topics from social justice, to fiscal reform, to democratic governance.

Since we commissioned the papers, Canada's commitments to climate action and growing a green economy have advanced substantially. The Foundation hopes the ideas explored in this series will assist in the crucial work, that is now underway, toward building a low-carbon, resource efficient, and resilient Canada.

Sandy Houston,
President and CEO
Metcalf Foundation

SUMMARY

Green infrastructure is defined as "natural and human-made elements that provide ecological and hydrological functions and processes…including components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces and green roofs." [1]

Funding for green infrastructure is an ongoing challenge for municipal governments. This challenge extends to traditional engineered stormwater infrastructure systems, which are generally aging and sometimes inadequate to manage the surge in extreme weather events associated with climate change. Faced with this ongoing infrastructure deficit and the need to adapt to changing or more extreme weather events, Ontario municipalities have strong motivation to turn to cost-effective strategies to deliver essential civic services. Green infrastructure has proved to be a cost-effective alternative to engineered stormwater systems in many urban developments. Moreover, green infrastructure provides many benefits in addition to stormwater management: positive impacts on biodiversity, air quality, water quality, climate, human health, human happiness, and resilience to extreme events. When these multifunctional benefits are accounted for, the cost-benefits arising from green infrastructure investments are many times greater than those from traditional engineered infrastructure investments.

While green infrastructure yields many environmental, social, and economic benefits, the upfront investment of installing green infrastructure can often present a barrier for uptake, particularly for the private property holders who manage significant areas of urban lands. Yet implementation of green infrastructure on private land has been found to cost much less than on public land. Because of this, private landowners are crucial agents in managing and expanding green infrastructure in urban settings. A comprehensive green infrastructure strategy cannot be done without including approaches tailored to their needs.

Market-based policies, which use prices to provide an incentive to protect the environment, are a key technique for making green infrastructure investments more financially appealing to private landowners. Some market-based tools also create new revenue streams for local governments — revenue which can be redirected to maintaining and renewing engineered stormwater infrastructure, to encouraging further use of green infrastructure, and to investing directly in green infrastructure projects on municipal lands.

1 As defined in the Ontario *Provincial Policy Statement 2014*. Retrieved from: http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463

This report provides the rationale for local governments to consider green infrastructure strategies and introduces six market-based tools that are used across Canada and the United States to support such strategies. These tools include stormwater user fees and fee discounts; stormwater credit trading; grants, rebates and installation financing; development charges; development incentives; and habitat compensation banks. The report also describes a pioneering strategy to integrate the value to municipalities of existing green infrastructure, into formal local government asset management systems.

While some municipalities in Ontario have adopted green infrastructure strategies and are supporting these with market-based policies, Ontario lags far behind the United States in these approaches. This gap has consequences not only for the resilience of Ontario communities to climate change, but also for the financial resources available to tackle municipal infrastructure deficits and for the quality of life in urban centers. Drawing on interviews with the Ontario municipalities who have considered or implemented market-based policies for green infrastructure, the potential barriers to implementing such programs are reviewed and recommendations are offered to help governments encourage greater use of green infrastructure in their cities and neighbourhoods.

PURPOSE OF THIS REPORT

In 2012, the Green Infrastructure Ontario Coalition produced the report *Health, Prosperity and Sustainability: The Case for Green Infrastructure in Ontario*. It outlined best practices in green infrastructure with recommendations for legislative and policy reform in Ontario. Among these was the recommendation that green infrastructure projects be supported through mechanisms such as eligibility for public infrastructure funds, stormwater fees, and incentive programs.

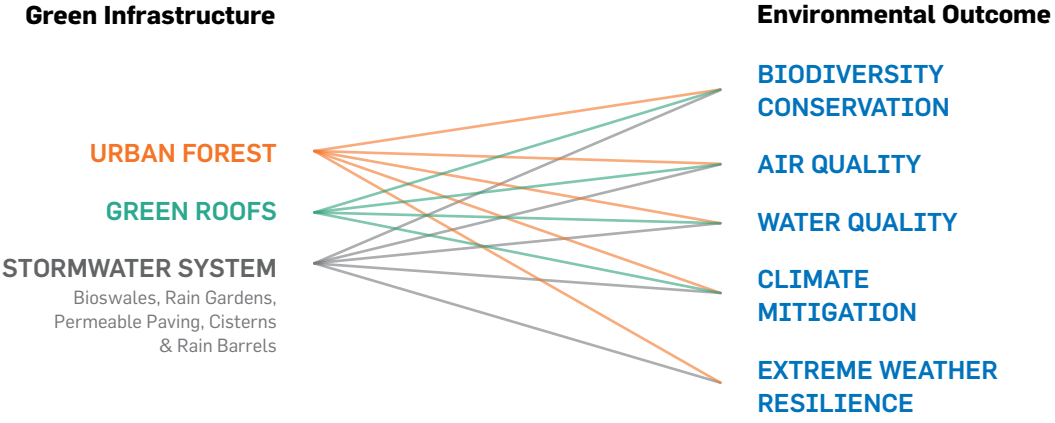
This report introduces fee, incentive, and other market-based programs that can support the expansion of green infrastructure in cities and neighbourhoods. It considers the potential barriers to implementing these and offers recommendations, to local and provincial governments on how, to encourage greater use of green infrastructure, on private and public property in southern Ontario municipalities.

THE RATIONALE FOR GREEN INFRASTRUCTURE STRATEGIES

WHAT IS GREEN INFRASTRUCTURE?

Urban design and landscape have profound consequences for how people and nature struggle or thrive in urban centres, including the resilience of these centres to more extreme weather events. As our cities grow denser and larger they become more reliant on costly and often single-purpose engineered (or 'gray') infrastructure for services — many of which were once provided free by nature. As a result, cities risk becoming devoid of natural ecological and hydrological elements and risk losing the multifunctional benefits these elements provide. Benefits can include positive impacts on biodiversity, air quality, water quality, climate, human health, human happiness, and resilience to extreme events (Figure 1).[2]

FIGURE 1
Selected Environmental Outcomes from Green Infrastructure



Resilience to extreme events is a growing concern in cities, particularly with respect to managing the increase in extreme rainfall associated with climate change and associated risks of urban floods. Urban settings have extensive impermeable surfaces ranging from pavement for parking lots, roads, driveways, sidewalks, and rooftops, to other built structures that prevent precipitation from infiltrating naturally into the soil. Not only does this result in more water collecting and pooling on hard surfaces, but the water

2 European Union. (2013). *Building a Green Infrastructure for Europe.* Retrieved from http://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructure_broc.pdf

that falls onto the built surface accumulates oil and other debris before flowing into engineered stormwater drains. What was once clean precipitation becomes polluted stormwater.[3] This higher volume and more polluted stormwater runoff can cause many problems, including threats to human health, diminished recreational opportunities from polluted beaches, stream erosion damage, threats to fish and wildlife, and pollution of drinking water.[4] The traditional response by cities to this issue has been to expand engineered stormwater drainage and treatment infrastructure.

In addition to causing environmental and human health problems, the engineered approach to stormwater management undervalues the opportunity of using rainwater as a resource. Instead of capturing and using the rainwater resource of urban ecosystems for uses such as irrigation and toilet flushing — which according to some studies constitutes over three-quarters of domestic water demand — the engineered approach increases dependence on centralized water supply infrastructure and treatment.[5]

Deliberately reintegrating nature into the built environment offers an alternative, transformative approach. Green infrastructure, as defined in the Ontario Provincial Policy Statement (2014), is:

> "natural and human-made elements that provide ecological and hydrological functions and processes … including components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural chhhannels, permeable surfaces and green roofs."[6,7]

An expanded use of green infrastructure in southern Ontario cities can benefit multiple objectives (Figure 1):

- A cost-effective complement to aging or under-capacity engineered stormwater infrastructure in existing developments, and a more affordable approach in greenfield developments;

3 Porter-Bopp, S., Brandes, O. M., Sandborn, C., and Brandes, L. (2011). *Peeling back the pavement: A Blueprint for Reinventing Rainwater Management in Canada's Communities*. POLIS Project on Ecological Governance. Retrieved from http://poliswaterproject.org/sites/default/files/Peeling_Back_lowres_nov17.pdf

4 ibid.

5 Schreier, H. 2014. Innovative stormwater management: Translating Science into Actions, Canadian Water Network, NCE, http://www.cwn-rce.ca/assets/resources/pdf/CWN-EN-Stormwater-Report-FINAL.pdf

6 Ontario Ministry of Municipal Affairs and Housing. (2014). *Provincial Policy Statement Under the Planning Act*. Retrieved from http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463

7 There are many ways to define green infrastructure. For the purposes of this paper, we use the definition in the Ontario Provincial Policy Statement 2014. Other definitions include components that are restricted to natural elements such as open spaces, parks, waterways, trees and woodlands, while others are broader and include, in addition to natural elements, green streets, squares and public realm, sustainable drainage systems and healthy waterways, cycleways and pedestrian routes within city environments. Green infrastructure has also been described specifically in relation to stormwater to include ecological processes that process, capture and direct water, stormwater and wastewater. Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V, Kazmierczak, A., Niemela, J. et al. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. Landscape and Urban Planning, 81, (3), pp. 167–178; Arup. (2014). Cities Alive: Rethinking Green Infrastructure. Retrieved from http://www.arup.com/Homepage_Cities_Alive.aspx; Canadian Environmental Law Association, Ducks Unlimited Canada, Ecojustice Canada, Ontario Headwaters Institute, Ontario Nature, and Coalition for a Livable Sudbury. Provincial Policy Statement (2005), 5-year Review. Retrieved from http://www.cela.ca/sites/cela.ca/files/830LetterWynnePPSReview.pdf

- Greater resilience to extreme weather events such as heat waves, torrential rain, and spring floods that overwhelm the capacity of urban 'gray' infrastructure;
- Reduction of urban non-point sources of pollution — a significant source of water contamination;
- Renewal and expansion of urban forests across Ontario;
- Reduction of electricity consumption for heating and cooling to meet demand reduction targets in Ontario's Long-Term Energy Plan;
- Biodiversity protection and restoration; and
- Health protection and promotion among urban populations.

For these reasons, when Ontario's Provincial Policy Statement under the Planning Act was updated in 2014, planning authorities were encouraged to promote green infrastructure as a complement to traditional infrastructure.[8] The 2015 Ontario Provincial Budget also committed to invest more than $130 billion in public infrastructure over 10 years[9] and Ontario's 10-year infrastructure investment plan, *Building Together*, mentions green infrastructure and provides examples of provincial leadership. Although all these documents encourage more green infrastructure, there is no specific directive or funding stream for green infrastructure in the province and connections between ministries associated with different aspects of green infrastructure are weak.[10]

THE ECONOMIC CASE FOR GREEN INFRASTRUCTURE

Funding for infrastructure is an ongoing challenge for Canada's municipal governments. For example, in 2013, the Canadian Chamber of Commerce estimated that Canada's infrastructure deficit could be as high as $570 billion.[11] Toronto alone has a repair backlog of $1.7 billion, indicative of the decaying condition of its infrastructure.[12] For Ontario as a whole, it has been estimated that investments of $30 to $40 billion over the next 15 years will be needed to repair water and wastewater systems and to accommodate new population growth.[13] Stormwater systems are generally aging[14] and

8 Ontario Ministry of Municipal Affairs and Housing. (2014). *Provincial Policy Statement under the Planning Act.* Retrieved from http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463

9 Ontario Ministry of Finance. (2015). *Budget 2015 Makes Largest Infrastructure Investment in Ontario's History*. Retrieved from http://news.ontario.ca/mof/en/2015/04/budget-2015-makes-largest-infrastructure-investment-in-ontarios-history.html

10 Green Infrastructure Ontario Coalition. (2012). *Health, Prosperity and Sustainability: The case for green infrastructure in Ontario*. Retrieved from https://www.ecojustice.ca/wp-content/uploads/2014/08/Health-Prosperity-and-Sustainability_The-Case-for-Green-Infrastructure-in-Ontario.pdf

11 Canadian Chamber of Commerce. (2014). *The Foundations of a Competitive Canada: The Need for Strategic Infrastructure Investment*. Retrieved from http://www.chamber.ca/media/blog/131218-The-Foundations-of-a-Competitive-Canada/131218_The_Foundations_of_a_Competitive_Canada.pdf

12 TD Economics. (2015). *Working towards an improved greater Toronto/Hamilton area.* Retrieved from http://www.td.com/document/PDF/economics/special/CivicAction2015.pdf

13 Water Technology Acceleration Project. (2013). *Capital Expenditures and O&M Costs.* Retrieved from http://www.watertapontario.com/asset-map/utilities/capital-expenditures

sometimes inadequate to manage the surge in extreme weather events associated with climate change. Faced with this ongoing infrastructure deficit, Ontario municipalities have strong motivation to turn to cost-effective strategies to deliver essential civic services.

Green infrastructure has proved to be a cost-effective alternative to traditional engineered stormwater systems in many instances. In Maryland and Illinois, new residential developments that used green infrastructure for controlling stormwater saved $3,500 to $4,500 per lot compared to lots designed with conventional engineered stormwater systems.[15] In Seattle, the use of green infrastructure was found to reduce construction costs in street redesign projects by 24% to 45%.[16] In Portland, a project to manage stormwater using green infrastructure cost 40% less than the engineered infrastructure alternative.[17] Precise cost comparisons are necessarily influenced by specific site conditions.

Moreover, when the multifunctional benefits associated with green infrastructure are taken into account, the cost-benefits arising from green infrastructure investments outweigh those from traditional infrastructure investment. In Philadelphia, green infrastructure stormwater management was found to provide US$2.8 billion in benefits, which included increased recreational opportunities, improved aesthetics/property value, reduction in heat stress mortality, and water quality/aquatic habitat enhancement. Similar benefits from traditional engineered systems were estimated at $122 million — a ratio of 23 to 1.[18]

Research in southern Ontario finds similar patterns. A 2005 assessment of a Toronto-wide green roof installation program found it would provide $313 million in initial net cost savings from stormwater, combined sewer overflow, air quality, building energy, and urban heat island benefits, with an additional operating cost savings of $37 million annually.[19] The 10 million trees in Toronto's urban forest provide $80 million in annual benefits from stormwater retention, air quality, climate moderation and energy savings, carbon sequestration, and avoided fossil fuel generation.[20]

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14 See Canadian Infrastructure Report Card, Part 2: Sector Report Stormwater. Of assessed stormwater infrastructure, 35% 20-39 yrs old and 28% 40-59 yrs old. Retrieved from: http://www.canadainfrastructure.ca/downloads/Canadian_Infrastructure_Report_2016.pdf

15 Kloss, C. & Calarusse, C. (2006). *Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combine Sewer Overflows.* Natural Resources Defence Council. Retrieved from http://www.lowimpactdevelopment.org/lid%20articles/rooftops.pdf p. 12

16 Puget Sound Action Team. (n.d.). *Low Impact Development: How Can We Protect Puget Sound as We Grow?* Retrieved from http://ci.granite-falls.wa.us/media/pdf/stormwater/lid_brochure06_11x17.pdf

17 McGuire et. al. 2010. *Reinventing Rainwater Management: A Strategy to Protect Health and to Restore Nature in the Capital Region.* Environmental Law Clinic, University of Victoria.

18 Stratus Consulting. (2009). *A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia's Watersheds.* Conducted for the Office of Watersheds, City of Philadelphia Water Department. Retrieved from https://www.michigan.gov/documents/dnr/TBL.AssessmentGreen-VsTraditionalStormwaterMgt_293337_7.pdf

19 Banting, D., Doshi, H., Li, J., Missios, P., Au, A., Currie, B.A., & Verrati, M. (2005). *Report on the Environmental Benefits and Costs of Green Roof Technology for the City of Toronto.* Retrieved from http://www1.toronto.ca/city_of_toronto/city_planning/zoning__environment/files/pdf/fullreport103105.pdf

20 TD Economics. (2014). *Urban Forests: The Value of Trees in The City of Toronto.* Retrieved from http://www.td.com/document/PDF/economics/special/UrbanForests.pdf

THE IMPORTANCE OF PRIVATE LANDOWNERS AND STRATEGIES TAILORED TO THEM

Because private landowners own a large percentage of urban land, including existing green infrastructure, they are crucial agents in managing and expanding green infrastructure. In Philadelphia, for example, while 45% of impervious area was found to be on publicly owned land, the remainder is within privately held properties.[21] In Ontario, the same situation is likely true. Approximately three quarters of the land within the City of Ottawa is privately held[22] and 60% of the trees growing in Toronto are on private property.[23] Consequently, while programs aimed at increasing green infrastructure on publicly owned land are important, they will not be enough to fully address existing infrastructure issues. As well, green infrastructure on private land may be implemented at much lower cost than on public land. In Philadelphia, it has cost $250,000 $300,000 to "green" an acre of impervious land on publicly owned land, but only $100,000 for similar stormwater retention benefits on private property.[24]

Few private landowners, however, are motivated to invest in green infrastructure. This is because of a split incentive: in many cases the benefits of green infrastructure accrue to the general public and taxpayer but the costs fall on the private landowner. In the case of new development this split incentive can be overcome by making green infrastructure elements, such as bioswales, green roofs, or rain gardens, mandatory through building standards. Another strategy is to make them economically attractive through development incentives such as density bonusing or development cost charge discounts. In the case of existing development or when looking to experiment with leading edge approaches, other policy tools are needed. Tools that make green infrastructure investments more financially appealing to private landowners are critical .[25]

21 Amended Green Cities, Clean Waters: The City of Philadelphia's Program for Combined Sewer Overflow Control Program Summary. Retrieved from: http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf

22 Estimated from data provided by City of Ottawa staff and in the 2015 NCC Capital Urban Lands Plan. Retrieved from: http://www.ncc-ccn.gc.ca/sites/default/files/pubs/culp-ptuc-en-optimized.pdf

23 TD Economics. (2014). *Urban Forests: The Value of Trees in The City of Toronto*. Retrieved from http://www.td.com/document/PDF/economics/special/UrbanForests.pdf

24 Amended Green Cities, Clean Waters: The City of Philadelphia's Program for Combined Sewer Overflow Control Program Summary. Retrieved from: http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf

25 Porter-Bopp, S., Brandes, O. M., Sandborn, C., and Brandes, L. (2011). *Peeling back the pavement: A Blueprint for Reinventing Rainwater Management in Canada's Communities*. POLIS Project on Ecological Governance. Retrieved from http://poliswaterproject.org/sites/default/files/Peeling_Back_lowres_nov17.pdf

Bringing Cost Competitive Green Infrastructure Retrofits to Scale

Philadelphia, with the largest green stormwater infrastructure program in the United States, has taken a creative approach to encourage the scaling up of the most cost competitive green infrastructure retrofits.

The Philadelphia program, launched in 2011, includes a stormwater fee that charges property owners based on the amount of impervious surface on their properties. The program also discounts up to 80% off their stormwater charge for the implementation of green infrastructure practices. A rebate program initiated in 2012, called the 'Stormwater Management Incentive Program' (SMIP), offers additional incentive to help private property owners offset the upfront costs of installing green infrastructure.

Under SMIP, the city found that green infrastructure on private land cost approximately 40% less per acre than it did on publicly owned land. This was in part because public property retrofits entail additional time and costs associated with street closure requirements, utility conflicts, limited retrofit options, competing needs for limited space, and the need for coordination among multiple public agencies. Even though significant cost-savings could be achieved through a focus on private land, there was a low participation rate in SMIP because the transaction costs of program application and project management were too high for the mainly small-scale projects.

These findings led the Philadelphia Water Department to create the 'Greened Acres Retrofit Program' (GARP) — a green infrastructure grant program that rewards projects on their cost competitiveness. This program requires that projects applying for the grant be at least 10 acres in size and encourages the aggregation of green infrastructure projects across multiple properties. GARP is particularly innovative because it creates a market incentive for project developers and contractors to convince property owners — with cost-effective green infrastructure opportunities on their properties — to participate in the program.

One of the conditions of funding under GARP is an Operations & Maintenance agreement to maintain the green infrastructure asset for 45 years. This agreement ensures the city's investment is protected over time since the property owners continue to receive additional monthly stormwater fee reductions as an added incentive to maintain the green infrastructure asset.[26]

26 Valderrama, A., and Davis, P. (2015). *Wanted: green acres, how Philadelphia's greened acre retrofit program is catalyzing low-cost green infrastructure retrofits on private property*. Natural Resources Defense Council Issue Brief. Retrieved from http://www.nrdc.org/water/files/philadelphia-green-infrastructure-retrofits-IB.pdf

MARKET-BASED TOOLS: SUPPORTING BETTER INFORMED ENVIRONMENTAL CHOICES

The market prices we pay for goods and service do not always reflect their full cost or their full benefit to society. If prices do not inform us of the real costs or benefits of our choices, decisions will be made that impose too large a cost on society or provide too little benefit. This is an underlying cause of environmental degradation.

Policy-makers can change prices to provide an incentive to protect the environment. For example, they can use **consumption based user fees** to charge the full cost of providing civic services such as stormwater management. This helps ensure these services are financially sustainable and not used wastefully. They can use **taxes, fees,** or **charges** to raise the market price of goods, services, or behaviours that have negative environmental impacts. This discourages environmental degradation. They can use **subsidies** such as grants, rebates, and financing programs to lower market prices where goods, services, or behaviours have environmental benefits. This encourages environmental protection. They can also establish **proxy markets** to put an economic value on environmental protection, for example, through the trading of environmental permits.

The goal behind these government policy tools is to close the gap between private costs and benefits, and social costs and benefits. This will ensure that the economic choices of individuals and firms are better informed by prices which more accurately reflect the environmental interests of broader society.

Depending on the environmental issue and context, market-based tools can serve as an alternative, or a complement, to government regulation. In the green infrastructure context their purpose is to complement regulation. Local governments can, for example, use market-based tools to encourage developers to adopt innovative green infrastructure designs before such practices are mature enough to be required as a standard, thereby acting as a complement to less stringent regulations. These tools can encourage private landowners to undertake green infrastructure retrofits on existing developments, which would not be required by regulation. Market-based tools can also be used for strategically narrow applications such as the targeting of grants for green infrastructure to a particular ecologically significant geographical area.[27]

27 Environmental Protection Agency. (2010). *Green Infrastructure Case Studies: Municipal Policies for Managing Stormwater with Green Infrastructure*. Retrieved from http://water.epa.gov/polwaste/green/upload/gi_case_studies_2010.pdf

Market-based tools that put a cost on environmental degradation can generate public revenue, which improves the ability of local governments to implement innovative best practices. In some cases, this is a key aspect of the policy design — for example, designating stormwater user fees to fund further stormwater infrastructure development (green or engineered). A revenue raising tool can also be used to fund and complement a subsidy tool, such as when stormwater user fees are combined with grants or rebates for the installation of green infrastructure on private properties. Such an approach combines “carrot and stick” tactics while helping to offset the upfront capital investment of green infrastructure.

MARKET-BASED APPROACHES TO ENCOURAGE GREEN INFRASTRUCTURE

Examples of market-based tools used to encourage green infrastructure can be found across Canada and the United States. These approaches are much more prevalent in the United States where local governments have developed stormwater user fee, credit, and incentive programs in large part to meet requirements of the U.S. federal *Clean Water Act*. This includes raising revenue for expanded municipal stormwater facilities. In contrast, the creation of stormwater credit and incentive programs in Canada has not been prompted by provincial or federal legislation, but rather from pursuing equitable and balanced approaches for funding stormwater services.[28] For this reason, these tools are not yet being used to their full potential in Canada.

The six market-based tools explored in this report have been chosen based on their prevalence both in literature and in practice. Additional information on who implements, who pays, who benefits, and the changes required for each tool is provided at the end of this section, in Table 1.

1. STORMWATER USER FEES AND FEE DISCOUNTS

WHAT: A stormwater user fee charges property owners a fee for the amount of stormwater runoff their property produces. The fee is generally based on the area of impervious surface their lot contains — a proxy for the cost imposed on traditional stormwater infrastructure. User fees can be designed as a flat fee based on property type, a rate based on the average amount of impervious area on a residential lot, or a rate based on the actual measured amount of impervious area on the property. User fee discounts or credits can be applied to properties that have stormwater management best practices installed (such as permeable surfaces or rain barrels)[29] to reduce the quantity and improve the quality of stormwater runoff entering the municipal stormwater system.

WHY: Stormwater user fees serve two purposes. First, they provide a cost incentive to landowners to reduce the area of impermeable surface on their property and introduce natural hydrological processes. This reduces demand on engineered stormwater infrastructure, and, hence, municipal

28 Johnson, L. (2014). *Local government innovation: A policy analysis of stormwater credit and incentive program implementation*. Master's thesis, Simon Fraser University. Available at http://summit.sfu.ca/item/13892

29 Green Infrastructure Ontario Coalition. (2012). *Health, Prosperity and Sustainability: The case for green infrastructure in Ontario*. Retrieved from https://www.ecojustice.ca/wp-content/uploads/2014/08/Health-Prosperity-and-Sustainability_The-Case-for-Green-Infrastructure-in-Ontario.pdf

costs. Second, they provide a dedicated source of revenue for the maintenance, renewal, and/or expansion of stormwater infrastructure (green or engineered).

Municipalities have limited powers of taxation, which constrains how they can generate revenue to manage stormwater.[30] In Canada, funds for stormwater infrastructure are usually collected through property taxes, which are based solely on property value, and go into the general revenue pool where stormwater management must compete with all other municipal services for budget allocations.

A stormwater user fee removes stormwater charges from property taxes, and places these charges on a property's water bill or on a dedicated stormwater utility bill. This changes how stormwater costs are calculated and billed, and under the stormwater utility model, how the revenue is managed. It is not a new municipal charge, but may, depending on rates and design, change the costs of individual property owners. This structure makes it easier to dedicate the user fee revenue for stormwater management infrastructure.

EXAMPLES: Stormwater fees are the most common market-based tool for green infrastructure used in Canada and the United States. In response to U.S. Environmental Protection Agency's requirements to manage non-point sources of water pollution, over 1500 municipalities in the U.S. have implemented stormwater fees.[31] Without similar regulation only about a dozen have been implemented so far in Canada. In Ontario, these include London, Aurora, St. Thomas, Kitchener, Waterloo, Richmond Hill[32] and Mississauga.

Before the introduction of a user fee model in 2011, Kitchener relied on funding from property taxes to fund stormwater management. Today, Kitchener's property owners find their stormwater fees on their utility bill. The stormwater utility uses a tiered flat fee for stormwater management for all properties, and an average single family home is charged an average of $10.48 per month for stormwater management.[33]

Kitchener has also created a credit program to complement the stormwater utility program. The credit program provides a discount of up to 45% of the stormwater portion of a property owner's utility bill for the implementation of best management practices (rain barrels, cisterns, and permeable

30 AECOM. (2013). *City of Mississauga stormwater Financing paper*. Retrieved from http://www7.mississauga.ca/Documents/TW/Environment/RPT_MississaugaStormwaterFinancingStudy_Apr2013_Final.pdf

31 Campbell, W. (2013). *Western Kentucky University Stormwater Utility Survey*. Retrieved from http://www.wku.edu/engineering/civil/fpm/swusurvey/wku_swu_survey_2014_incorporating_rd_comments.pdf

32 Ibid.

33 For more information, see https://www.kitchener.ca/en/livinginkitchener/Stormwater_Utility.asp

surfaces) to reduce the quantity and improve the quality of stormwater runoff entering the municipal stormwater system. The program applies to both residential and non-residential properties, and the credit is calculated based on a property's total impervious surface area.[34]

Waterloo has a similar program.[35] Given their geographical proximity, Kitchener and Waterloo collaborated to fund a joint stormwater management funding review,[36] which led them to develop their respective programs.

Mississauga has a stormwater utility fee but has a slightly different credit program that applies to multi-residential and non-residential properties only. The program provides owners or tenants a reduction of up to 50% of their stormwater charge for implementing best management practices.[37]

2. STORMWATER CREDIT TRADING

WHAT: Property owners who are required to meet on-site stormwater retention targets can either meet the requirement on their own site or elect to purchase "credits." These credits are generated from other regulated property owners who go beyond their stormwater management obligations, or from non-regulated property owners who voluntarily reduce stormwater runoff by installing best practices for green infrastructure stormwater management.

WHY: Stormwater credit trading enables property owners more flexibility to meet their stormwater management requirements and provides incentives for unregulated properties to reduce their stormwater through green infrastructure best management practices. Credit trading programs can also reduce the overall cost of stormwater management programs by providing an avenue for stormwater to be managed on the lowest cost sites within a watershed.

EXAMPLE: Washington, D.C.'s Stormwater Retention Credit Trading Program is part of the District's stormwater regulation that requires regulated properties to manage at least 50% of the stormwater retention requirement from their properties onsite. As the remaining 50% of the retention requirement can be managed offsite, the credit program allows property owners to comply with the regulation by buying credits from other property owners who have created certified credits for the voluntary actions

34 For more information, see http://www.kitchener.ca/en/livinginkitchener/Stormwater_Credit_Policy.asp

35 For more information, see http://www.waterloo.ca/en/living/creditprogram.asp

36 For more information, see http://www.waterloo.ca/en/contentresources/resources/livihng/stormwater_report_feasiblity_study.pdf

37 For more information, see http://www.mississauga.ca/portal/stormwater/charge

they take on their properties. The program is managed by the Washington Department of Energy and Environment (DOEE), who provides contact information of credit owners wishing to sell their credits. Credit buyers and sellers can independently negotiate the trade, but the DOEE must approve the transaction. The DOEE's role is also to track ownership, use, price, and to prevent fraud.[38]

In this program, one Stormwater Retention Credit (SRC) is worth one gallon of retention for one year.[39] The first trade, in fall of 2014, resulted in a trade of 11,013 SRCs valued at $25,000.[40]

3. GRANTS, REBATES, AND INSTALLATION FINANCING

WHAT: Direct financial incentives in the form of grants or rebates to encourage particular forms of green infrastructure, such as rain gardens, green roofs, or stream restoration projects. Generally, this funding may be provided by provincial and federal agencies, or can also come from the revenue raised by related initiatives such as stormwater user fees.

WHY: Unlike user fees, which must be applied uniformly, direct financial incentives provide flexibility for targeting priority neighbourhoods, such as those on a combined sewer and stormwater system or areas with particular runoff challenges. They can be attractive to local governments because they are relatively easy to implement.

As with all subsidies, there is a risk that individuals and firms using the subsidy would have taken the subsidized action anyway. In addition, without a matching source of revenue, such as provincial or federal funding or stormwater user fees, funding for direct financial incentives must compete with other uses of municipal revenue and requires taxpayer funding.

EXAMPLES: The City of Toronto has created an innovative program for incentivizing green roofs. This program complements a unique province approved city bylaw requiring the construction of green roofs on all new buildings greater than 2000 m2 (and excluding residential buildings less than 6 storeys or 20 m in height). The program encourages green roofs on existing buildings through financial incentives. Developers who are unable to provide the required green roof on new buildings must pay $200 per square meter of green roof not built. This money is collected

38 For more information, see http://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/FinalGuidebook_changes%20accepted_Chapters%201-7_07_29_2013_compressed.pdf

39 For more information, see http://green.dc.gov/src

40 District of Columbia Department of Energy and Environment. (2014). *DDOE Approves First Stormwater Retention Credit Trade*. Retrieved from http://green.dc.gov/node/900322

into a reserve fund that is used by the city to incentivize voluntary green roofs on existing buildings. Through the incentive program eligible green roof projects are offered grants of $75 per square meter up to a maximum of $100,000.[41] So far the city has over 400 green roofs.[42]

The city of Guelph, Ontario, has a program to incentivize the use of rainwater harvesting systems. The *Rainwater Harvesting System Rebate* provides a rebate of $0.10/litre of tank storage (to a maximum of $400) for installation of an approved rainwater harvesting seasonal tank or a $2,000 rebate to install an approved all-season rainwater harvesting system.[43]

The *RiverSmart* programs in Washington, D.C., offer financial incentives to help residents install green infrastructure for stormwater management. The RiverSmart Homes program offers up to $1,200 for green infrastructure on private homes. The *RiverSmart Communities* program offers up to 60% off green infrastructure for condominiums, co-ops, apartments, locally owned businesses, and houses of worship. And the *RiverSmart Rooftops* program provides base funding for green roofs of $10 per square foot and up to $15 per square foot in targeted sub watersheds.[44]

The *Green Infrastructure Challenge*, also in Washington, includes a $1 million program with financial rewards for the design and construction of innovative green practices that absorb rainwater in the Potomac and Rock Creek drainage areas in the District of Columbia.[45]

4. DEVELOPMENT CHARGE DISCOUNTS

WHAT: Lower development charge fees on new developments that incorporate green infrastructure features into their design.

WHY: Development charges are one-time fees that municipal governments levy on new developments to help pay for infrastructure costs related to that development. The integration of green infrastructure into a new development lowers the burden on municipal water, water treatment, and stormwater infrastructure and this is reflected in the discounted development charge. This creates an incentive for green infrastructure.

EXAMPLE: The *Green Development Program* in Caledon, Ontario, provides development charge discounts for new green commercial and

41 For more information, see http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=3a0b506ec20f7410VgnVCM10000071d60f89RCRD

42 City of Toronto. (2015). *Green roofs around Toronto*. Retrieved from http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=0c420621f3161410VgnVCM10000071d60f89RCRD

43 For more information, see http://guelph.ca/living/environment/rebates/rainwater-harvesting-system-rebate/

44 For more information, see http://green.dc.gov/riversmart

45 For more information, see http://www.dcwater.com/greenchallenge

A checklist to help developers navigate green infrastructure options and incentives

In order to help developers and property owners create long lasting and sustainable projects and access various green infrastructure development incentives, the City of Kamloops, B.C., has created a checklist for developers. The checklist contains multiple options such as regulatory conditions, public health and safety, urban design, social sustainability, site access, connectivity, and parking and environmental sustainability (which includes onsite stormwater management and green roof components). Developers have the potential to receive multiple incentives based on type and extent of green infrastructure installed. Incentives can include a combination of property tax reductions, development cost charge discounts, parking requirement relaxations, density bonusing, and other incentives.[50]

industrial buildings. The program offers a 5% discount for innovative stormwater management practices or installation of a stormwater cistern as well as up to 27.5% discount on LEED building practices.[46]

5. DEVELOPMENT INCENTIVES

WHAT: Incentives to developers who include green infrastructure design criteria in their projects, such as density bonuses (approval for a larger development than otherwise allowed by zoning) or acceleration of the approval process for development permits.

WHY: Similar to grants and rebates, development incentives can be directed to specific areas within a municipality and for identified green infrastructure practices depending on the unique context of a particular area. Municipalities receive improved stormwater management while developers receive added revenue in the form of additional units or decreased approval process costs.

EXAMPLES: Portland, Oregon's *Ecoroof Floor Area Ratio Bonus* allows developers to earn a bonus of 1–3 square feet of additional floor area per square foot of green roof. The program applies to large-scale developments such as industrial, commercial, and multi-residential buildings.[47]

In Greenville County, South Carolina, the Density Bonus for *Low Impact Development Program* allows developers to increase density in residential developments in exchange for designing projects that better manage stormwater and protect water quality. The commercial component focuses on reducing the impacts of surface parking lots on water quality by providing developers an incentive to build smaller and more appropriately sized parking lots. The residential program provides incentives to develop residential areas in more compact growth patterns while encouraging onsite stormwater management.[48]

Another incentive model is acceleration of the permitting process. In Chicago, Illinois, the *Green Permit Program* offers projects with green elements, including green roofs and rainwater harvesting systems, a priority review process as well as possible reduction of permit fees.[49]

46 For more information, see http://www.caledon.ca/en/business/resources/Caledon_Green_Development_Brochure2015.pdf

47 For more information, see http://www.portlandoregon.gov/bes/article/474490

48 For more information, see https://www.greenvillecounty.org/gcpc/pdf/density_bonus_lid_program.pdf

49 For more information, see http://www.cityofchicago.org/city/en/depts/bldgs/provdrs/green_permit.html

50 For more information, see http://venturekamloops.com/business-climate/incentives/north-shore-neighbourhood-plan/

6. HABITAT COMPENSATION BANKS

WHAT: Habitat compensation banks give developers the opportunity to pay a conservation authority to create new habitat to compensate for damage caused by development. They also allow landowners to sell credits to developers for the protection, restoration, or improvement of habitat values on their off-site property.

WHY: Habitat compensation banks are often used as a last resort when all other attempts to avoid environmental damage have been fully investigated and deemed not feasible. In these instances, compensation banks can allow developers to account for environmental loss on one site by protecting, restoring, or improving conditions on another site. They can also allow municipalities to direct compensation funding to particularly sensitive or needed restoration efforts.

EXAMPLES: The *Habitat Compensation Bank* in Kelowna, B.C., was created to ensure compensation for unavoidable environmental impacts from city infrastructure projects. The City and its partners work together to direct compensation and restoration efforts to the Mission Creek Restoration Initiative where they can be most effective in restoring valuable fish habitat and providing additional flood protection throughout the city. So far, the city, the province, and irrigation districts have paid $1.2 million into the mitigation bank for green infrastructure projects.[51]

The Port of Metro Vancouver operates a habitat banking program for creating and improving fish and wildlife habitat in advance of port development projects. The program ensures potential impacts, to existing habitat, can be offset.[52]

51 For more information, see http://www.kelowna.ca/CityPage/Docs/PDFs%5C%5CEnvironment%20Division%5CReport_Aquatic%20HabitatCompensationBanking.pdf

52 For more information, see http://www.portvancouver.com/environment/water-land-wildlife/habitat-enhancement/habitat_banking_program_working_agreement_-_port_metro_vancouver_and_fisheries_and_oceans_canada/

TABLE 1
Characteristics of Profiled Financial Tools

POLICY TOOL	WHO IMPLEMENTS	WHO PAYS
Stormwater user fee & fee discounts • Municipal authority to charge for services provided • User fee based on impact of property on stormwater system (amount of impervious surface, total lot area) • Can have discounts for green infrastructure such as pervious pavement, rain barrels	Municipality	Property owners based on estimated stormwater use
Stormwater Credit Trading • Property owners earn credits for installing green infrastructure for stormwater management and can sell extra credits	Municipality (start up) Third Party Managers	Property owners not meeting stormwater management standards
Grants, Rebates and Installation Financing • Funding to encourage particular green infrastructure	Property owner	Provincial or federal agencies Municipality General taxpayer
Development Charges • Development charges can be reduced to account for provision of green infrastructure	Municipality	Developers pay less, resulting in lower revenue for the municipality, which can possibly put pressure on other parts of the municipality's revenue base (including residents and taxpayer)
Development Incentives • Density bonuses can allow greater height if certain design features are incorporated	Municipality	Developers pay less, resulting in lower revenue for the municipality, which can possibly put pressure on other parts of the municipality's revenue base (including residents and taxpayer)
Habitat Compensation Banks • Compensation funding for damage caused by a development can be used to create/ restore/enhance habitat in another location	Municipality Conservation Authority Third Party Manager	Developers

WHO BENEFITS	CHANGES REQUIRED
Property owners who implement stormwater management best practices Municipality: demand for stormwater management is reduced, and costs are directly covered	Stormwater management fee moved from general Property Tax to either water bill or a separate stormwater utility bill • requires development of database on features of individual properties • requires maintenance of database • requires technical assessment for discounts applied for implementation of best practices
Property owners voluntarily installing green infrastructure or going beyond minimum requirement Municipality: demand for stormwater management is reduced	Set up and management of a credit trading system. If completed by a third party manager, administrative burden on municipality is lessened.
Property owners: reduces upfront financial barrier for implementing best practices Municipality: demand for stormwater management is reduced	Provincial/federal funding: no major changes required at municipal level unless the green infrastructure tools are linked to stormwater user fees & fee discounts Municipal Funding: administration of fee collection from separate program and reallocation to recipients of green infrastructure financing
Developers through reduced development charge Municipalities receive funding from some developments that tax existing stormwater system but encourage green infrastructure in other developments. Funding received can be linked to a financial incentive program to encourage green infrastructure in other areas.	Development charge bylaw amendments would be required to implement fee but these bylaws are reviewed regularly so the additional administrative burden is modest
Developers: additional density provides greater income potential. Natural green infrastructure features can also boost the desirability of a development. Municipality: can encourage greater green infrastructure in areas that most need it, such as downtown areas	Municipality would be required to develop appropriate administrative system for implementing density bonusing in a fair and transparent manner
Developers: developments can proceed by paying a compensation fee for environmental damage Municipality: funding from developments can be targeted to habitat restoration in areas that most need it	Municipality would be required to set up a habitat compensation bank system and manage the system along with the organization who will be using the funds to do the habitat work

MANAGING EXISTING GREEN INFRASTRUCTURE: THE ECO-ASSET STRATEGY

The financial approaches described in the previous section focus on encouraging expanded green infrastructure on private lands. But what of the extensive green infrastructure that already exists in urban settings? How can the benefits already provided by nature be brought into municipal decisions and investments?

WHAT: An Eco-Asset Strategy[53] focuses on identifying a municipality's existing natural capital; measuring the value of municipal civic services provided by this natural capital; and, making this information operational by integrating it into municipal asset management through governance system changes. This approach calculates the value of existing natural capital such as green space, forests, topsoil, aquifers, and creeks in terms of the municipal services provided, and the risk and replacement costs if these services were to fail. Based on this information, the "eco-asset" value of the natural capital is integrated into the municipality's asset management plan alongside other traditional engineered assets.

WHY: In standard infrastructure asset management practice, natural assets are not included in asset inventories or given a value on municipalities' financial books or in standard accounting practices. This leads to under-investment in maintaining the health of important natural assets. The Eco-Asset Strategy considers nature to be the most important municipal infrastructure asset and one to be carefully stewarded. If natural assets are lost, it can be far more expensive to replace them with engineered assets compared to the cost of keeping the original natural assets healthy. Natural assets, by definition, have no up-front capital cost, do not depreciate in the same way as engineered assets, never need to be written off, and may preclude altogether the need for expenditures on engineered assets.

EXAMPLE: The Town of Gibsons, just north of Vancouver, B.C., has pioneered the Eco-Asset Strategy. It is still in an early stage of development. Drinking water for the Gibsons community is provided by an aquifer. The town found that aquifer monitoring costs approximately $28,000 per year, but the construction and operation of a filtration and treatment plant with a similar filtration function as the existing aquifer would be magnitudes higher. This led the town to focus on maintaining the aquifer's integrity.

53 Town of Gibsons. (2015). *Towards an Eco-Asset Strategy in the Town of Gibsons*. Retrieved from http://www.gibsons.ca/eco-assets

Three creeks running through Gibsons convey and filter stormwater run-off, while the forested headwaters of one of the creeks provides natural storm-water management. If these creeks and ponds ceased to perform their current functions, engineered infrastructure would need to be constructed and maintained to manage resulting flooding. Maintaining the health of the woodland and creeks would involve general maintenance and dredging every three to four years at a cost of approximately $10,000 per dredging — considerably less than the costs of engineered infrastructure.

A foreshore provides a vital natural seawall to protect the waterfront of Gibsons from storm surges and sea level rise. Engineered alternatives would be required if the foreshore became degraded, with associated capital and operating costs exceeding those required to keep the foreshore in good health. A 2014 foreshore condition assessment by an engineering firm for the town provides a basis for a long-term stewardship plan, including a bioengineering approach to ensure the shoreline, associated infrastructure, and adjoining development is properly protected from an anticipated sea level rise.[54]

54 Kerr Wood Leidal Associates Ltd. (2014). *Town of Gibsons Foreshore Condition Assessment*. Final Report, December 5, 2014.

USING MARKET-BASED INSTRUMENTS FOR GREEN INFRASTRUCTURE IN ONTARIO: FACTORS FOR SUCCESS AND BARRIERS TO IMPLEMENTATION

Although implementation of green infrastructure strategies and the use of market-based policies to support these strategies is in its infancy in Ontario municipalities, lessons can be learned from the Ontario municipalities who have considered or implemented these approaches.

Municipalities identify a number of factors for success in pursuing, designing, and implementing or maintaining market-based programs to incentivize green infrastructure:

- *Strong leadership*, at the political and senior staff level, has been particularly important for the implementation of stormwater user fees to reassure property owners that this was not a new municipal tax.
- Some programs require *specialized knowledge or technical expertise*, such as engineering, finance or administrative skills, although other approaches require little oversight and can be conducted through online technology. For example, implementation of a stormwater user fee involves administrative costs in determining the amount of permeable surface on private property and in maintaining a database of that information. While such data exists through the Municipal Property Assessment Corporation, obtaining this data is not free of charge.
- *Strong communication lines*, between the municipality implementing the program and the landowners, are important for voluntary green infrastructure incentive programs. Property owners must be aware of the program to ensure adequate uptake. Awareness of technical options for green infrastructure and of advisory or skilled labour resources in the community is also needed.

Key barriers to success relate to the public understanding and expectation of the economics of the programs:

- Property owners may be reluctant to make green infrastructure investments if they do not see *evidence of a return on investment*.

These returns may not be obvious, especially if they have longer payback periods. Communicating the financial savings that can occur from investing in green infrastructure will encourage greater participation.

- Landowners may *expect* that participation in a green infrastructure program will be *revenue neutral* on an individual basis. This is not the goal of such programs. Market-based programs are a creative and flexible way to incentivize greater use of green infrastructure to meet broader municipal environmental goals, and/or ensure a sustainable funding stream for municipal infrastructure. Market-based tools may be well-suited to providing both economic and environmental gains for municipalities, but the environmental goal remains primary. Green infrastructure program goals may impose costs, as would regulatory programs, and these costs may still exist for participating property owners.

Nonetheless, municipalities must ensure fairness to their residents in the package of policies used to incent green infrastructure. For example, stormwater fees are often determined for residential properties based on a tiered rate system allocated by average property size in each tier. However, properties that have less impervious surface, or properties whose owners are managing stormwater through green infrastructure, contribute less to the stormwater system than otherwise similar properties. In order to encourage the use of more green infrastructure there must be a benefit to the property owner for installing the green infrastructure or managing more stormwater on-site. A fee discount or credit trading program can help acknowledge the actions of property owners and address any fairness concerns associated with the user fee system.

RECOMMENDATIONS TO INCENTIVIZE GREEN INFRASTRUCTURE

Market-based approaches to incentivize green infrastructure are an under-utilized tool in Ontario and in Canadian municipalities. The following recommendations are aimed at provincial and municipal policy-makers to encourage the use of market-based tools for green infrastructure in municipalities in southern Ontario.

RECOMMENDATIONS FOR ONTARIO PROVINCIAL POLICY

Introduce a stronger provincial regulatory structure for stormwater management

There are no regulatory obligations at the provincial level to address stormwater issues, only voluntary guidelines and actions. The Ontario Clean Water Act of 2006 protects drinking water, from source to tap, by ensuring communities are able to protect their municipal drinking water supplies through the identification of potential risks to local water sources and actions to reduce or eliminate these risks. However, stricter guidelines for stormwater management are needed. The potential for market-based instruments for stormwater management is recognized in the Ontario Growth Plan for the Greater Golden Horseshoe, which states that municipalities should generate sufficient revenue to recover the full cost of providing municipal water and wastewater systems.[55] It states further that municipalities are also encouraged to implement and support innovative approaches to stormwater management as part of redevelopment and intensification.[56] However, there are no regulatory obligations to support the use of these tools. A stormwater discharge permitting system, based on the U.S. National Pollution Discharge Elimination System under the Clean Water Act, could be considered by the Province of Ontario.

Grant municipalities powers to mandate or incentivize green infrastructure

Municipalities in Ontario have limited powers to require green infrastructure practices. Extending municipal powers to amend local bylaws may encourage greater use of green infrastructure in Ontario municipalities. For example, the authority to create Toronto's unique green roof bylaw that mandates green roofs on new development was granted under The *City of Toronto Act* with exceptions under the *Ontario Building Code Act*, 1992. Similar opportunities could be explored to amend the Building Code to recognize green infrastructure or to provide exemptions for municipalities to bypass existing Building Code requirements, which may inadvertently limit the use of green infrastructure.

55 Ontario Ministry of Infrastructure. (2006). *Growth Plan for the Greater Golden Horseshoe, 2006*. Retrieved from https://www.placestogrow.ca/index.php?option=com_content&task=view&id=359&Itemid=12#3.2.5

56 Ibid

Integrate green infrastructure into Municipal Water Sustainability Plans under the Water Opportunities Act

The Ontario Water Opportunities Act, 2010, encourages municipalities to plan for and improve the sustainability of their water, wastewater, and stormwater infrastructure. The Act enables the Ontario Cabinet to make regulations requiring all municipal service providers to prepare municipal water sustainability plans for their municipal drinking water, wastewater, and stormwater services.[57] These plans could include greater provisions for the use of stormwater utilities and stormwater discounts, as well as other green infrastructure provisions that could contribute to the overall sustainability of municipal water services.

RECOMMENDATIONS FOR MUNICIPAL POLICY

Develop effective knowledge-sharing practices

Pilot programs can be a cost-effective way to test the efficiency of a proposed policy and provide case study information for other municipalities considering similar programs. Such information could help assure municipalities and developers that technologies will perform as expected in terms of cost, administration ease, or uptake. Some organizations, such as the Credit Valley Conservation Authority[58] and Toronto Region Conservation Authority,[59] have undertaken pilot programs. Still, there is a need for both ongoing projects and better methods for sharing and communicating existing knowledge gained through pilot programs or other studies.

Use creative funding models to offset upfront costs to landowners of green infrastructure

The upfront capital investment of participating in a green infrastructure program may dissuade or prohibit landowner participation. The price-based incentives for installing green infrastructure may not be high enough or there may be associated upfront costs with the particular green infrastructure feature — such as the costs of installing a rain barrel to qualify for a discount on stormwater utility fees. To overcome this barrier, alternative funding programs should be considered. For example, a municipality could establish a revolving fund to provide loans for the installation of green infrastructure. When the property owner begins to receive credit for green infrastructure practices from a stormwater credit program, the savings over time would be used to pay off the loan. Such loan programs could be developed under Local Improvement Charges, as has been done with energy efficiency retrofit programs. Other alternative funding mechanisms could be achieved through the recycling of revenue from charges. For example, Toronto's green roof incentive program is funded through charges to developers who do not comply with the bylaw requiring green roofs on all new buildings. These charges are recycled to an incentive program for

57 Water Opportunities and Water Conservation Act, 2010, part 3, sec. 25. Available at http://www.ontario.ca/laws/statute/s10019

58 For examples, see http://www.creditvalleyca.ca/wp-content/uploads/2015/07/SWICaseStudy_15July2015.pdf

59 For examples, see http://www.sustainabletechnologies.ca/wp/home/urban-runoff-green-infrastructure/

voluntary green roofs on existing buildings. Similar types of alternative funding programs could be explored further to reduce initial cost barriers to green infrastructure or market-based tools for green infrastructure.

Ensure adequate public education to support green infrastructure incentives

Public education is an important component of any market-based program. In some cases private property owners may not be aware the program exists for their use, or they may not be aware of the financial savings that such programs and green infrastructure can provide.

CONCLUSIONS

The benefits of green infrastructure in urban areas have been well documented and include positive impacts on biodiversity, air quality, water quality, climate, human health, and human happiness. The use of green infrastructure is even more important in the face of climate change and the associated increasing frequency of extreme weather events. Incorporating green infrastructure into building and neighbourhood developments will increase the resiliency of communities by increasing the absorption of precipitation into the soil and water table which, in turn, reduces flooding risk and municipal stormwater management costs.

Green infrastructure approaches deserve greater prominence. They have proved to be cost-effective alternatives to engineered stormwater systems in many urban developments. They bring with them an array of other environmental and social benefits many times greater than their initial costs. While some municipalities in Ontario have adopted green infrastructure strategies supported by market-based policies, Ontario lags far behind the United States in this regard. This gap has consequences not only for the resilience of Ontario communities to climate change, but also for the financial resources available to tackle municipal infrastructure deficits and for the quality of life in urban centers.

Market-based tools have a distinctive role in green infrastructure strategies, which zoning and other bylaws cannot replace. Depending on the tool, they can create cost incentives for landowners to retrofit natural features onto their properties and for developers to adopt innovative green infrastructure design before such practices are mature enough to be required as a standard. Creative design — as in the Philadelphia retrofit incentive program — and choice of policy tool — as in the Washington stormwater credit trading program — can be used to dramatically reduce the overall cost of green infrastructure programs by providing an avenue for stormwater to be managed on the lowest cost sites. They can also be used for strategically narrow applications such as the targeting of grants for green infrastructure to a particular, ecologically significant geographical area. Finally, stormwater user fees can also provide a dedicated source of revenue for the maintenance, renewal, and expansion of all stormwater infrastructure — be it green or engineered.

Strong leadership, specialized knowledge or technical expertise, and robust communication lines between a municipality and its landowners are important for the success of initiatives to implement market-based tools for green infrastructure. For these programs to be successful, the public must also be aware of the financial savings to be found from investing in green infrastructure. This includes understanding that these programs may not be revenue neutral on an individual basis. The new Ontario policy direction to encourage green infrastructure, and the continued work of organizations

such as the Green Infrastructure Ontario Coalition, provide momentum and support for these factors for success.

The province of Ontario can support greater use of market-based tools for green infrastructure through a stronger provincial regulatory structure for stormwater management. This can be done by granting municipal bylaws for mandating or incentivizing green infrastructure and by incorporating green infrastructure into Municipal Water Sustainability Plans under the Water Opportunities Act.

Municipalities interested in using market-based approaches for green infrastructure should consider starting with pilot programs, using creative funding models to offset upfront costs to landowners of green infrastructure, and supporting any initiatives with public education. They can also look to protect and better manage the green infrastructure already in place as was done through the Eco-Asset Strategy development in the Town of Gibsons. With a comprehensive program that includes the market-based tools discussed in this report governments can encourage greater use of green infrastructure in their cities and neighbourhoods.

Incenting the nature of cities:
Using financial approaches
to support green infrastructure
in Ontario

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