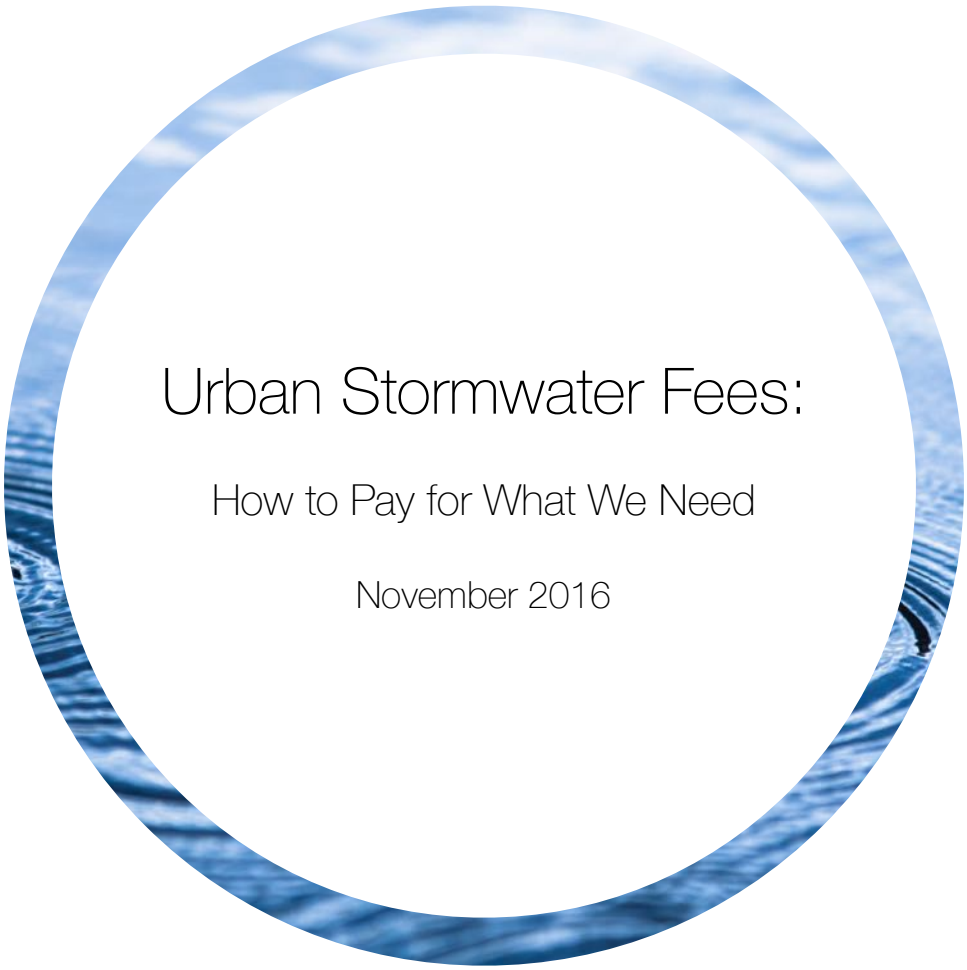

Urban Stormwater Fees:

How to Pay for What We Need

November 2016

Environmental Commissioner of Ontario

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Executive Summary

In healthy ecosystems, the water from rain storms and snow melts mostly absorbs into the ground or evaporates. In urban communities heavily covered by hard or impermeable surfaces, much of the water runs off overland and through storm sewers. This stormwater runoff, also called runoff or stormwater, carries substantial pollution into Ontario's lakes and rivers. It also can cause flooding and erosion.

Stormwater management is primarily the responsibility of municipalities. Inadequate funding has created a $6.8 billion stormwater infrastructure deficit in Ontario. This financial gap could get even bigger in the future as population growth leads to the creation of more impermeable surfaces and, consequently, worsens runoff. There may also be additional costs to upgrade or replace existing stormwater infrastructure to deal with changes in precipitation, and thus runoff, from climate change. As the funding gap increases, so will the economic and environmental impacts of deficient stormwater management.

Most Ontario municipalities do not have the money to do what they know needs to be done to properly manage stormwater. Only about 35 per cent of municipalities that responded to our survey said that they currently recover the full costs associated with managing stormwater. Forty-three per cent of municipalities that responded to the survey do not even have asset management plans for their stormwater infrastructure.

Funding stormwater management out of municipal property taxes, the most popular method used in Ontario, simply has not worked. It has been too difficult for municipal councils to allocate the necessary funds, in competition with other priorities. Even more important, funding stormwater management out of taxes gives no incentive to public or private property owners to limit the runoff and pollution they create, and to protect the natural areas and green infrastructure that absorb stormwater.

As a result, municipalities risk sinking billions of dollars into grey infrastructure, instead of green infrastructure; and into disaster clean-ups instead of prevention. For the environment, this means a higher risk of flooding, decreased water quality and degraded habitats.

There is a much better solution, and it is already in use by eight Ontario municipalities. Stormwater fees provide a dedicated, stable, fair and equitable funding source, and incent better property management. About 35 per cent of municipalities that responded to the survey are considering implementing a stormwater fee.

Recommendations

1: The province should require municipalities to recover the full costs of stormwater management.

2: The Ministry of Infrastructure should require municipalities to prepare asset management plans for their grey and green stormwater infrastructure.

3: The Ministry of Municipal Affairs, in collaboration with the Ministry of the Environment and Climate Change, should support municipalities in implementing stormwater fees.

4: The Ministry of the Environment and Climate Change should follow through on its outstanding policy initiatives related to stormwater management such as:

- Developing a policy framework for stormwater management in response to climate change;
- Reviewing the approvals process for municipal stormwater management to encourage source control best practices; and
- Updating its 2003 *Stormwater Management Planning and Design Manual*.

Introduction

During a dry, hot summer day, rain promises relief: cooler temperatures and much needed water for parched trees and gardens. However, if it rains too much in a short amount of time, overland flooding can threaten lives, damage homes and businesses, cause erosion and pollute rivers and lakes. Numerous devastating urban floods in Ontario have been caused by heavy rain, such as Windsor/ Tecumseh in September 2016, Burlington in August 2014, Toronto in July 2013, and Thunder Bay in May 2012.

Rain and melted snow that runs off roofs, driveways, parking lots, roads, sidewalks and other hard surfaces is called stormwater runoff, also called runoff or stormwater. Stormwater, especially in urban areas, can cause flooding, erosion and water pollution if it is not managed properly. Managing stormwater is becoming more difficult and expensive because of climate change, population growth, land use decisions and a large infrastructure deficit.

> Stormwater…can cause flooding, erosion and water pollution

Stormwater management aims to control the quantity and quality of runoff to reduce flooding, erosion and pollution from rain and snow melt. In this report, we first outline some current challenges in stormwater management. Second, we examine a key response to address these challenges: stormwater fees. Third, we highlight success stories from within Ontario and elsewhere of implementing stormwater fees.

Why is Stormwater Management Important?

The water (or hydrological) cycle is the continuous movement of water between land, waterbodies and the atmosphere. When rain falls or snow melts, some of the water returns to the atmosphere in a process called evapotranspiration. Some of the water is absorbed into the ground, and the remainder becomes runoff which travels across land to the nearest waterbody.

Urban areas…produce much more runoff

In natural areas like woodlands and grasslands, most of the water infiltrates into the ground or returns to the atmosphere, leaving relatively little as runoff. Urban areas, on the other hand, produce much more runoff because there are more hard (impervious) surfaces, like pavement and roofs, and less vegetation. These conditions reduce the amount of water that can be absorbed into the ground, evaporate or be consumed by plants (Figure 1).

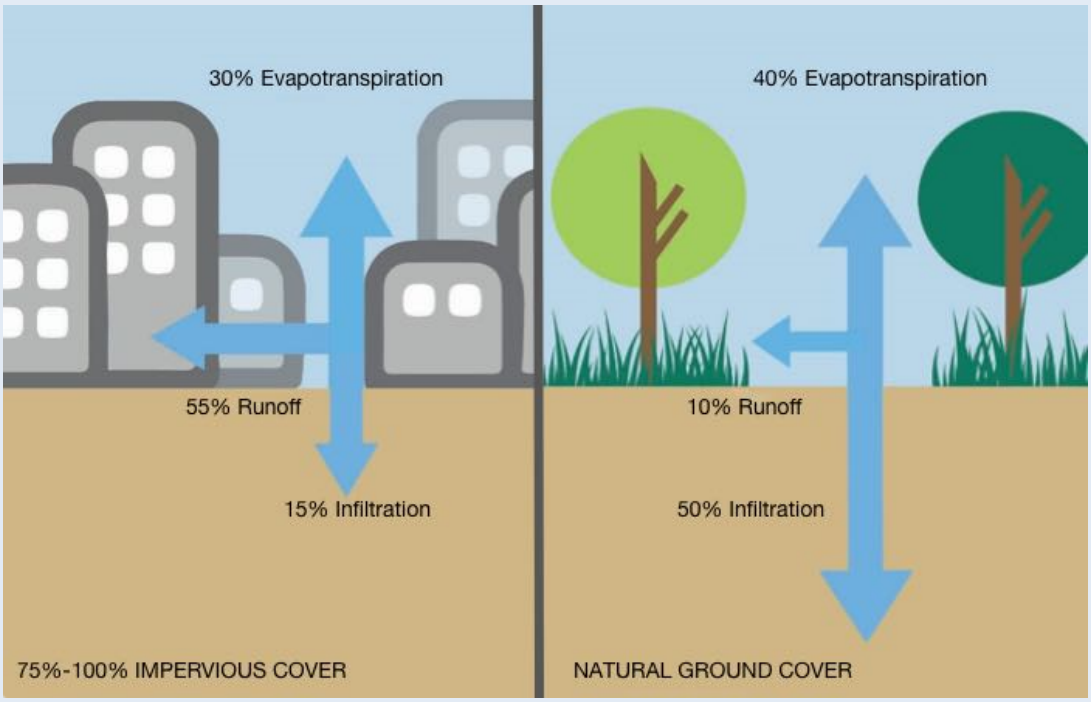


Figure 1: Natural and urban water cycles (Source: Kawartha Conservation).

In urban areas, hard surfaces create more and faster moving runoff, which can cause flooding during rain storms and snow melt. Flooding can threaten lives and damage property. Between 2009 and 2016, 48 Canadian municipalities reported 671 floods that resulted in damage; over 66,000 private properties were affected.[1] Flooding can also increase home insurance costs or prevent some from obtaining insurance at all.

Runoff can cause erosion and sedimentation. For example, when stormwater is directed through sewer pipes to a nearby stream or river, it picks up speed and can scour away stream beds and banks. Erosion also adds sediment to the water, which can damage a stream's ecosystem and is expensive to manage (e.g., dredge from ponds and dispose of properly).

In addition, urban runoff typically contains pollutants. As runoff travels across hard surfaces, it picks up pollutants along the way and carries them to nearby lakes, rivers and streams, including:

- Sediment from construction sites, roads and winter sanding;

- Oil and grease from vehicles, leaks and spills;
- Nutrients (nitrogen and phosphorus) from fertilizers, pet waste and yard waste;
- Pesticides and herbicides from lawns and garden care;
- Viruses and bacteria from pet waste and failing septic systems;
- Road salts from winter road maintenance;
- Metals from roof shingles and vehicles; and
- Heat (increased water temperature) from exposure to air in warm seasons.

Polluted urban runoff can have damaging environmental, social and economic effects, such as fish kills, algae blooms, drinking water contamination and beach closures.

Urban runoff typically contains pollutants

Also problematic, urban runoff may flush raw sewage into surface waters. Most urban areas in Canada that were developed before the 1940s have combined sewers, a drainage system that collects both sanitary sewage (from the pipes in our homes and buildings) and stormwater together, and conveys it to a nearby wastewater treatment plant. During heavy rain or snow melt, the volume of water can exceed the capacity of the sewer system causing a "combined sewer overflow," or exceed a treatment plant's capacity, causing a "sewage bypass." In both cases, untreated wastewater and stormwater are discharged directly into a waterbody, in order to minimize basement flooding ("sewer backups") and infrastructure damage. The overflows and bypasses funnel untreated human and industrial waste, toxic materials, and debris directly into surface waters, degrading their quality and threatening environmental and human health.

Public Notification of Toronto's Overflows

The ECO has supported efforts to at least notify the public when heavy rain flushes raw sewage into the waterfront.

For example, on July 8, 2013, a record-breaking 126 millimetres of rain fell in some areas of Toronto in just a few hours. The rain far exceeded the sewer capacity and flooded homes, streets and railroad tracks. Because Toronto has combined sewers, two wastewater treatment plants bypassed enough wastewater and stormwater into Lake Ontario to fill half of the Rogers Centre.

In response, Lake Ontario Waterkeeper submitted an application under the *Environmental Bill of Rights, 1993* asking the Ministry of the Environment and Climate Change (MOECC) to amend the approvals of these two wastewater treatment plants to require public notification of combined sewer overflows or sewage bypasses. The MOECC agreed to undertake the review and, in August 2015, committed to develop public messaging about the health risks of poor water quality following storm events, determine how Toronto Water could report bypass events to the public in real-time, and amend the water treatment plants' approvals to require public reporting of bypasses. Nevertheless, bypass notices have not been added to the Toronto plant's approvals, and effective public notice of bypasses and other spills is still not being given. For more information on this review, see Part 2.3.2 in Volume One of the ECO's 2015/2016 Environmental Protection Report, *Small Steps Forward*.[2]

Grey vs. Green

Green infrastructure and low impact development are cost-effective, environmentally sound and resilient approaches to managing stormwater. Traditionally, stormwater management has been done primarily through "grey infrastructure": man-made, engineering works such as ditches, culverts, storm sewers, swales, catch basins, inlets, outfalls, ponds and other water quality treatment devices. While grey infrastructure is designed to move water away from developed areas, green infrastructure and low impact development practices aim to keep and treat stormwater at its source as a valuable resource. Examples of green infrastructure include urban forests and wetlands. Low impact development practices include rain gardens, rain barrels and permeable pavement.

More recently, green infrastructure and low impact development have been recognized as powerful tools to manage stormwater with reduced costs, increased climate resilience, greater biodiversity and other benefits, including:

- Reducing combined sewer overflows;
- Lowering pollutant loads;
- Mitigating flood risk;
- Recharging groundwater;
- Providing adequate water for local trees and other vegetation;
- Reducing water consumption (e.g., rainwater harvesting);
- Reducing the heat island effect;
- Reducing ozone and particulate pollution levels;
- Improving aquatic and terrestrial habitat;
- Improving habitat connectivity;
- Restoring and enhancing public recreational spaces (e.g., parks); and
- Increasing property values.

Phosphorus Reduction in Lake Erie

In response to large-scale algal blooms that have begun to reappear in Lake Erie, Canada and the U.S. adopted a target of 40 per cent phosphorus load reductions in the western and central basins by 2025 from 2008 levels. In June 2015, Ontario signed the *Western Basin of Lake Erie Collaborative Agreement* with the States of Michigan and Ohio, collectively committing to this target. To achieve this target, Ontario (Ministries of the Environment and Climate Change, Agriculture, Food and Rural Affairs, and Natural Resources and Forestry) is working with Canada and members of the Great Lakes community to develop a plan: *The Canada-Ontario Action Plan for Lake Erie*. One of the proposed actions in this plan is for Ontario to work with developers and others to promote and support the use of green infrastructure and low impact development, including clarifying and enhancing policies, and developing green standards. For more information on this plan, refer to the Environmental Registry notice, Reducing Phosphorus to Minimize Algal Blooms in Lake Erie (#012-8760).

Green infrastructure and low impact development are cost-effective, environmentally sound and resilient approaches to managing stormwater

Who is Responsible for Stormwater Management in Ontario?

In Ontario there are a number of agencies with jurisdiction over stormwater management, including municipalities, conservation authorities, and provincial ministries. The overlapping roles and responsibilities can be bewildering, even for experts.

Municipalities play a major role in stormwater management and their programs typically include:

- Design, permitting, and construction of new capital improvement projects;
- Operation and maintenance of stormwater management facilities;
- Asset management, valuation, and planning;
- Rehabilitation, renewal, retrofit, reconstruction or upgrade of existing facilities;
- Emergency response, recovery, and clean-up after flooding events, system failures (e.g., pipe collapses, streambank slope instabilities), spills and other water quality violations;
- Engineering and support services for review and regulation of proposed land or building developments;
- Inspection, monitoring, environmental compliance programs, record maintenance and document management;
- Support for public education and community involvement programs; and
- Administration, staffing, computer resources, equipment, and enforcement of by-laws and detection of illicit discharges and cross-connections.

Conservation authorities (watershed-based natural resource agencies) prohibit, restrict, regulate or permit certain activities, including stormwater management, in and adjacent to watercourses (including valley lands), wetlands, shorelines of inland lakes and the Great Lakes-St. Lawrence River System, and other hazardous lands. Working together with the Ministry of Natural Resources and Forestry (MNRF), conservation authorities are also responsible for flood forecasting and warning and the operation of flood control structures.

Numerous provincial ministries have a leadership and regulatory role in the design, management and delivery of municipal stormwater infrastructure. For example, the Ministry of the Environment and Climate Change (MOECC) is responsible for approving sewage works, including those for stormwater, under the *Ontario Water Resources Act*. The MOECC also developed the *Stormwater Management Planning and Design Manual* (2003) to provide "technical and procedural guidance for the planning, design and review of stormwater management practices." The Ministry of Municipal Affairs (MMA) provides direction to municipalities on stormwater management requirements in land use planning, including the *Provincial Policy Statement, 2014* and the *Growth Plan for the Greater Golden Horseshoe*. The Ministry of Transportation provides design standards for provincial culverts, bridges and highway drainage systems and approves some land development proposals if stormwater runoff is discharged to a roadside ditch that is part of a highway drainage system. The Ministry of Infrastructure (MOI) provides funding for infrastructure projects, including stormwater management facilities, and the MNRF is the provincial lead for water-related natural hazards.

Stormwater Management: Getting Tougher and More Costly

Stormwater management in Ontario has evolved over the last 40 years to address new and emerging issues, such as flooding in the 1970s, pollution in the 1990s and erosion and water-balance (natural flows and volumes) in the early-2000s. Today, stormwater management faces new challenges.

Following decades of declining investments to maintain and repair aging infrastructure, Ontario's municipalities are now faced with a $6.8 billion stormwater management infrastructure deficit.[3] Municipalities will have to deal with more runoff as greenfield lands are developed to accommodate population growth, and climate change brings altered precipitation patterns. Without enough funds to maintain, retrofit and replace stormwater infrastructure, there could be more overland and basement flooding, sewage bypasses, beach closure days, and sediment in lakes and rivers.

> Stormwater management faces new challenges

> Many municipalities in Ontario do not have stormwater monitoring programs and are unaware of the actual conditions of their facilities

Infrastructure is Aging

Stormwater managers are struggling with the deteriorating condition of existing infrastructure and the staggering costs to repair or replace it. Most municipal infrastructure in Canada was built between the 1950s and 1970s and much of it is due for replacement, especially in older communities. As a result, the cost to replace stormwater management infrastructure in poor or very poor condition in Canada is estimated to be $10 billion.[4]

In 2008, it was estimated that it would take about $681 million a year for 10 years to close the gap between Ontario's stormwater infrastructure needs (costs to rehabilitate, replace, and upgrade existing system and build new ones to accommodate population growth) and spending prior to 2008.[5] Unfortunately, this is the most recent estimate for Ontario's stormwater infrastructure deficit.

Many municipalities in Ontario do not have stormwater monitoring programs and are unaware of the actual conditions of their facilities. It is very costly to monitor and maintain stormwater infrastructure and many municipalities may not have enough funds set aside. In 2010, the ECO reported that most instances of non-compliance with stormwater management approvals issued by the MOECC related to insufficient monitoring. The ECO recommended that the MOECC require stormwater management facility owners or operators to monitor and maintain all stormwater management infrastructure in Ontario.[6]

Population and Impermeable Surfaces are Growing

As the population in an area increases, so typically do the impervious surfaces. The population in southern Ontario, and in particular the Greater Golden Horseshoe, is expected to continue to grow dramatically in the coming years; the provincial government projects that the population in the Greater Golden Horseshoe will increase to almost 13.5 million by 2041 from 8.7 million people in 2011.[78] As a result, the amount of impervious surfaces will most likely continue to increase. More impervious surfaces will mean more, faster and more polluted runoff.

For example, the Toronto area has lost many natural features that can soak up stormwater, such as wetlands and river headwater areas. In the Don River Watershed, which covers a 36,000 hectare (ha) area from the headwaters in Richmond Hill and Vaughan down to Lake Ontario, 80 per cent of the land is urban, with only 4 per cent rural and 16 per cent under natural cover. As most of the watershed was developed with poor stormwater management, it is subject to frequent floods, sewer overflows, erosion and poor water quality. The watershed has so little infiltration capacity that the river swells and rises quickly following even a moderate rainfall.[9]

More than 70 per cent of southern Ontario's original wetlands have been lost since pre-settlement times, and the Ministry of Agriculture, Food and Rural Affairs continues to subsidize wetland destruction under the *Drainage Act*. The ECO has made numerous recommendations to better protect wetlands in Ontario. Most recently, the ECO recommended that the MMA prohibit infrastructure in provincially significant wetlands (for more information, refer to Volume Two of our 2015/2016 Environmental Protection Report).[10]

While the *Greenbelt Plan* is meant to protect headwater areas of many streams that drain into Lake Ontario – areas that are prone to flooding and pollution – these protections are under attack. In September 2016, the Ontario Greenbelt Alliance reported that developers and municipalities have made over 650 request to remove land from the *Greenbelt Plan* area, much of which is located in the headwater areas.[11] The loss of these features from landscapes can further increase runoff and cause flooding and pollution downstream, especially in developed areas like the Greater Golden Horseshoe.

More impervious surfaces will mean more, faster and more polluted runoff

Precipitation Patterns Are Changing

Climate change projections for total precipitation in the Great Lakes basin vary, with some studies predicting small increases in annual precipitation and others suggesting decreases (Table 1). However, many studies predict that there will be seasonal changes in precipitation: more precipitation is expected to occur in the winter, and more of the winter precipitation will fall as rain rather than snow.[12]

Table 1: Projected changes in precipitation in four Ontario cities (Ottawa, Thunder Bay, Toronto and Windsor) between 2020-2049 (Source: Ontario Climate Change Data Portal, 2016).[13]

City	Change in Annual Precipitation (2020-2049)
Ottawa	-5.0% to 22.3%
Thunder Bay	-2.7% to 9.9%
Toronto	-0.4% to 13%
Windsor	-4.7% to 23.6%

Additionally, studies predict that the frequency and intensity of heavy rainfall events will increase.[14,15] For example, the number of days with rainfall above 25 mm are predicted to increase by about 10-30 per cent and 35-50 per cent respectively over the periods of 2046-2065 and 2081-2100.[16]

More intense and frequent rainfall events can overwhelm aging infrastructure

More intense and frequent rainfall events can overwhelm aging infrastructure, causing overland flooding, basement flooding, and stream or river bank erosion. It could also create more and larger combined sewer overflows, further degrading aquatic environments. Heavier rainfalls could move debris that can block flows to culverts and catch basins, which in turn can result in localized flooding or erosion in surrounding areas, damaging infrastructure and properties.[17]

In recent years, Ontario has experienced some particularly severe floods. The 2013 Toronto flood is the fourth most costly natural disaster in Canadian history ($943 million in insured damage).[18,i] Burlington's flood in August 2014 caused more than $90 million in insured damages.[19] More than 1,700 homes were flooded in Windsor and Tecumseh in September 2016.[20] Other 2016 floods occurred in Thunder Bay (June) and Dryden (August).

[i] The costliest natural disaster in Canada was the Fort McMurray wildfires in 2016 ($3.58 billion in insured damage) followed by the southern Alberta floods in 2013 ($1.72 billion in insured damage).

Damage from severe weather is now the leading cause of property insurance claims in Canada.[21] Canadian insurance losses for extreme weather have been around $1 billion per year, mostly due to water damage. The losses are driven in part by Canada's aging sewer infrastructure, which cannot handle increased runoff.[22]

As a result of these changes in precipitation patterns, runoff patterns are also expected to change in the Great Lakes basin. While total annual runoff may decrease, it may increase in the winter. There may be an earlier spring freshet (runoff from melting snow and ice) and lower and longer summer and fall low flows. Additionally, there may be an increase in the frequency of high flows from extreme precipitation events.[23]

Resilience in the Face of Climate Change

Improved stormwater management is critical to improve Ontario's resilience to climate change.

For a decade, the ECO and other organizations have urged the MOECC and the MNRF to update the rules, policies, and guidelines dealing with stormwater and flood prevention in light of climate change. Updated policy direction is needed for municipalities to better manage stormwater and to build stormwater infrastructure that is resilient and adaptive to climate change to better protect the environment. For more information, refer to Chapter Four of the ECO's Annual Greenhouse Gas Progress Report 2014: *Looking for Leadership, The Costs of Climate Inaction*.[24]

In recent years, the MOECC has undertaken a number of initiatives related to stormwater management, including:

Improved stormwater management is critical to improve Ontario's resilience to climate change

- From 2011 to 2015, Ontario's Showcasing Water Innovation program provided $17 million to fund innovative, cost-effective solutions for managing drinking water, wastewater and stormwater systems. It funded 16 projects (out of 32 in total) that involved the development and/or implementation of novel technologies and approaches for stormwater management (e.g., low impact development). This was a one-time program and funding is no longer available;
- In 2013, the Ontario Climate Change Data Portal provided updated rainfall intensity-duration-frequency curves, which are used to predict rainfall and inform the design of infrastructure. The University of Regina developed the portal, with funding from the MOECC, and currently maintains it;
- The *Provincial Policy Statement 2014,* directs municipalities to consider the impacts of climate change in infrastructure planning, promote green infrastructure to complement infrastructure and promote best practices when planning for stormwater management, including low impact development and stormwater attenuation and re-use. The MOECC said that it is currently working with the MMA on these new policies;
- In 2015, the MOECC released the *Interpretation Bulletin, Ontario Ministry of the Environment and Climate Change Expectations Re: Stormwater Management* to "clarify the ministry's expectations regarding stormwater management." The bulletin explicitly states that "the ministry's existing policies

and guidance emphasize an approach to stormwater management that mimics a site's natural hydrology as the landscape is developed"; and

- The MOECC is developing new guidance on low impact development to provide direction on how it can be integrated into the stormwater management framework, such as targets for runoff volume control and climate change adaptation considerations. The MOECC plans to release the draft low impact development guidance manual in early 2017 for public comment. The interpretation bulletin and the manual are supplementary to the 2003 *Stormwater Management Planning and Design Manual* and will not amend or replace it.

Unfortunately, the MOECC has made little progress on some of the most pressing initiatives. The ministry has not yet developed a policy framework for stormwater management in response to climate change, reviewed the approvals process for municipal stormwater management to encourage source control best practices, or updated the 2003 *Stormwater Management Planning and Design Manual*. Municipalities have been left on their own to prepare for what is to come.

Financing Stormwater Management

Many Ontarians remember the 2000 Walkerton tragedy, where the municipality's drinking water became contaminated with *E. coli*, killing 7 people and sickening over 2,300 others. While many factors contributed to this awful event, Justice Dennis O'Connor, who led the provincial inquiry into the events in Walkerton, identified inadequate funding as one key cause. In 2002, Justice O'Connor made a number of recommendations to safeguard Ontario's drinking water, including that municipalities should recover the full cost of their drinking water systems in order to ensure that they have enough money to run them properly.[25] The province promised to implement all of Justice O'Connor's recommendations.

While Justice O'Connor's recommendations focused on drinking water systems, the provincial government recognized the importance of recovering the full costs of all municipal water systems including stormwater management. While the *Water Opportunities Act, 2010* includes a requirement for municipalities to prepare asset management plans for all municipal water services, including drinking water, wastewater and stormwater, it never came into force.

Sixteen years after Walkerton, do municipalities collect the full cost of their water systems? The province does not publish such data. Accordingly, in May 2016, the ECO sent a survey to all 444 Ontario municipalities (refer to Appendix 1 for the survey questions). Seventy-seven municipalities completed the survey.[ii]

Sixteen years after Walkerton, do municipalities collect the full cost of their water systems?

[ii] Many of the 444 municipalities to whom the survey was sent do not provide stormwater management services, such as northern, rural or upper-tier municipalities, and therefore, the survey would not apply to these municipalities.

What is Full Cost Recovery?

Full cost recovery means that a municipality recoups all the costs associated with operating, maintaining and replacing all aspects of its water systems. There are a number of essential steps to achieving full cost recovery of water systems:

1. Prepare an asset management plan to itemize assets, estimate lifespan, and estimate when the asset will need to be repaired or replaced;
2. Estimate and report on the full costs of implementing the asset management plan by assessing the full cost of services (operation, maintenance, administration, research and development, and capital investments);
3. Work towards full cost recovery by generating sufficient revenues to cover the full costs of providing services, like charging user fees for the full cost of services.

Are Municipalities Achieving Full Cost Recovery?

Despite the government's claim that it has implemented all of Justice O'Connor's recommendations, the recommendations related to full cost recovery of drinking water systems remain unfulfilled. In 2014, the ECO reported that many municipalities are still not assessing or recovering the full costs of their drinking water systems (for more information, see our 2013/2014 Annual Report).[26] The same is true for stormwater management.

Of the surveyed municipalities, only 35 per cent currently recover the full costs of managing stormwater (Figure 2). Some of the other municipalities are taking steps towards full cost recovery, e.g., planning to: increase annual capital budgets; undertake stormwater management or master plans; complete asset management plans; prepare stormwater rate studies; and/or implement stormwater fees or charges.

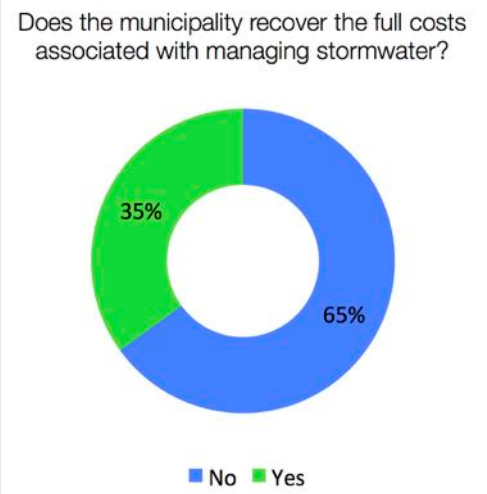


Figure 2: Percentages of responding municipalities that do and do not recover the full costs associated with managing stormwater (Source: 2016 ECO survey to municipalities).

Knowing What Costs to Recover

Many municipalities do not yet know what costs to recover.

Asset management plans are an important first step towards achieving full cost recovery. Several provincial laws and programs require or propose to require municipalities to prepare asset management plans in certain

cases, but they are not required for all municipalities or in all cases. For example, asset management plans are required for municipalities to collect development charges and to obtain provincial and federal infrastructure grants. A number of acts contain provisions that would require asset management plans, but these requirements have not yet been proclaimed. In 2016, the MOI released a discussion paper outlining a potential municipal asset management planning regulation under the *Infrastructure for Jobs and Prosperity Act, 2015* (which would implement the requirement to prepare asset management plans) but no such regulation has been proposed or filed.

Many municipalities do not yet know what costs to recover

In July 2016, the MOI stated that more than 95 per cent of Ontario municipalities have now developed an asset management plan for municipal infrastructure.[27] However, in the ECO's survey, 43 per cent of responding municipalities said that they do not have an asset management plan for stormwater management facilities or systems (Figure 3). Of these municipalities, 33 per cent indicated that they are not considering preparing an asset management plan for stormwater management facilities or systems in the next two years (Figure 3). One municipality said that it has an asset management plan for roads, water and sanitary sewers but not stormwater management, and that other assets like buildings are a greater priority to be integrated into the existing asset management plans.

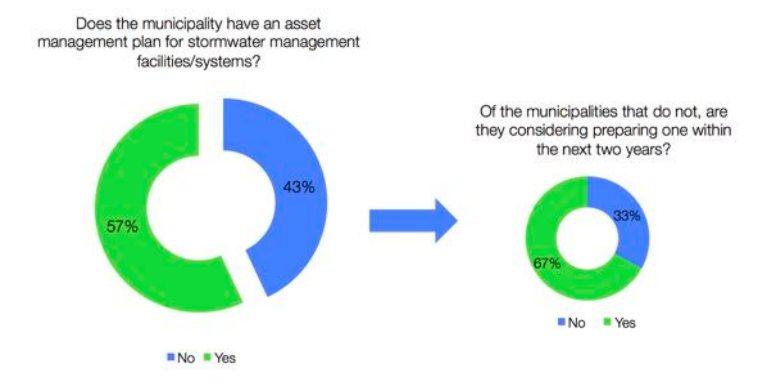


Figure 3: Percentages of municipalities that responded to the ECO's survey that: do and do not have an asset management plan for stormwater management, and; of the municipalities that do not have an asset management plan for stormwater management, are considering preparing one within two years (Source: 2016 ECO survey to municipalities).

How is Stormwater Management Funded Now?

Ontario municipalities use a variety of different funding sources to pay for stormwater management (see Figure 4). The systematic drawbacks of most of these sources have led to the huge funding gap for stormwater

infrastructure across the province. In turn, inadequate funding for stormwater management leaves Ontarians vulnerable to floods, erosion and water pollution.

Property Tax

Of the municipalities that responded to the survey, property tax was the most popular source of funding for stormwater management: about 85 per cent use a general property tax fund and 9 per cent use a dedicated tax levy (Figure 4). Property tax is determined based on the market value of each property. The funds used to support the stormwater management program are determined during the annual municipal budget process. Dedicated tax levies provide a specific service through a fixed rate that is applied to each property, again based on market value.

Using property tax to fund infrastructure builds on an established billing system. However, property taxes are not a good tool to fund stormwater management for a number of reasons:

- Property taxes are calculated based on a property's assessed value and not on its runoff contribution;
- Many properties produce runoff but do not pay property taxes (such as schools, churches and government-owned land);
- Property taxes create no incentives for property owners to reduce stormwater runoff and pollutant discharge from their properties; and
- Stormwater management must compete for funding with other, more visible and popular services like roads, transit, police and firefighting every budget cycle.

The property tax funding model has typically not provided sufficient or stable funding for stormwater management, and it does nothing to reduce the growing volume of stormwater to manage.

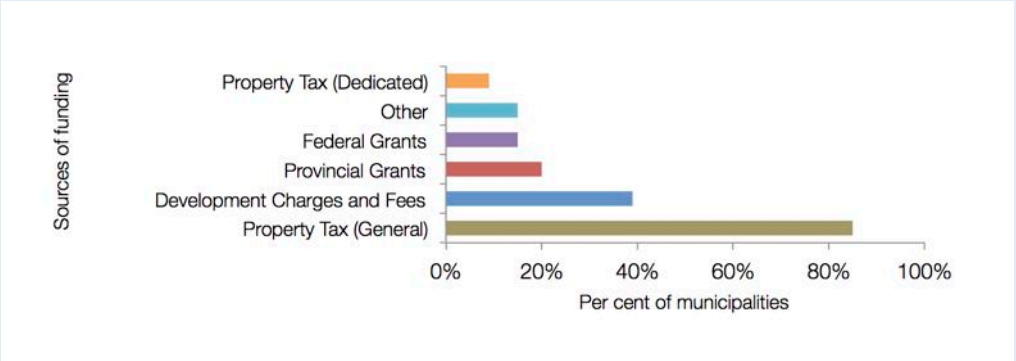


Figure 4: Source of funding for municipal stormwater management. "Other" includes stormwater fees, gas taxes and water rates (Source: 2016 ECO survey to municipalities).

Development Charges

Of the municipalities that responded to the survey, 39 per cent use development charges to help install stormwater infrastructure in developing areas (Figure 4). The *Development Charges Act, 1997* enables municipalities to pass by-laws to recover the additional costs of providing services to areas where new development or redevelopment projects are taking place. Development charges are based on the principle that development related to growth should pay for itself and not impose a burden on existing residents. These charges are typically used to install "hard" services such as grey infrastructure. If designed well, development charges should cover the full cost of installing new infrastructure.

Inadequate funding for stormwater management leaves Ontarians vulnerable to floods, erosion and water pollution

However, excessive reliance on development charges can lead municipalities to favour urban sprawl, which creates even more hard surfaces and worsens runoff. Development charges cannot be used for maintenance or for investments in infrastructure not related to growth, which are a big part of stormwater programs' costs.

Infrastructure Grants and Other Sources

Provincial and federal grants, such as the Building Canada Fund, can also be used to install, but not to maintain, stormwater infrastructure. Of the municipalities that responded to the survey, 20 per cent use provincial grants and 15 per cent use federal grants (Figure 4).

Grants are typically meant to build "shovel ready" capital projects, usually grey infrastructure, not green. Grants do not provide funds for operating costs, such as monitoring and maintenance. Similarly, federal gas tax funding is provided "to build and revitalize public infrastructure," and cannot be used for operating expenses. Building new infrastructure without monitoring and maintaining existing infrastructure can worsen the existing deficit. Of the municipalities that responded to the survey, 15 per cent use other sources of funding, including stormwater fees, gas taxes and water rates (Figure 4).

Water rates puts most of the financial burden on heavy water users, not on those who create runoff. For example, a laundromat uses lots of water and pays high water fees, but may generate little runoff. By contrast, a parking lot generates lots of runoff, but typically uses no water and pays no water fees. This is arguably unfair. It certainly creates no incentives for property owners to reduce stormwater runoff and pollutant discharge from their properties.

A Better Option: Stormwater Fees

Twenty-one Canadian municipalities, eight of them in Ontario, use separate stormwater fees to fund stormwater management (refer to Appendix 2). Other municipalities should follow their lead. Of the surveyed municipalities, 35 per cent are considering doing so.

Stormwater fees are specifically imposed on property owners to cover the costs of stormwater management (e.g., the operation, monitoring, and maintenance of grey and green stormwater infrastructure). Many governments around the world charge stormwater fees to provide adequate stormwater funding, better protect the environment and become more resilient to climate change. In the United States, more than 1,600 municipalities and utilities have implemented stormwater fees.[28] English and Welsh utilities also charge a "surface water drainage fee."

Ontario's *Municipal Act, 2001* allows municipalities to implement stormwater fees. While the Act is silent on how stormwater fees could be implemented, options for calculating such fees include:

> A well designed stormwater fee can give developers and property owners an economic incentive to reduce the runoff from their property

- Flat fee or tiered flat fee: a set charge that does not vary based on use or size of the land, or a series of set charges for different categories of land (e.g., residential and commercial);
- Equivalent residential unit and single-family unit: calculated through a statistical sampling of measured impervious areas for residential dwelling to determine the average equivalent residential unit (ERU) or single-family unit (SFU) (square meters of impervious area) that are used as the base billing unit against which all other charges are calculated (ERU) or to come up with the average impervious area (SFU); and
- Impervious area: based on the total amount of impervious area on a property.

Of those Ontario municipalities that charge stormwater fees, the fees differ because of varying program needs, fee calculation method, and community input. The average stormwater fee for a single detached residential property in Ontario municipalities that charge a fee ranges from $3.95 to $14.92 per month (Appendix 2). The comparable average U.S. fee is $5.14 (U.S.).[29]

Benefits

There are many benefits to funding stormwater management through a separate fee. First, it can provide municipalities with a dedicated and stable funding source that allows long-range planning, preventative maintenance, and large-scale capital improvements.

At least equally important, a well designed stormwater fee can give developers and property owners an economic incentive to reduce the runoff from their property. This incentive is created if the stormwater fee is based on the amount of impermeable surface on a property, whether directly or through a credit program. Landowners can reduce runoff, and therefore their stormwater fee, through green infrastructure and other best management practices such as rain barrels, cisterns, rain gardens or permeable pavement or pavers. The combined effect of such practices can dramatically reduce the speed, quantity and pollution of runoff that the municipality must then manage.

Stormwater fees based on runoff also have other advantages. For example, they are a more equitable way to finance stormwater management, because they implement the polluter pay principle. It requires those who create the most runoff to pay for their proportional share. Stormwater fees can also increase awareness of and transparency in how much runoff management costs and why the service is needed. Public understanding can help build public support for this essential, but often invisible public service.

Challenges

Implementing stormwater fees can be challenging at first, but the challenges can be managed. First, the public may be wary of a new tax or fee, may not understand the need for it, or may distrust politicians to spend the money as promised. Municipalities can minimize this challenge through effective public communications about the rationale and implementation of the fee, such as a stormwater advisory committee and other outreach and education programs.

Second, there may be protests from those for whom stormwater fees impose a significant financial burden. Municipalities can help property owners that are legitimately unable to pay by phasing in the fee over a period of time, by reducing or eliminating the fee for certain property owners or classes of property, and/or by helping such owners to alter their properties to reduce runoff.

Third, there are administrative costs, such as the rate study, database management, billing and customer services. These costs can be reduced if municipalities choose a fee design that is compatible with their resources and capacity, or if groups of municipalities share the costs. The province could also do a great deal to reduce administrative costs by providing a sample bylaw, templates and guidance documents.

No Provincial Guidance or Support

Despite many examples of successful stormwater fee programs, some of which are described below, and the many benefits of stormwater fees, Ontario has done little to promote their use. No provincial ministry has provided templates, guidance material or other support to municipalities wishing to implement stormwater fees (e.g., funding for feasibility studies). A few illustrative sentences about the City of Kitchener's stormwater user fee were included in the MOI's 2012 *Guide for Municipal Asset Management Plans*. So far, this appears to be the extent of the province's support.

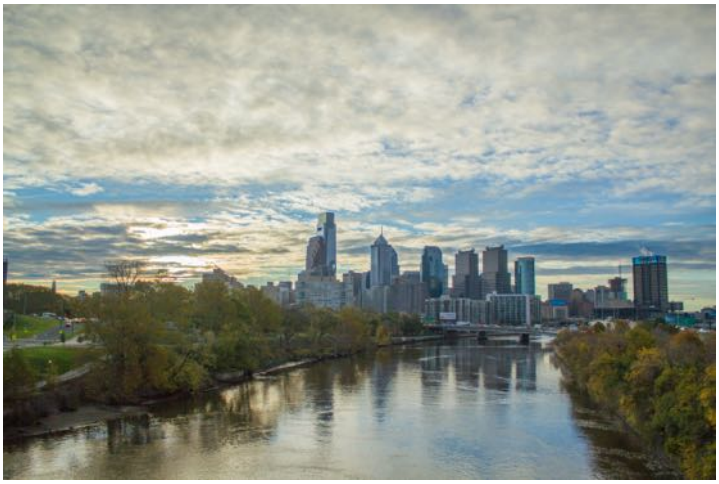
In the absence of provincial leadership, other organizations are trying to help. Green Communities Canada produced a toolkit in 2016 to promote policies and programs "that work with nature to reduce runoff, flood risk and stormwater pollution," including a section on user fees for stormwater services.[30] Sustainable Prosperity also produced a useful guide for municipalities, called *New Solutions for Sustainable Stormwater Management in Canada*.[31]

The U.S. Environmental Protection Agency actively supports stormwater fees by producing guidance documents and holding informative webinars to help municipalities understand and successfully implement stormwater fees. Unsurprisingly, over a thousand U.S. municipalities and utilities now charge stormwater fees.

Examples of Successful Stormwater Fees

Philadelphia, Pennsylvania

Prior to 2010, the City of Philadelphia calculated stormwater charges based on the size of the water meter(s) located in a property. However, Philadelphia identified that such an approach creates inequity because the size of the water meter bears little relationship to the volume of stormwater runoff from a property, and properties without water meters (e.g., parking lots) did not contribute to stormwater cost recovery. For example, skyscrapers were being charged more than strip malls because their water mains were larger, but their stormwater impact was far less.



The City of Philadelphia now charges a stormwater fee for every parcel of land in the city, including residential, commercial, institutional and public properties. Residential customers pay a standard amount (based on the average surface area of impervious cover of all residential properties throughout the city). For non-residential properties, the charge is based on the specific square footage of impervious area covering the property and the total square footage of the property.

The city uses the revenue generated to fund a variety of activities including maintaining pipes and inlets. The revenue is also used to implement stormwater management and stream restoration projects to reduce combined sewer overflows and pollution to streams and waterways. The cost to provide stormwater management services exceeds $100 million per year.[32]

Philadelphia created two stormwater grant programs: the Stormwater Management Incentives Program and the Greened Acre Retrofit Program. The Stormwater Management Incentives Program provides grants directly to non-residential property owners who construct stormwater retrofit projects. The Greened Acre Retrofit Program provides grants to contractors and companies that build large-scale stormwater retrofit projects across multiple properties. These practices reduce stormwater pollution to the city's sewers and surrounding waterways, and enhance water quality in the region's watersheds. For residential properties, the Philadelphia Water Department offers free rain barrels and subsidized pricing on residential landscape improvements that manage stormwater through its Rain Check program.

The city has also created two online apps: the Stormwater Parcel Viewer lets users explore land parcels on an interactive map to determine impervious area;[33] and the Credits Explorer lets users install virtual stormwater management practices to see how much stormwater fees can be reduced on non-residential properties.[34]

The stormwater charges, apps, and incentive programs are all part of the city's 25-year, $2.5 billion *Green City, Clean Waters* plan to manage stormwater and protect watersheds.[35] The plan's goal is to reduce runoff and overflow pollution volume by 80 per cent by 2036.[36]

As of June 2016, the city has more than doubled its five-year pollution reduction targets (established in 2011 through the *Green City, Clean Waters* plan). It has also established more than 837 "greened acres," which represents a more than 5.7 billion litre reduction in stormwater runoff and combined sewer overflows during a typical year of rainfall.[37] "Greened acres" use tools like rain gardens and stormwater tree planters to manage runoff from hard surfaces.

England and Wales

Ofwat, the body responsible for regulating the water sector in England and Wales, collects around £1 billion each year to cover the costs of removing and processing rainwater. Properties that drain rainwater into the public sewer are charged for surface water drainage in one of four ways:

- A flat fee;
- A charge based on the (rateable) value of the property;
- As part of the volumetric rate (water meter); or
- A charge based on the area of the property.

If a property owner can prove that their property does not drain surface rainwater into the public sewer, they may be entitled to an exemption from future surface water charges and a refund for amounts previously paid for surface water drainage.

Ofwat encourages, but does not require, water utility companies to charge for surface water drainage according to the area that drains into public sewers. Currently only four sewerage companies base their charges for surface water drainage on the area of the site: Severn Trent Water started charging by site area in 1990/1991; Yorkshire Water in 2001/2002; Northumbrian Water in 2005/2006; and United Utilities in 2007. While this method is revenue neutral overall, it may increase the bills for some customers (e.g., properties that have low rateable values and large impermeable areas such as churches)[38] and water companies can offer reduced rates to certain organizations.

In the summer of 2007, England experienced devastating flooding: 13 people died, 7,000 people were rescued from flood waters and 55,000 properties were flooded. Sir Michael Pitt, who was asked by Ministers to conduct an independent review of this flooding emergency, released a report in 2008 of the lessons learned from these floods and found that there was a high proportion of flooding from surface water rather than from rivers.[39] His report included a number of recommendations to government aimed at reducing the likelihood of flooding and its impact in the future, including:

- Removing the right of households to lay impermeable surfaces;
- Removing developers' automatic right to connect surface water drainage from new developments to the public sewer; and
- Resolving which organisations should be responsible for the ownership and maintenance of sustainable drainage systems.

The government accepted these three recommendations and has implemented almost all of them. The right for property owners to lay impermeable surfaces in front gardens was removed, but this was not extended to domestic rear gardens.[40]

Sir Pitt's report also highlighted the importance of water companies incentivising the adoption of sustainable urban drainage or SUDS (measures like permeable surfaces and green roofs). For example, Germany's adoption of transparent surface water drainage charges and subsidies led to the widespread adoption of SUDS (e.g., in North-Rhine Westphalia six million square metres (m^2) of surface area were disconnected from the sewer system between 1996 and 2004).

City of Kitchener

In 2011, the City of Kitchener began funding stormwater management though a user-fee program. The city had previously funded stormwater management mainly through property taxes, but stormwater management had to compete for these funds with other more visible and popular city services such as parks, roads, libraries, and social services. As a result, the average annual expenditure for stormwater management was only $4.5 million per year, far less than what was needed to sustainably manage stormwater in light of aging infrastructure, regulatory requirements and the added pressures of climate change. To meet a sustainable service level, the city estimated that it needed $13 million per year in 2010.

The City of Kitchener's stormwater user rate is charged based upon the contribution of stormwater runoff, calculated based on the impervious surface area of the property. The city uses a 13-tiered flat fee rate schedule to calculate the rate for each property, which is administered on monthly utility bills. The tiers are based on property type (residential, multi-residential and non-residential) and impervious area ("smallest" to "largest") or number of residential units. For example, the average single dwelling homeowner is currently charged approximately $11.44/per month for stormwater management. The city also offers incentives to all rate payers who demonstrate best practices for managing stormwater runoff.

The recent improvement to Victoria Park Lake is a well-known project that was made possible by implementing the stormwater fee. Because the lake acted like a large stormwater facility, it suffered from water quality issues, mostly due to sediment, and needed to be dredged about every 15 years. The improvements included:

Recent improvement to Victoria Park Lake is a well-known project that was made possible by implementing the stormwater fee

- Removal of 45,000 tonnes of sediment;
- Reconstruction of over 2,000 metres (m) of shoreline;
- Rehabilitation of an existing heritage bridge structure;
- Realignment of the trail system to improve connectivity and circulation and allow for the incorporation of a new pedestrian bridge;
- Improvements to lake bathymetry and aquatic habitat conditions;
- Tree/vegetation management and protection;
- Decommissioning and removal of existing infrastructure; and
- Construction of measures to assist future maintenance activities.

City of Mississauga

The City of Mississauga began funding stormwater management through a stormwater charge in January 2016. The city previously funded stormwater through property taxes and reserves; in 2012 the city's annual expenditure of $14.7 million was funded from these sources. However, the city's stormwater infrastructure is aging and will need additional operation, maintenance and capital improvement costs to sustain and improve service levels; the estimated sustainable service level[iii] is $39 million per year.

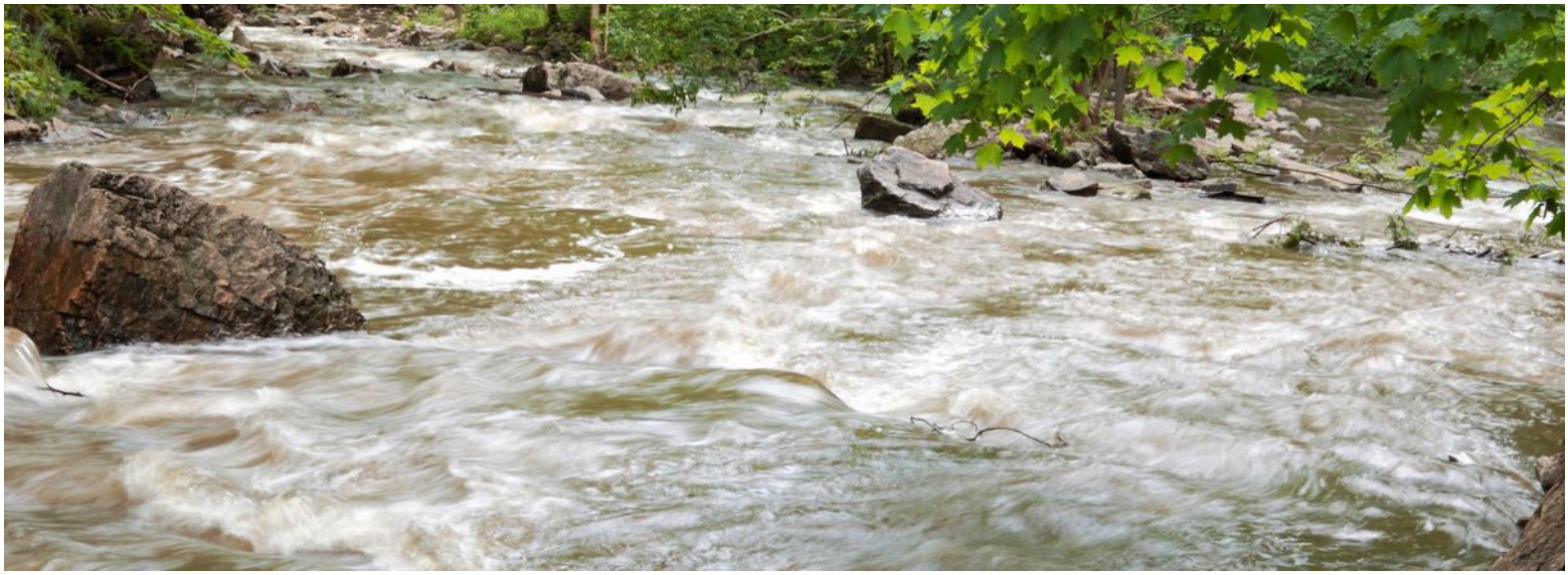
Mississauga's stormwater charge is based on the amount of impervious area on a property. Residential properties are categorized into five tiers based on the size of their rooftop ("smallest" to "largest") as an indicator of total impervious area, with charges ranging from $50 - $170 per year. The charge for multi-residential and non-residential properties is determined by dividing the property's total impervious area by a single billing unit (267m^2) and then multiplying by the stormwater rate ($100). The city created an online "stormwater charge estimator" where property owners can enter an address to determine what their charge might be.

[iii] Sustainable service level for the City of Mississauga represents full funding of the city's capital program, operation and maintenance, and pipe renewal needs.

To encourage and recognize stormwater management best practices by property owners, the city created a credit program for multi-residential and/or non-residential properties for up to 50 per cent off the stormwater charge. While the city decided not to create a credit program for residential properties because of the high administration costs and low uptake of similar programs in other cities, it developed an enhanced residential stormwater outreach and education program instead.

Since implementing the stormwater charge, the city has been able to schedule many projects that fell into a category called "unfunded" – projects that do not currently have funding but may, or may not, be allocated funding from property taxes in a future annual budget. Some of these projects that are now scheduled to proceed in the coming years include:

- Cooksville Creek Stormwater Management (Flood Storage) Facilities;
- Dredging and rehabilitating several existing stormwater management ponds for the Credit River and Levi Creek; and
- A number of watercourse erosion control projects (e.g., Mullet Creek, Mimico Creek, and Cooksville Creek).



ECO Comment

Inadequate stormwater management poses serious threats to Ontarians, including flooding, erosion, and water pollution. Poor funding has created a $6.8 billion stormwater infrastructure deficit, just as the rapidly growing population in southern Ontario and climate change will make stormwater management much more challenging.

All three of these problems have a common solution: stormwater fees

Current funding models simply do not provide enough stable, predictable funds to allow stormwater managers to do what they need to do to protect Ontario communities from flooding, erosion and pollution. They encourage stormwater managers to focus on grey, instead of green infrastructure. Additionally, they give property owners no incentive to reduce runoff from their properties.

All three of these problems have a common solution: stormwater fees that are set on the basis of runoff, and that recover the full costs of grey and green infrastructure associated with managing stormwater. Ontario law already allows for this solution. It is time for the province to actively support it and lead a stormwater funding reform.

Recommendation #1: The province should require municipalities to recover the full costs of stormwater management.

The first step is to know, and to tell the public, what costs to recover.

Recommendation #2: The Ministry of Infrastructure should require municipalities to prepare asset management plans for their grey and green stormwater infrastructure.

Ontario should follow the U.S. lead, and help municipalities to adopt stormwater fees.

Recommendation #3: The Ministry of Municipal Affairs, in collaboration with the Ministry of the Environment and Climate Change, should support municipalities in implementing stormwater fees.

And to help municipalities and property owners minimize runoff in light of climate change, the Ministry of the Environment and Climate Change should update its stormwater management policies.

Recommendation #4: The Ministry of the Environment and Climate Change should follow through on its outstanding policy initiatives related to stormwater such as:

- **Developing a policy framework for stormwater management in response to climate change;**
- **Reviewing the approvals process for municipal stormwater management to encourage source control best practices; and**
- **Updating its 2003 *Stormwater Management Planning and Design Manual*.**

Appendix 1: ECO Stormwater Management Questionnaire

In May 2016, the ECO circulated the following questions in an electronic survey to all municipalities in Ontario.

1. What is the current (2016) annual budget for managing stormwater in your municipality (e.g., capital costs, operation and maintenance)?
2. How does your municipality currently finance stormwater management: property tax (general tax fund); Property tax (dedicated tax fund); development related charges and fees; stormwater fees/charges; federal grants; provincial grants; and/or other?
3. Does your municipality currently recover the full costs associated with managing stormwater?
4. What steps, if any, is your municipality taking towards achieving full cost recovery of stormwater management?
5. What is the approximate annual stormwater management deficit in your municipality?
6. Does your municipality have an asset management plan for stormwater management facilities/systems?
    a. If so, what prompted the preparation of the asset management plan for stormwater management facilities/systems?
    b. If not, is your municipality considering preparing an asset management plan for stormwater management facilities/systems within the next two years?
7. Does your municipality currently use a separate fee/charge for stormwater management?
    a. If so, does your municipality also have an associated credit or incentive program for property owners related to the stormwater charge/fee?
    b. If not, is your municipality considering implementing a separate fee/charge for stormwater management?
8. Are there any comments or concerns related to stormwater management you would like to bring to the Environmental Commissioner's attention?

Appendix 2: Description of Municipal Stormwater Fee Programs in Ontario

Municipality	Type of fee	Avg. Monthly Fee[iv]	Year	Credit/ Rebate Program
Aurora	Tiered flat fee based on type of property: - Residential and condominium properties (fee per unit) - Metered non-residential commercial/ industrial and multi-residential properties (fee per unit)	$5.01	1998	No
Kitchener	Tiered flat fee based type of property and building footprint, number of dwelling units or buildings or impervious area: - Residential (building footprint) - Townhouse/condominium (number of dwelling units) - Multi-residential (number of buildings) - Non-residential (amount of impervious area)	$11.44	2011	Yes (residential, and non-residential, up to 45 per cent)
London	Tiered flat fee based on type and size of property or calculated based on size of property: - Land areas 0.4 ha or less (flat fee) - Residential land area 0.4 ha or less without a storm drain within 90 m (flat fee) - Land area above 0.4 ha (calculated based on size of property)	$14.92	1996	No
Markham	Flat fee based on property type or calculated based on property value: - Residential (flat fee) - Non-residential (calculated based on property value)	$3.95	2015	No

[iv] Single, detached residential property

Municipality	Type of fee	Avg. Monthly Fee[iv]	Year	Credit/ Rebate Program
Mississauga	Calculated based on single-family unit (the average hard surface area on a single detached residential property in Mississauga): - Residential rate (tiered based on "roofprint" area for each property) [v] - Individual multi-residential and non-residential rate (calculated based on total impervious area of property) [vi]	$8.33	2016	Multi-residential and non-residential properties: Yes, up to 50 per cent. Residential: No, but enhanced education and outreach program
Richmond Hill	Flat fee based on type of property: - Residential and farm; and - Industrial, commercial, multi-unit and condominium	$8.73	2013	No
St. Thomas	Flat fee based on type or calculated based on size of property: - Residential and commercial and institutional (flat fee) - Industrial (calculated based on size of property)	$7.81	2000	No
Waterloo	Tiered flat fee based on type and size of property: - Residential: small, medium and large; - Multi-residential: small, medium and large; - Institutional: small, medium and large; - Commercial and industrial: small, medium, large and largest	$8.43	2011	Yes, (Residential, non- and multi-residential, up to 45 per cent)

[v] "Roofprint" area is used as a predictor of total impervious area

[vi] Multi-residential and non-residential properties' fees are determined by dividing the total hard surface areas by a stormwater billing unit (average total impervious area on a detached single family property in Mississauga is 267m^2) and then multiplying by the stormwater rate ($100).

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