


Upper Tier and Lower Tier Municipality Integration to Collaboratively Address Population Growth, Aging Infrastructure and Climate Change

A white paper prepared for the Canadian Water Network research project:
"An Integrated Risk Management Framework for Municipal Water Systems"

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2015

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A decorative graphic in the bottom left corner consisting of several water droplets and splashes of varying sizes, rendered in a realistic style with highlights and shadows.

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Partners:

- City of Waterloo
- City of Kitchener
- Town of Oakville
- City of Mississauga
- Region of Peel
- Durham Region
- Town of Orangeville
- City of Surrey
- City of Calgary
- Town of Okotoks
- City of Fredericton
- Credit Valley Conservation Authority
- Alberta Low Impact Development Partnership
- Allstate Insurance
- Canadian Standards Association
- Institute for Catastrophic Loss Reduction
- Environment Canada
- Ontario Clean Water Agency
- Southern Ontario Water Consortium
- Clean Nova Scotia
- British Columbia Ministry of Transportation and Infrastructure
- WaterTAP
- Engineers Canada
- West Coast Environmental Law
- Watson and Associates
- AECOM
- Ecojustice
- Zizzo Allan Professional Corporation
- Royal Roads University
- City of North Vancouver
- University of British Columbia
- Carleton University



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Canadian municipalities are facing challenges related to population growth, aging infrastructure, and climate change. Recent floods have caused sewer back-ups in many municipalities across Canada, highlighting the need to treat, distribute and upgrade water services to meet current and future water needs.

Sustainable infrastructures are being used in North America and Europe to fulfill urban and ecological policies to address these challenges. However; in the water management sector, most communities do not have policies to foster new sustainable water management (EPRI, 2010), and most communities are being forced to seek alternatives to the traditional water management approach on their own (EPRI, 2010).

Many municipalities treat stormwater as a waste, rather than a resource; causing stormwater infrastructure to be overlooked despite its impact on groundwater, drinking water and wastewater. Regional and local municipalities need to work more closely to develop an integrated water, wastewater and stormwater management solution.

In order to achieve a seamless integration between both tiers, municipal governance structure and frameworks should be revised and updated to incorporate policies that allow local governments to align their initiatives with federal and provincial plans.

The objective of this document is to highlight the governance structures and policies needed for regional and local municipalities in Canada to overcome water related challenges.



pt 1. introduction

Municipalities across Canada are facing various challenges to meet their water needs and managing risks. These challenges include flooding, economic uncertainty, regulations and bureaucracy, aging and degrading infrastructure, polluted water resources, and stakeholders with limited understanding of water issues (EPRI, 2010). Canada's water infrastructure deficit, of \$160 billion dollars, results in poor water quality, floods, sewer back-ups, boil-water warnings, and water use restrictions (Canadian Infrastructure Report Card, 2012).

This paper includes examples of North American municipalities like Halifax (the first municipality in Canada to establish a utility with the mandate of regulating integrated water, wastewater & stormwater) that have work together to facilitate the removal of governance structure and policy barriers to stormwater optimization. This document will be of value to municipalities, the water, wastewater and stormwater management sector as well as government agencies involved in water regulations and policies to building communities with capacity and resiliency in water, wastewater and stormwater management.

The research process includes informal interviews as a primary mean of obtaining information from different individuals working in the water service, stormwater service and wastewater service industry. Such individuals are "primary sources" who provided information not available from other sources.

For the purpose of this paper, water infrastructure refers to physical infrastructures as well as water-related structures designed for the functional operation of the water system in a given society. The physical structures are both man-made and natural (EPRI, 2010). Water governance will make reference to the "laws and regulations, the agencies and institutions responsible for decision-making and the policies and procedures used to make decisions and manage water resources" (Water Governance BC, 2014).

A municipality, as defined in The Ontario Municipal Act, refers to a "geographic area whose inhabitants are incorporated" (Ontario Municipal Act, 2001).



pt 2. the municipal water policy landscape

2.1 TWO-TIER MUNICIPALITY SYSTEM

The Canadian provinces of Ontario, Quebec and British Columbia have two-tier municipality systems. Municipalities in Ontario may be Single-tier municipalities, such as the City of Toronto and the City of Hamilton, or Two-tier municipalities. In the Two-tier municipalities category, an Upper-tier municipality (Regional) is formed by two or more Lower-tier municipalities (Local). The Upper-tier municipality (Regional) could be either a county, such as Wellington, or a regional municipality, such as Halton. According to the Ontario Municipal Act, municipal responsibilities in the province are divided between the both municipalities for the Two-tier system. The Act also states that “Municipalities are created by the Province of Ontario to be responsible and accountable governments with respect to matters within their jurisdiction, and each municipality is given powers and duties under the act and many other acts for the purpose of providing good government with respect to those matters” (Ontario Municipal Act, 2001).

In a two-tier municipality, the regional municipalities often coordinate area-wide service delivery to all local municipalities. Public services are assigned to the either municipality by legislation. Both municipalities may provide these services exclusively or non-exclusively within their geographical boundaries.

Table 2.1 shows that the regional municipalities are responsible exclusively for water production, treatment and storage; and non-exclusively for the collection of stormwater and other drainage from land (geographic region shown in Figure 2.1).

Regional and local municipalities both have their respective municipal councils. The Local municipal council is elected by direct election either by wards or at large (Ministry of Municipal Affairs and Housing, 2011). The Regional council is usually formed indirectly, with Local councilors sitting at both councils, although some Regional municipalities may hold elections to choose their regional councilors. In Waterloo Region, council consists of elected regional councilors and the mayors of the region’s Lower-tier municipalities (Ministry of Municipal Affairs and Housing, 2011). British Columbia’s municipal government structure is similar to that of Ontario. However in a Two-tier municipality the Regional municipality is referred to as a Regional District. Local government in British Columbia may refer to the council of a municipality, or the board of a regional district (British Columbia Local Government Act, 1996).

Table 2.1 - Public utilities in a two-tier municipality

Sphere of Jurisdiction	Part of Sphere Assigned	Upper-tier Municipality (ies) to which Part of Sphere Assigned	Exclusive or Non-Exclusive Assignments
Public Utilities	Sewage treatment	All counties, Niagara, Waterloo, York Durham, Halton, Muskoka, Oxford, Peel	Non-exclusive Exclusive
	Collection of sanitary sewage	All counties, Niagara, Waterloo, York Durham, Halton, Muskoka, Oxford, Peel	Non-exclusive Exclusive
	Collection of stormwater and other drainage from land	All upper-tier municipalities	Non-exclusive
	Water production, treatment and storage	All upper tier municipalities except counties	Exclusive
	Water distribution	Niagara, Waterloo, York	Non-exclusive
		Oxford, Durham, Halton, Muskoka, Peel	Exclusive

Source: Ontario Municipal Act, 2001

Figure 2.1 - Upper-tier/Single-tier/Regional Municipalities in Ontario
(Image source www.neptis.org)



2.2 EMERGING CHALLENGES

Recent floods, sewer back-ups, boil-water warnings, and water use restrictions in many municipalities across Canada are highlighting the need to treat, distribute and upgrade water services to meet current and future water needs. Over three-quarters of Canadians have expressed concern about the water quality in their lakes, rivers, and streams (RBC, 2013), and with good reason considering that Canada is at greater risk from climate change. Frequent hail and thunderstorm predictions add to the growing concern (IPCC Report 2013). The Greater Toronto Area has experienced four extreme events in the last 10 years, and in 2013 extreme rainfall and rising floodwaters targeted communities in Calgary and Southern Alberta (Suzuki, 2013).

Municipalities across Canada have a traditional approach to address water-related issues. Issues such as drinking water, stormwater, wastewater, urban watersheds, and related urban planning and disaster management responses tend to be managed in isolation as mutually exclusive systems. The current water management process views water provision and wastewater management as two exclusive processes. The water provision process extracts water and treats it to potable standards and delivers it to consumers, to be used and later disposed as wastewater. Wastewater is collected and taken to a water treatment plant facility to remove pollutants. Stormwater is mainly managed for flood control through rapid transportation and discharge (EPRI, 2010). Stormwater needs to be considered to be a resource rather than a waste to mitigate societal cost such as infrastructure, pumping, treatment and environmental impacts (EPRI, 2010). Even the Ontario Municipal Act defines “sewage” as both stormwater and other drainage from land and as waste (Ontario Municipal Act, 2001). Unlike the current one-pass use of water, the recommended closed loop water management system emphasizes in resource recovery from wastewater.

2.2 A PLAUSIBLE SOLUTION

New water management and infrastructure development models are emerging. In 2007 the Water Environment Research Foundation (WERF) created the Baltimore Charter for Sustainable Water Systems “a commitment to design new water systems that mimic and work with nature. These systems will both protect public health and safety and will restore natural and human landscapes” (Nelson et al. 2007). Municipalities are starting to look at a more holistic and integrated approach to municipal water management like Integrated Water Management (IWM), however, they are facing difficulties drafting new sustainable water management policies to shift from the traditional water management model toward a more sustainable one (Table 2.2, EPRI, 2010).

Table 2.2 - Difference between current and new approach

Topic	Current Practice	New Paradigm
Water Use	Single use—water is used only once and then disposed to water treatment plant.	Multiple use – Use household gray-water for irrigation.
Water Quality (supplied)	Treat all supply-side water to potable standards.	Apply “right water for right use”—Treat water to a level of water quality based on the intended use. Potable water is not needed for irrigation purposes or to flush toilets.
Wastewater	After a single use, “waste” water is treated and returned to the environment.	“Close the Loop” – recover valuable resources from “waste” water (reclaimed water, nutrients, carbon, metals and biosolids) for beneficial uses such as potable water offsets, fertilizers, and generating power.
Stormwater	“Convey stormwater off-site as quickly as possible with no regard for maintaining hydrological integrity of ecosystem” (EPRI, 2010).	“Harvest stormwater for water supply, irrigation, and/or infiltration benefits” (EPRI, 2010).
Increase System Capacity	“Add capacity to water and wastewater facilities and collection/distribution systems as water demand increases.”	“Implement cost-effective demand side and green infrastructure before increasing gray infrastructure.”
Type of Water Infrastructure	“Primarily use gray infrastructure— engineered and constructed materials (pipes and treatment facilities and pumps).”	“Integrate the natural capacities of soil and vegetation to capture, infiltrate and treat water (green infrastructure) with gray infrastructure.”
Centralized Infrastructure	Centralized large water treatment and distribution systems.	Multiple decentralized small water treatment and distribution systems combining local needs and the triple bottom line.
Complex Design	“Administrative programs tend to favor more established, less complex, standard infrastructure designs and technologies” (EPRI, 2010).	Today’s complex water problems required new infrastructure design technologies and strategies.
Infrastructure Integration	Water, stormwater and wastewater are typically managed as exclusive systems.	“Water is water” - integrate infrastructure and management of all types of water regionally.
Public Involvement	“Stakeholders are informed when approval of pre- chosen solutions is required” (EPRI, 2010).	“Stakeholders are engaged in the decision-making system from the beginning” (EPRI, 2010).
Monitoring and Maintenance	“Water and wastewater facilities use computerized Supervisory Control and Data Acquisition (SCADA) to monitor and control processes” (EPRI, 2010).	“Moves smart systems out to end users to provide real-time feedback regarding energy use and water use rates to build understanding, modify behavior for higher efficiencies, and notify for maintenance” (EPRI, 2010).
Cost-Benefit Analyses	“Use estimates of capital and recurring costs as the primary quantitative factor for cost-benefit analyses” (EPRI, 2010).	“Develop an understanding of the full cost and benefits of infrastructure, including externalities” (EPRI, 2010).

Source: Table 2.1 in EPRI (2010)

2.4 WHO DOES WHAT IN A TWO-TIER MUNICIPALITY SYSTEM?

BRITISH COLUMBIA

In British Columbia the Regional District of Metro Vancouver is a “political body and corporate entity operating under provincial legislation as a ‘regional district’ and ‘greater boards’ that delivers regional services, planning and political leadership on behalf of 24 local authorities” (DWMP, 2011). The Regional District of Metro Vancouver is made up of four separate corporate entities, each with a different set of members and governed by a separate board of directors (MV, 2014). The Directors are members of the Local Municipalities or First Nation councils that have been appointed to one the boards of the Regional District of Metro Vancouver by their respective councils (MV, 2014).

Metro Vancouver interacts with its municipalities via a large number of monthly meetings for each committee (Source 1 - refer to note at bottom of page) to develop region-wide policies that are voted on before acceptance and adoption by all municipalities (Source 2). A region-wide policy comes into effect, the “Local Municipalities must abide by it” (Source 1) and create a local policy in accordance with the region-wide policy and which must be approved by Metro Vancouver (Source 1). This process may be seen as a top down approach from a hierarchical structure perspective; however it actually works more as a cross-functional team in a horizontal organizational structure because all even though all municipalities have to “abide” by these region-wide policies, such policies are voted by the Local municipalities themselves through their representatives at the Metro Vancouver (Region) council (Source 2).

Some examples of policies that have been developed by the Metro Vancouver Boards include the “Regional Growth Strategy, and the Integrated Liquid Waste and Resource Management Plan (ILWRMP)” (Source 1). Some examples of local policies created by municipalities that were developed as a result of the region-wide policy are the Official Community Plans (OCP), and Integrated Stormwater Management Plans (ISMPs) (Source 2). For example, Metro Vancouver developed the Integrated Liquid Waste and Resource Management Plan (ILWRMP), with municipalities weighing in to layout the plan and requirements (Source 2). Metro Vancouver was responsible to obtain provincial approvals while local governments developed Integrated Stormwater Management Plans (ISMPs) in accordance with Metro Vancouver’s Integrated Liquid Waste Resource Management Plan (ILWRMP) requirements and to also meet provincial requirements (Source 2).

For wastewater, the District of Metro Vancouver is responsible for the management of all wastewater treatment plants as well as the trunk mains that connect each (Local) municipality to the wastewater treatment plants (Source 1). Each municipality is responsible for managing smaller sanitary sewers systems that deliver sewage from each customer to the Metro Vancouver trunk mains to be delivered to the waste water treatment plants (Source 1). The City of Surrey collects and pumps wastewater to the Metro Vancouver trunk mains to have it delivered to Metro Vancouver’s wastewater treatment plants. The District of Metro Vancouver has three trunk mains in the City of Surrey that are used to collect “sewage from multiple local governments” (Source 2). All municipalities contribute bear the financial cost for the operation and maintenance of the wastewater treatment plants (Source 2).

Note - (Source X) - this format is used to identify interview respondents.

For stormwater each Local municipality is responsible for most stormwater planning and stormwater infrastructure (Source 1). “Metro Vancouver does set region-wide policy through the Liquid Waste Management Plan, and helps to coordinate management and research through the Stormwater Inter-agency Liaison Group (SILG)” (Source 1). However, Metro Vancouver has no jurisdiction over any municipal wastewater system “except one where Burnaby/Vancouver and Coquitlam entered an agreement for Metro Vancouver to manage one watershed for them” (Source 2).

ONTARIO

In Ontario, Regional and Local municipalities interact in a similar manner to that of the Regional District of Metro Vancouver and its 21 municipalities. The Region of Waterloo (Upper-tier) includes the cities of Cambridge, Kitchener, Waterloo and Townships of North Dumfries, Woolwich, Wilmot, Wellesley (Source 3). The Regional council of the Region of Waterloo is composed of the “Regional Chair, eight directly elected Regional Councilors, and the mayors of the seven local municipalities” (Region of Waterloo, 2014). The Peel Regional Council is formed different from that of the City of Waterloo. It consists of 25 members, the Regional Chair, the Mayors of the three Lower-tier municipalities (Caledon, Brampton and Mississauga), the 11 City of Mississauga Council members, 6 City of Brampton Council members and the 4 Town of Caledon Regional Council members (Region of Peel, 2014). There is significant interaction as well as information sharing between the Regional municipality and Local municipalities in Ontario. The Region of Waterloo council develops policies with consultation of its local municipalities (Source 3); a very inclusive process considering that the mayors of each municipality sit in the council as well. In the Region of Peel, both municipalities work collaboratively to ensure projects are coordinated, for example in the case of “coordinating roadway re-surfacing following water main repair” (Source 5).

In Ontario the responsibility for water, wastewater and stormwater assets in municipalities is similar to that of British Columbia. In The Region of Peel, the region is responsible for water and wastewater, and Local municipalities are responsible for stormwater (Source 5). “Most Local municipalities work independently on storm drainage projects within their jurisdiction; however inter-municipal Staff work together on cross-boundary projects when necessary” (Source 5). Similarly, the Region of Waterloo is responsible for drinking water source, water treatment, water storage and water pumping as well as wastewater treatment, discharge and bio-solids (Source 3). Local municipalities like the City of Waterloo are responsible for water distribution and billing as well as exclusively responsible for stormwater management (Source 3). Municipalities collaborative interact to provide better water services. For example the Region of Waterloo owns the wastewater treatment plant and the transmission water-mains and the each Local municipality owns their sanitary collection system which includes trunk sewers and pumping stations. However for water-mains the local municipality undertakes the repair work (Source 4). In the City of Waterloo the water distribution system, wastewater collection system, and stormwater management system are all managed under the Water Services Division at the City of Waterloo (Source 4).

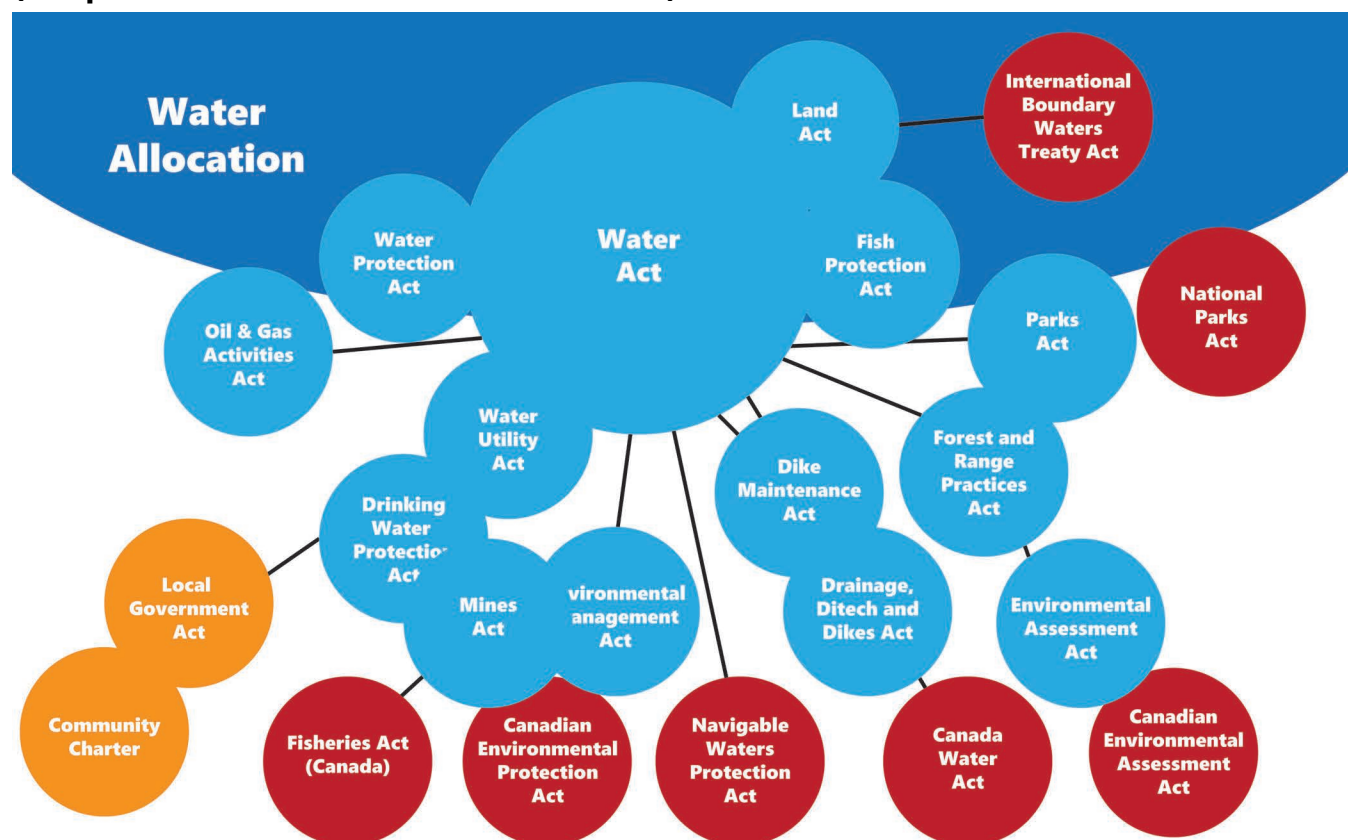
The City of Waterloo funds water, wastewater and stormwater based on user rates (Source 4). For water and wastewater the majority of customer charges are based on meter readings; however, for stormwater the charge is a “tiered flat rate based on property type and size as a measure of impervious surface” making it not financially sustainable (Source 4), the City plans to strengthen wastewater significantly over the next three years (Source 4). The stormwater program in the City of Mississauga is generally funded through taxes and development charges (Source 5). “Water and wastewater have more financial stability, sustainability and predictability due to the long-standing practice of rate predictions” (Source 4). The City of Waterloo has initiated an asset management plan for all three assets (Source 4).

2.5 WATER GOVERNANCE

The Water Opportunities Act, 2010 (Ontario) requires certain municipalities to prepare, approve and submit to the Minister of the Environment municipal water sustainability plans for municipal water services, municipal wastewater services and municipal stormwater services under their jurisdiction (Water Opportunities Act, 2010). The Act also states that two or more regulated entities may prepare a joint plan or a joint part of their plans, which creates an opportunity for both municipalities to develop a plan together (Water Opportunities Act, 2010).

Water governance in B.C. for water, wastewater and stormwater assets operate under the Drinking Water Protection Act, Drinking Water Protection Regulation, and the Water Act, however; they are not governed by the public utility act (Source 1). There are other laws and regulations that affect water governance in the province (Figure 2.2).

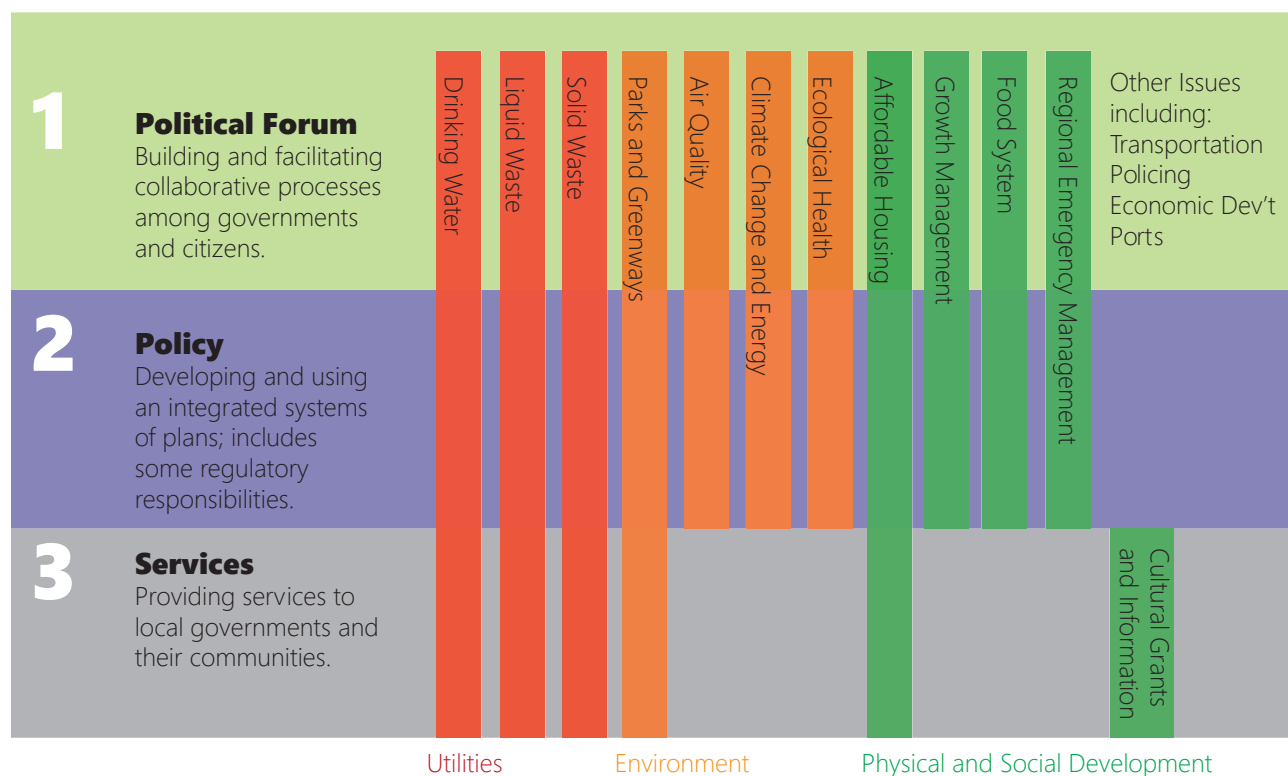
Figure 2.2 - Legislation Influencing Water in B.C.
(Adopted from Water law Framework, 2014)



The current Water Act will be repealed when Bill 18, the new Water Sustainability Act (introduced on March 11, 2014) comes into force in 2015 (Water Sustainability Act, 2014). The Water Sustainability Act responds to “current and future pressures on water, including a growing population, a changing climate and expanding resource development” (Water for BC, 2014) through sustainable water management.

Metro Vancouver’s three main roles are political forum, policy development and service delivery to its municipalities (DWMP, 2011), as shown in Figure 2.3. With the development of integrated systems and the facilitation of local governments collaboration under the Metro Vancouver umbrella, Metro Vancouver’s metrics, targets and key deliverables are harmonized across the region (DWMP, 2011).

**Figure 2.3 - Metro Vancouver Regional Roles
(Adopted from DWMP 2011)**





pt 3. moving forward

3.1 CURRENT INITIATIVES

Municipalities are developing strategic plans for their water, wastewater and stormwater assets. The city of Waterloo provides a “ten-year rate model, identifying capital and operating forecasts and associated rates” (Source 4), and currently has master plans developed for sanitary and stormwater and a water distribution master plan scheduled for 2015/2016 (Source 4). The City has initiated an asset management plan also (Source 4). Region of Waterloo (Upper-tier) oversees water conservation programs and has implemented region-wide measures for water conservation. As a result there has been a steady decline in water demand in the past decade, attributed to conservation programs for the most part (Source 4). The City of Waterloo also provides an incentive programs for stormwater management practices on private properties (Source 4). The City of Mississauga, Peel Region, is using lot-level low impact development approaches hoping to reduce the impact of stormwater runoff in the future (Source 5).

In British Columbia Metro Vancouver’s Regional Growth Strategy to 2040 provides a framework for land use related to water and wastewater (Source 1). Metro Vancouver’s strategy encourages municipalities to foster a compact urban area that can operate more efficiently and requiring less infrastructure, and preserving lands that protect drinking water and stormwater assets (Source 1). The City of North Vancouver’s Official Community Plan and Integrated Stormwater Management Plans, although still in the developing stages, lays out similar objectives and land use plans to make the most of their infrastructure (Source 1). North Vancouver also has asset management plans for all infrastructure projects, and their engineering department is developing a “strategic plan that will apply to all engineering works, however this is in the early stages of development” (Source 1). Surrey on the other hand has looked at the renewal requirements for their water, wastewater and stormwater assets and has conducted some joint asset management studies (Source 2).

Water conservation also plays a key role in water management practices. Metro Vancouver has several water conservation programs at both the local and regional levels (Source 1).

Conservation programs are mostly related to conserving drinking water (lawn watering regulations), but they may also benefit wastewater systems (low flow toilet rebates) (Source 1). "Metro Vancouver runs tours of protected water source watersheds to better understand conservation issues" (Source 1). The City of Surrey has large conservation programs for water and stormwater (Source 2). The City has been running the "Project Save H2O for six years now and the Salmon Habitat Restoration Project for almost 20" (Source 2). Both programs educate the public on water conservation and healthy streams, fisheries enhancements and water quality (Source 2). Surrey has also developed spin off programs for storm drain marking, industries, and stream stewardship which has resulted in very active community involvement with "residents marking storm drains, as well as testing water quality" (Source 2). "We do joint projects with schools and stream keeper groups to assist with education and also neighbor programs (stream planting, invasive removals)" (Source 2). The City of Surrey has a Sustainability Charter, A Climate Change Adaptation Strategy, various Neighborhood Concept Plans, Water Plans, and Integrated Stormwater Management Plans for all sub-watersheds, a Lowlands strategy as well as various policies and Official Community plan to ensure planning for current and future (even changing future) needs in a sustainable way (Source 2). City "Council is supportive of adopting new ideas to ensure sustainability" in Surrey (Source 2). The City also has "plans for each utility related to seismic vulnerability and making systems more resilient" (Source 2) and it is looking at "heat recovery from sanitary sewers to input into the City centre district energy network" (Source 2). Capital and planning studies are funded through each utility as part of 10-year plan portion and the City provides general revenue for the City-wide plans to be developed (Source 2).

3.2 REMOVING BARRIERS

It is crucial that Regional and Local municipalities work collaboratively to develop integrated water, wastewater and stormwater management solutions. Canadian municipalities where municipal governance structure and frameworks present a barrier to achieve a seamless integration between both municipalities, need to be revised and updated to incorporate policies that allow local governments to integrate their initiatives with federal and provincial plans like municipalities in Ontario and British Columbia.

Municipalities should revise their utility "rate approval criteria and procedures to allow for rate structures that provide adequate revenue streams" (EPRI, 2010). Currently the primary revenue source for water service in municipalities is customer billing, usually based on water usage; although water rates often go down for larger users, providing little incentive to encourage water conservation (EPRI, 2010). In some municipalities utility regulators in may set rate structures that counteract conservation pricing (EPRI, 2010). It is critical that municipalities identify such structures and review and update them to foster water conservation using water metering as a conservation tool. Municipalities should implement water metering with a progressive rate structure and the ability for consumers to easily track their water use.

Municipalities need to identify and eliminate regulatory impediments to sustainable design and development and service delivery by making revisions and updating provincial and municipal policies, codes (plumbing), planning and zoning, and administrative procedures (engineering and health departments) to allow or encourage sustainable water practices (EPRI, 2010). Table 3.1 identifies tools for water system integration between Upper Tier and Lower Tier municipalities.

Table 3.1 - Water Integration, Policy and Governance between Upper-tier and Lower-tier Municipalities

Upper Tier	Lower Tier	Conservation	Integration	Financing	Governance
Regional District of Metro Vancouver (BC)	City of North Vancouver (Source 1)	<ul style="list-style-type: none"> • Summer lawn water restrictions. • Public outreach with free water saver kits for inside and outside water use. 	<ul style="list-style-type: none"> • Stormwater Inter-agency Liaison Group (SILG) • Ensuring City's ISMP matches the regional district's ILWRMP • The Fraser Basin Council (FBC). 	<ul style="list-style-type: none"> • Stormwater management is funded through general City expenditures. 	<ul style="list-style-type: none"> • Greater Vancouver Sewerage and Drainage District (GVS&DD) • Greater Vancouver Water District (GVWD)
Regional District of Metro Vancouver (BC)	City of Surrey (Source 2)	<ul style="list-style-type: none"> • Summer lawn water restrictions. • Public outreach with free water saver kits for inside and outside water use. 	<ul style="list-style-type: none"> • Stormwater Inter-agency Liaison Group (SILG) • Ensuring City's ISMP matches the regional district's ILWRMP • The Fraser Basin Council (FBC). 	<ul style="list-style-type: none"> • Capital and planning studies funded through each utility. • City provides general revenue for the city wide plans to be developed. 	<ul style="list-style-type: none"> • Greater Vancouver Sewerage and Drainage District (GVS&DD) • Greater Vancouver Water District (GVWD)
Region of Waterloo (ON)	The City of Waterloo (Source 3, 4)	<ul style="list-style-type: none"> • The Region oversees water conservation programs. 	<ul style="list-style-type: none"> • Regular meetings e.g. Quarterly meetings to review best management practices. • City undertakes the repair work of transmission water mains (owned by Region). 	<ul style="list-style-type: none"> • Water, wastewater and stormwater assets currently funded based on user rates. 	<ul style="list-style-type: none"> • The Region's mayors of the seven local municipalities are Regional Councilors as well.
Region of Peel (ON)	The City of Mississauga (Source 5)	<ul style="list-style-type: none"> • Implement lot-level LID to help reduce the impact of stormwater runoff in the future 	<ul style="list-style-type: none"> • Coordination of Projects. e.g. Roadway re-surfacing following watermain repair. • Ensure Regional and City issues are coordinated as best as possible so educational campaigns and facility planning can involve representatives from both agencies. 	<ul style="list-style-type: none"> • Current funding of the stormwater program is generally through taxes and development charges. 	<ul style="list-style-type: none"> • Mississauga's 11 Councilors are Regional Councilors as well.

3.3 IS THERE AN IDEAL MODEL?

Halifax was the first municipality in Canada to take a well-defined integrated and funded approach. In Nova Scotia (With no regional and local municipality system), the city of Halifax created Halifax Water in charge of water, wastewater and stormwater in four municipalities. Halifax Water is publicly owned and it operates like a business, governed by board of directors; with shares owned by Halifax Regional Municipality (Yates, 2014).

Halifax Water is a self financed utility, capital and operating budgets are funded directly from user fees and fire protection revenue. Most water systems in Canada depend on funding from the government. Halifax Water has financial predictability and sustainability enabling better long-term investment decisions. Halifax Water operates in accordance with Act of Provincial Legislature with rates, rules and regulations approved by Nova Scotia Utility and Review Board [NSUARB] (Yates, 2014).



Image source: http://upload.wikimedia.org/wikipedia/commons/a/aa/Halifax_Canada_Day_2007.jpg



pt 4. conclusion

Water resources are limited and the way municipalities design and manage their water infrastructure systems is integral to sustainable resource management. Canadian municipalities are confronted by challenges related to continued growth, climate change and aging infrastructure, and the increasingly limited ability of the province's waterways to absorb the impact of stormwater runoff and pollution.

Regional and Local municipalities are encouraged to work collaboratively to create actions (supported by provincial governments) to plan for sustainable management of water and to implement innovative stormwater, water supply wastewater solutions such as Integrated Water Management System (IWMS). Resource efficiency, recovery and recycling concepts (closed-loop systems) directly relate to environmental sustainability goals.



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APPENDICES

SOURCES 1 - 5

SOURCE 1

The City of North Vancouver

Number and names of Lower-tier municipalities under this Upper-tier municipality?

Upper Tier Municipality (known as a Regional District, in this case): Metro Vancouver

Lower Tier Municipalities

Village of Anmore	District of North Vancouver
Village of Belcarra	City of Pitt Meadows
Bowen Island Municipality	City of Port Coquitlam
City of Burnaby	City of Port Moody
City of Coquitlam	City of Richmond
Corporation of Delta	City of Surrey
City of Langley	Tsawwassen
Township of Langley	City of Vancouver
Village of Lions Bay	District of West Vancouver
District of Maple Ridge	City of White Rock
City of New Westminster	Electoral Area A
City of North Vancouver	City of Abbotsford (only a member of Metro Vancouver with respect to park services)

How is your upper council formed?

Metro Vancouver is made up of four separate corporate entities, each with a different set of members:

- Greater Vancouver Regional District (GVRD)
- Greater Vancouver Sewerage and Drainage District (GVS&DD)
- Greater Vancouver Water District (GVWD)
- Metro Vancouver Housing Corporation (MVHC)

Each of these corporate entities is governed by its own board of directors, made up of elected officials from one of the municipalities of First Nations councils, except for Electoral Area A which has an appointed representative. The number of board members and their number of votes are determined by the population of the municipality. This is summarized here: <http://www.metrovancouver.org/boards/Pages/directors.aspx>

How is the upper tier council formed?

See above. Directors are appointed from elected officials from the lower tier municipalities in most cases. <http://www.metrovancouver.org/about/Pages/default.aspx>

How does the upper municipality and its lower municipalities interact? (Meetings? How often? Have by-laws ever conflicted? Document sharing? Neighboring lower tier municipalities work together?)

Metro Vancouver runs a large number of monthly meetings for each committee
<http://www.metrovancouver.org/boards/Pages/BoardsCommittees.aspx>

Metro Vancouver also sets a number of region-wide policies that the Lower Municipalities must abide by. Examples include the Regional Growth Strategy, and the Integrated Liquid Waste and Resource Management Plan (ILWRMP). These region-wide policies often require each municipality to then create a local policy that fits within the broader plan and which must be approved by Metro Vancouver (e.g. Official Community Plans (OCP), and Integrated Stormwater Management Plans (ISMPs)).

Lower tier municipalities work together in a number of official and unofficial capacities. For example the City of North Vancouver and the District of North Vancouver are developing joint ISMPs to manage their three shared watersheds. We also participate in less formal working groups to coordinate action on specific issues, including climate change on the North Shore (which involves the City and District of North Vancouver, the District of West Vancouver, and the North Shore Emergency Management Office), and a Burrard Inlet Flood Sea Level Rise Collaborative (which involves several municipalities around Burrard Inlet and the Simon Fraser University Adaptation to Climate Change Team).

The Fraser Basin Council (FBC - <http://www.fraserbasin.bc.ca/>) is another good example of cooperation. The FBC is a non-profit that helps to coordinate sustainability initiatives across the region, such as the newly created Lower Mainland Flood Management Strategy, which involves almost all local governments in the region.

Who is responsible for water, wastewater and stormwater assets in your municipality?

Water: Metro Vancouver is responsible the water supply for the entire region, all treating and water quality issues, and delivery to each municipality. Each municipality is then responsible for delivery to its customers.

Wastewater: Metro Vancouver is responsible for all wastewater treatment, and the trunk lines which connect each municipality to the wastewater treatment plants. Each municipality is responsible for the smaller sanitary sewers that deliver sewage from each customer to the Metro Vancouver trunk lines.

Stormwater: Individual municipalities are responsible for most stormwater planning and infrastructure. Metro Vancouver does set region-wide policy through the Liquid Waste Management Plan, and helps to coordinate management and research through the Stormwater Interagency Liaison Group (SILG).

[LOWER TIER MUNICIPALITY]

Does your municipality have a combined water, wastewater and stormwater system? is it under the same umbrella/office and the same management?

There is no official combined system, however when work is done on one system we do look at whether we can take advantage of the opportunity to upgrade other infrastructure at the same time. We are also using the development of our Integrated Stormwater Management Plan (ISMP) to do long term planning for both our stormwater and sanitary systems, how climate change will affect both of them, and to develop compatible computer models of the two using PCSWMM, which could be combined in the future.

Do your water, wastewater and stormwater assets operate under the provincial public utility act?

No, I don't believe any of our assets operate under the BC public utility acts. We are still governed by the Drinking Water Protection Act, Drinking Water Protection Regulation, and the Water Act, however.

Who governs the water, wastewater and stormwater assets? And how is this governing body formed?

The water assets are mainly governed by the Greater Vancouver Water District (GVWD) board as part of Metro Vancouver, with the smaller local assets governed by the individual municipalities.

Similarly, the wastewater assets are governed by the Greater Vancouver Sewerage and Drainage District (GVS&DD) board as part of Metro Vancouver, with the smaller local assets governed by the individual municipalities.

Stormwater assets are governed by the local municipal governments.

What is your drinking water loss in liters per day? Can you estimate where it goes?

This is something Metro Vancouver would manage.

How are water rates, wastewater rates and stormwater rates determined?

Water rates are determined by the GVWD as part of Metro Vancouver. New province wide policy will also come into effect in 2015 under the Water Sustainability Act (<http://engage.gov.bc.ca/watersustainabilityact/>) which will change the rate structure for bulk water use.

Wastewater rates are set by the GVS&DD as part of Metro Vancouver.

There are no distinct stormwater rates. Stormwater management is funded through general City expenditures.

What changes would you make to ensure your water, wastewater and stormwater assets have financial stability, sustainability and predictability? How are they currently funded?

- Dedicated funding for long-term monitoring and adaptive management programs, including flow creek and sewer flow monitoring, water quality, ecosystem health, etc.
- Water metering should be instituted for all customers across the region, with a progressive rate structure and the ability for customers to easily track their water use.
- Climate change should be explicitly accounted for in all planning. I think this will be one of the greatest driving forces to coordinate the planning of these three facets of water.
- Much stricter planning and development regulations regarding effective impervious area and the use of green infrastructure (rain gardens, rain barrels, bioswales, green roofs, etc).
- Ease regulation on the use of greywater, and look into providing area wide greywater collection or servicing (e.g. to flush toilets)
- Protect and restore wetlands and creek-side habitat and natural areas.
- Continue to enforce very strict source water protection.
- More conservation programs, especially regarding lawn watering and the encouraging the use of alternative ground cover.

Do you have a strategic plan for your water, wastewater and stormwater assets over the next 15 years? To what degree are these assets integrated?

Metro Vancouver's Regional Growth Strategy to 2040 provides a framework for land use related to water and wastewater. The strategy encourages a compact urban area that can operate more efficiently and requires less infrastructure, along with the conservation of lands that protect our drinking water and stormwater assets. In this case the different areas are integrated in that they all benefit from trying to attain higher levels goals (e.g. compact, complete community). The City of North Vancouver's Official Community Plan and Integrated Stormwater Management Plans (in development) lay out similar objectives and land use plans to make the most of our infrastructure.

The City also has asset management plans for all infrastructure, run using Hansen software. Our engineering department is also developing a strategic plan that will apply to all engineering works, however this is in the early stages of development.

What role does conservation play in your water, wastewater and stormwater assets?

There are several water conservation programs at both the municipal and regional district levels. These programs are mostly related to conserving drinking water (e.g. lawn watering regulations), but also benefit wastewater systems as well (e.g. low flow toilet rebates). Metro Vancouver also runs tours of our protected water source watersheds to increase understanding of the issue. Given that we live in a rainforest, a lot of residents don't think of water scarcity as a problem.

A point or two for the table below would be great (again on cooperation) between MV and City of North Vancouver:

Conservation	Integration	Governance
<ul style="list-style-type: none">• Summer lawn water restrictions• Public outreach with free water saver kits for inside and outside water use.	<ul style="list-style-type: none">• SILG• Making sure the City's ISMP matches the regional districts ILWRMP	GVS & DD

Any pros and cons for Metro to not have jurisdiction over wastewater system and have to depend on municipalities like North Vancouver?

I can see some issues arising where the natural gravity flows in the sanitary sewer network make it necessary (or at least a lot more logical) for the wastewater systems of multiple municipalities to be joined.

The City of North Vancouver has a few connections with the District of North Vancouver's wastewater network, but these are usually connected to small areas rather than major sewers and do not cause any major issue with our network. In most cases I would think that cooperation between two or three municipalities would be more efficient than having the regional district manage the system, but there may be cases where regional coordination would be advantageous.

Does North Vancouver have to report back to Metro Vancouver for any water, storm water or wastewater data, targets, assets, programs, etc?

Yes, under the ILWRMP there is a reporting requirement under the section Performance Measures and Adaptive Management. There is a range of stormwater related metrics that are required to be reported back to Metro Vancouver, and which the City will use to adjust its ISMP implementation. I don't know as much about the water use or wastewater reporting, but there would certainly be water use billing for industrial and commercial customers, and flow monitoring in the wastewater system at certain points.

SOURCE 2

How does the upper municipality and its lower municipalities interact?

•(Meetings? How often? Have by-laws ever conflicted? document sharing? Neighboring lower tier municipalities work together?)

Metro Vancouver is comprised of all the local governments; they develop some higher level policies that local governments vote on before acceptance and adoption. Some items require 100% consent from local governments others more consensus. They do not direct our works though. With the liquid waste management plan we worked with MV to develop the plan and requirements and then also who was responsible to follow which requirements in order to get Provincial approvals. Each local government is then responsible to develop programs etc to meet the provincial requirements and those of the LWMP.

Who is responsible for water, wastewater and stormwater assets in your municipality?

MV is responsible to some trunk mains but not distribution or collection systems. Surrey buys water from Metro Vancouver. They have mains under the Fraser that takes the water to various reservoirs in Surrey. We purchase the water from them but are responsible for our distribution system, metering etc. We could also supplement the water with our own sources if we wish. Some local governments do this like Township of Langley where they augment water supply with groundwater so residents pay less. The sanitary systems are all run by Surrey, we collect and pump to the Metro Vancouver mains that take the waste to the treatment plants. There are 3 MV mains in Surrey that are used to collect sewage from multiple local governments. Metro Vancouver manages all the sewage treatment plants. We all pay towards the operation and maintenance of the plants.

MV has one committee to help coordinate stormwater as it relates to the LWMP but has no jurisdiction over any system except one where Burnaby/Vancouver and Coquitlam entered an agreement for MV to manage one watershed for them.

In terms of water distribution in the city or sanitary servicing, its all done by City staff. I&I issues/programs are also managed by City staff. If we need additional chlorine, that's again city responsibilities. We are also looking at doing some energy exchanges at our sewage lift stations.

So MV big picture sewer & water treatment – local governments responsible for the rest.

At Surrey we have separate utilities for each water, waste water and stormwater. Each utility is responsible for their assets.

[LOWER TIER MUNICIPALITY]

Does your municipality have a combined water, wastewater and stormwater system? is it under the same umbrella/office and the same management?

We have utilities for the management and funding of each asset group. All utility staff work for the City of Surrey in the Engineering department. Within each utility some staff work in operations and some in the capital section of the utility.

So City and Engineering management levels are the same for all 3 utilities. (a tree would work better now to show the next breakdown) All 3 under 1 operations management and similarly 1 capital management structure. There is one more layer after this of managers for each asset group that get more specific into function and management.

Do your water; wastewater and stormwater assets operate under the provincial public utility act?

No

Who governs the water, wastewater and stormwater assets? And how is this governing body formed?

City Council has authority over the 3 utilities. They determine direction etc.

What is your drinking water loss in liters par day? Can you estimate where it goes?

Some background – the City buys its water from Metro Vancouver. Both the City and Metro Vancouver meter the amount we take into our system. In the Vancouver area, there are very few meters on private residences and businesses. S

urrey has been bringing in water meters for many years now but not all are metered so the numbers provided are an estimate. Homes and businesses not on meters were assumed to use the per capita average of those on meters.so we estimate that we lose 15,000 liters/day of drinking water from our system. This water is assumed to go into the ground.

How are water rates, wastewater rates and stormwater rates determined?

- Water rates for residents & businesses are derived from: costs to buy water from Metro Vancouver; 10 year capital plan to update or replace water infrastructure; operating costs to manage the water distribution system
- Wastewater rates residents & businesses are derived from: costs to send wastewater to Metro Vancouver sewage treatment plant; 10 year capital plan to update or replace wastewater infrastructure; operating costs to manage the wastewater collection system
- Stormwater rates residents & businesses are derived from: 10 year capital plan to update or replace stormwater infrastructure including dykes, shoreline protection, ravine stability etc; operating costs to manage the stormwater system – it should be noted that we have over 1500km of creeks in Surrey and over 100 km of dyke structures in addition to pump stations and pipe systems. Preservation of the natural environment associated with the creeks, rivers etc also fall under our drainage utility
- separate funding for development trunk infrastructure is also in each budget. The monies come from development as they progress in the City. We have line items in each 10 year plans for development related infrastructure required to facilitate growth.

What changes would you make to ensure your water, wastewater and stormwater assets have financial stability, sustainability and predictability? How are they currently funded?

We have been working on asset renewal programs and incorporating the replacement requirements into our 10 year program which then we can fund through the utility. We are also looking at trying to spread the renewal work out over a longer period. We are a newer community with newer infrastructure so infrastructure replacement is at a manageable rate at this time.

The City has a Sustainability Charter, A Climate Change Adaptation Strategy, various Neighbourhood Concept Plans, Water plan, Integrated Stormwater management plans for all subwatersheds, Lowlands strategy and various policies and Official Community plan. Through our plans, policies and bylaws, we are ensuring we are planning for current and future (even changing future) in a sustainable way. Council is supportive of adopting new ideas to ensure sustainability.

We also have plans for each utility related to seismic vulnerability and making systems more resilient. Let me know the amount of detail you want as we are doing a lot in this field. We are even looking at heat recovery from our sanitary sewers to input into the City center district energy network. Capital and planning studies are funded through each utility as part of 10 year plan portion. City provides general revenue for the city wide plans to be developed.

Do you have a strategic plan for your water, wastewater and stormwater assets over the next 15 years? To what degree are these assets integrated?

We have looked at the renewal requirements for each and have conducted some joint asset management studies. We manage our operations through the same software program and have linked plans through GIS to ensure we conduct renewals where possible together – including linking to road/pavement plans. 10 year plans are main funding sources yet we do have plans for renewals to much longer time frames. With sea level rise and 80-180 year horizons we have been also looking at how to incorporate with future conditions. FYI SLR is predicted at 1m by 2100 and 2m by 2200, this is also combined with land subsidence at about 2mm/year and then add storm surges and waves.

In some places this means changes in groundwater and large coastal protection needs etc will be 2-4 m higher than present by 2100. These factors in low lying areas are being taken into account when design new or upgrades services.

What role does conservation play in your water, wastewater and stormwater assets?

We have large conservation programs for water and stormwater. We have been running Project Save H2O for 6 years now and Salmon Habitat Restoration Project for almost 20. Both programs are devoted to educating the public on water conservation and also healthy streams, fisheries enhancements and water quality. We have also developed other spin off programs for storm drain marking, industries, stream stewardship, etc. We have residents marking storm drains, as well as testing water quality. We do joint projects with schools and stream keeper groups to assist with education and also neighborhood programs (stream planting, invasive removals etc).

SOURCES 3 and 4

Name of Upper-tier municipality?

Region of Waterloo.

Lower-tier municipalities under this Upper-tier municipality?

Cities of Cambridge, Kitchener, Waterloo and Townships of North Dumfries, Woolwich, Wilmot, and Wellesley.

Upper & Lower Tier Questions

How is the upper tier council formed?

Please see here <http://www.regionofwaterloo.ca/en/regionalgovernment/regionalcouncil.asp>

How do the upper municipality and its lower municipalities interact?

There is great interaction between the upper and lower tier municipalities for coordination for things such as infrastructure, programs and public communication. For water services, there are many types of meetings held at various frequencies to maintain communications. Regular meetings include annual meetings to review design standards and quarterly meetings to review best management practices which are attended by Region and lower tier representations as well as neighboring jurisdiction, while project specific meetings include an invitation from the city. There is also a quarterly operations coordination meeting between the Region and City. I don't know the history of every by-law but from the ones I know, they are developed with consultation of the lower tier municipalities. Bylaws are scrutinized by council also, which each lower tier municipality has a representative.

Lower and upper tier municipalities each maintain their own database of information, but share on a case by case basis.

There are many areas of overlap where the lower tier and upper tier have to work together. For example, the upper tier owns the trunk sewer, but in times of emergency repair, it sometimes makes sense for the lower tier to do the repair work. Note of correction, the sanitary collection system is owned by lower tier (including trunk sewers and pumping stations) and the Region owns treatment plant. I think the coordination Kaoru is referring to relates to the transmission watermain (owned by Region) whereby the City will undertake the repair work.

[LOWER TIER MUNICIPALITY]

Does your municipality have a combined water, wastewater and stormwater system?

Not sure what is meant by combined. We do not have combined sewers if this is what is being referred to. Under the same office/umbrella and even same management? The water distribution system, wastewater collection system, and stormwater management system are all managed under the Water Services Division at the City of Waterloo

Do your water; wastewater and stormwater assets operate under the provincial public utility act?

The City operates under the Municipal Act. I understand that the public utility act applies to utilities other than municipalities.

Who governs the water, wastewater and stormwater assets? And how is this governing body formed?

City of Waterloo Council governs these assets.

What is your drinking water loss in liters per day? Can you estimate where it goes?

Our non-revenue water loss including authorized and unauthorized water use (based on 2013 total water use) is approximately 4383955 l/day (represents 13% of total water use). We do estimate authorized non-metered water (e.g. flushing activities, fire department use, etc.) to determine an actual water loss based on AWWA Water Audit practices and associated software.

How are water rates, wastewater rates and stormwater rates determined?

Not sure if this question relates to the rate model components or the customer charges? For water and wastewater the majority of customer charges are consumption based (based on meter readings). For stormwater the charge is a tiered flat rate and is based on property type and size as a measure of impervious surface.

What changes would you make to ensure your water, wastewater and stormwater assets have financial stability, sustainability and predictability? How are they currently funded?

All 3 are currently funded based on user rates. Water and wastewater have more financial stability, sustainability and predictability due to the long standing practice of rate predictions. Stormwater rates are not sustainable and an aggressive increase is planned over the next 3 years. An asset management plan is also required for all 3 assets which the City has initiated.

Do you have a strategic plan for your water, wastewater and stormwater assets over the next 15 years? To what degree are these assets integrated?

From a funding/rate perspective we provide a 10 year rate model, identifying capital and operating forecasts and associated rates. We also have master plans developed for sanitary and stormwater. A water distribution master plan is scheduled for 2015/2016. An asset management plan has been initiated.

What role does conservation play in your water, wastewater and stormwater assets?

The Region oversees water conservation programs and has implemented many measures for conservation in the community. The result over the past 10 years is a steady decline in water demand. While other factors likely also contributed to the decline, conservation has a part. The City of Waterloo also provides an incentive program for stormwater management practices on private properties.

SOURCE 5

Number and names of Lower-tier municipalities under this Upper-tier municipality?

[MISS: Mississauga is the lower-tier municipality under the upper-tier municipality of Region of Peel. The other two lower-tier municipalities are Brampton and Caledon.]

How is your upper tier council formed?

[MISS: Representation from each of the three lower-tier municipalities. At present, all of Mississauga's 11 Councilors are also Regional Councilors. For your reference, more info can be found at <http://www.peelregion.ca/council/>]

Upper & Lower Tier Questions

How is the upper tier council formed? (in some municipalities, upper municipality councilors are elected by the public, in others they are members of their lower tier councils)

[MISS: The Chair of Regional Council is elected by Regional Council. Otherwise, unfortunately I'm not that up to speed on the process and would suggest that you contact the Regional Clerk to obtain information on protocol. Sorry I couldn't be of further help on this.]

How does the upper municipality and its lower municipalities interact?

[MISS: Most of the lower tier municipalities work independently on storm drainage projects within their jurisdiction. However inter-municipal Staff work together on cross-boundary projects when necessary. Between upper and lower tier municipalities we work together to ensure projects are coordinated for example in the case of coordinating roadway re-surfacing following watermain repair. Our Councilors like to know that we work together to ensure Regional and City issues are coordinated as best as possible so educational campaigns and facility planning can involve representatives from both agencies.]

Who is responsible for water, wastewater and stormwater assets in your municipality?

[MISS: Region takes care of water and wastewater, Municipality takes care of stormwater.]

[LOWER TIER MUNICIPALITY]

Does your municipality have a combined water, wastewater and stormwater system? Under the same office/umbrella and even same management?

[MISS: No.]

Do your water; wastewater and stormwater assets operate under the provincial public utility act?

[MISS: With respect to stormwater, I don't believe so. Would defer to Region for water & wastewater.]

Who governs the water, wastewater and stormwater assets? And how is this governing body formed?

[MISS: With respect to stormwater, Staff manage the asset(s). Would defer to Region for water & wastewater.]

What is your drinking water loss in liters par day? Can you estimate where it goes?

[MISS: Defer to Region.]

How are water rates, wastewater rates and stormwater rates determined?

[MISS: Defer to Region. NOTE: Mississauga is presently in the process of moving to a stormwater utility however implementation is not planned until early 2016.]

What changes would you make to ensure your water, wastewater and stormwater assets have financial stability, sustainability and predictability? How are they currently funded?

[MISS: Defer to Region on water/wastewater. For stormwater, see answer to no.9 above. Current funding of the stormwater program is generally through taxes and development charges.]

Do you have a strategic plan for your water, wastewater and stormwater assets over the next 15 years? To what degree are these assets integrated?

[MISS: Defer to Region on water/wastewater. For stormwater, we have a number of Studies that converge through the preparation of our Capital Plan which lays out a roadmap for planned improvements.]

What role does conservation play in your water, wastewater and stormwater assets?

[MISS: Defer to Region on water/wastewater. For stormwater, the hope is that lot-level low impact development approaches will help to reduce the impact of stormwater runoff in the future.]



CANADIAN WATER NETWORK
RÉSEAU CANADIEN DE L'EAU