OSWCA
Ontario Sewer & Watermain Construction Association

CLEAN WATER IS EVERYBODY'S BUSINESS

Bringing sustainability to Ontario's water systems:

A quarter-century of progress, with much left to do

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A quarter-century of progress, with much left to do

An independent research study
commissioned by the
Ontario Sewer and Watermain
Construction Association of Ontario

By
Michael Fenn and Harry Kitchen

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INTRODUCTION, ACKNOWLEDGEMENTS AND AUTHORS

INTRODUCTION

In 1990, the Ontario Sewer and Watermain Construction Association (OSWCA) commissioned an independent study (Fortin and Mitchell) to look at the current state of water and wastewater services and infrastructure in Ontario, with a particular focus on financial sustainability – use of water meters and adequacy of water rates.

This new study has been commissioned by the Ontario Sewer and Watermain Construction Association on the 25th anniversary of its seminal analysis (by Fortin and Mitchell) of water rates and related issues in Ontario. The 1990 study concluded with a call for greater use of water meters, a commitment to the user-pay principle and financial sustainability in water rates, and adoption of a utility model with full lifecycle costing for the capital and operating costs of these essential community services. While farsighted, OSWCA's ground-breaking 1990 study was not immediately recognized for its importance.

Much has changed since that time – from the Walkerton tragedy and the impact of more numerous severe weather events to the fiscal challenges facing governments at all levels and their recognition of the need to reinvest in infrastructure. As we approach the 14th anniversary of the final report of the O'Connor Inquiry, headlines from Flint, Michigan and long-standing boil water advisories in a number of our own First Nations communities remind us there remains much unfinished business in the water sector.

This study examines the progress made, and what remains to be done, to improve pricing, sustainability, reliability and efficient use of infrastructure for water, wastewater and stormwater through the next quarter-century. Amongst others, the following questions are addressed:

- What progress has been made towards adopting the use of water meters across Ontario and what changes have been made in pricing structures?
- Have water and sewer rates risen to match the cost of delivering water and sewage services and to sustain and refurbish the infrastructure that makes those services possible?
- Have capital expenditures on water and sewers increased? Have the capital budgets for water and wastewater infrastructure increased in size and scope to meet the challenges faced by our communities?

- What do we know about the size of the infrastructure deficit and the financial obligations of deferred maintenance? Are we accounting for them properly? Are we keeping pace?
- What new challenges do we face with water, wastewater and stormwater? Do rate-setting policies and capital planning practices recognize those challenges? Are water services properly organized and integrated to meet current and future needs?

Because of their relevance for public policy decision-makers, this study discusses the impact of various water rate schemes on users and providers. Understanding the consequences of each pricing structure is important, for it can lead to the implementation of proper pricing structures which, in turn, can improve sustainability, provide incentives for conservation and efficient use, and address social equity concerns and economic development opportunities.

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INTRODUCTION, ACKNOWLEDGEMENTS AND AUTHORS

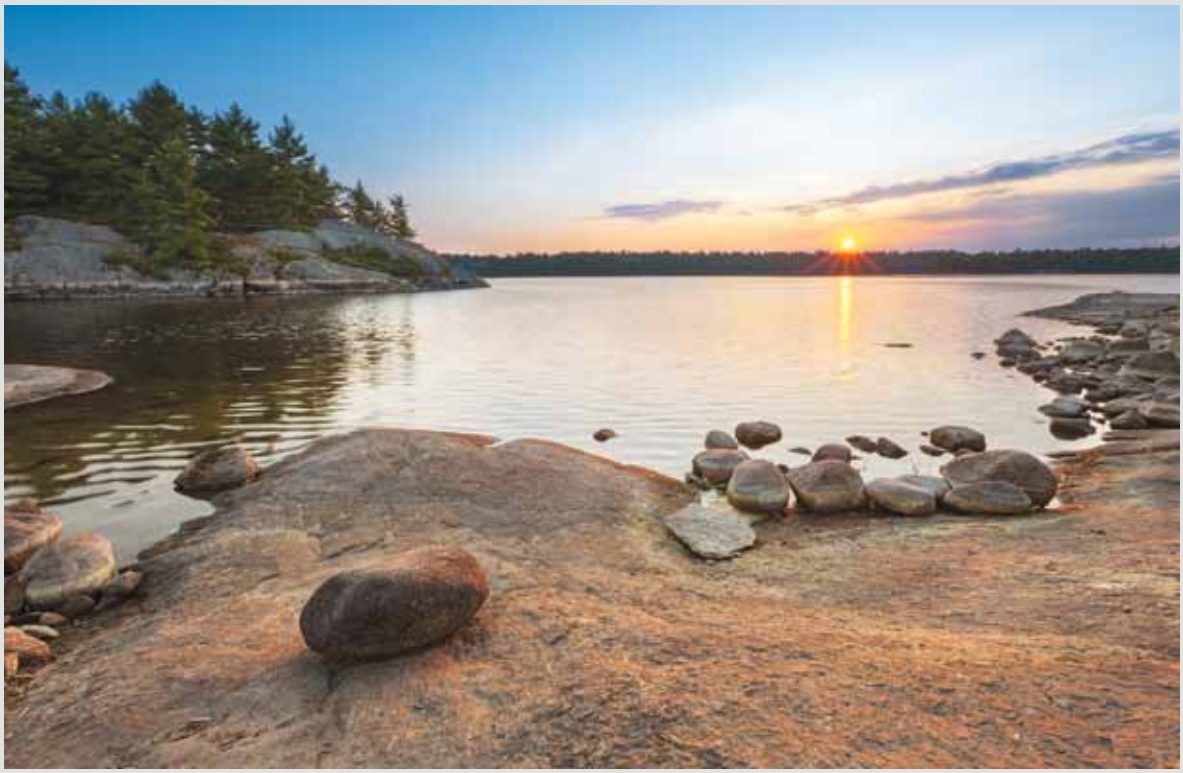
AUTHORS

Michael Fenn was an Ontario Deputy Minister under three Premiers, municipal chief administrator in Hamilton and Burlington, and the founding CEO of both regional transportation authority Metrolinx and regional health authority Mississauga Halton LHIN. He now writes and consults on municipal and infrastructure issues. A certified board director, he serves on the boards of the C$78 billion OMERS AC pension fund and the Toronto Board of Education's realty arm, the Toronto Lands Corporation.

Harry Kitchen is Professor Emeritus in the Economics Department at Trent University. Over the past 20 years, he has completed more than 100 articles, reports, studies and books on issues relating to local government expenditures, finance, structure and governance in Canada. In addition, he has served as a consultant or adviser for a number of municipal and provincial governments in Canada, the federal government and some private sector institutions. In 2013, he was awarded a Queens Diamond Jubilee medal for policy analysis and research contributions to municipal finance, structure and governance in Canada.

The views expressed are those of the authors. They may not reflect the views of the OSWCA or its members, nor the organizations with which Harry Kitchen or Michael Fenn are associated. Any errors or omissions are the responsibility of the authors.

BACKGROUND



This study – **"Bringing sustainability to Ontario's water systems"** – begins with advocacy in 1989 and 1990 by the OSWCA and other stakeholders for water system sustainability, based on universal metering, self-sustaining water and wastewater rate structures and policies, and more investment in the infrastructure that is too often out of sight and out of mind.

This study's findings show steady progress, but also the need for more progress …

- Water metering is now nearly universal, having gone from 81% in 1991 to 98% by 2009 – but water rates still need to rise in many municipalities to make water and wastewater systems sustainable.
- The structure of water rates has evolved to take into consideration conservation initiatives and efficiency objectives in some municipalities – but improvements are still needed in many other municipalities.
- Full-cost accounting and asset management programs have been adopted in many of the larger water and wastewater systems – but much still remains to be done in other municipalities.

- Water financing increasingly reflects a utility model and full-cost pricing – but there remains much debate about the definition (and components) of full-cost, lifecycle pricing.
- Water systems have higher standards and tighter regulation of staff and operations – but the burden of pursuing financial and operational sustainability has been largely left to municipalities and water authorities.
- There are exciting and challenging developments on the horizon, from new technologies to mitigating the effects of urbanization and emergencies – but many water authorities have neither the scale, finances nor in-house talent to take on these tasks.
- From climate-change impacts to extreme weather events, there is a need to link the silos of water, wastewater and stormwater planning – but without an integrated, regional or watershed approach, these efforts will be difficult.

After the 1990 report, OSWCA and others continued to champion the cause of clean water. As governments changed in Ontario, OSWCA lobbied vigorously for legislation and investment in water systems, warning that the consequences of not doing so could be very serious. The water contamination crisis in Collingwood in March 1996 illustrated the risks. Prior to the Walkerton tragedy, NDP Leader Howard Hampton quoted Sam Morra, OSWCA's Executive Director at the time, with this prescient warning to the Ontario Legislature on April 16, 1996: "Communities across Ontario will be facing problems like those in Collingwood, yet we know the money isn't there to do anything about it."

After the Walkerton tragedy in 2000, which impacted 2,500 water consumers, caused long-term health effects in others and resulted in seven deaths as a result of tainted water, the recommendations of Justice O'Connor (May 2002) and the Swain Panel (2005) were advanced. They were paralleled by focused advocacy led by OSWCA and others in 2002 and increased in 2010 to secure legislation to promote water system sustainability and full lifecycle costing of water services infrastructure.

In 2010, the Ontario government enacted the multi-faceted *Water Opportunities and Water Conservation Act, 2010*, which among other features empowered the province to require municipalities to submit water system sustainability plans (including financial plans and asset management plans). Those plans aimed to

address the fundamental issues that gave rise to the Flint tragedy: inadequate investment in restoring, reburishing and upgrading water and wastewater systems, and failure to allocate sufficient funds to construct and operate safe and efficient water and wastewater systems. However, the Act's substantive financial sustainability objectives depended on regulations to give effect to full-cost pricing by municipalities and local utilities. The proposed regulations proved to be difficult to design, while direct ministry regulation of rates was unpopular with municipalities, so these were not enacted (Region of York 2015, at 20).

At the same time, a Private Member's bill introduced by MPP David Caplan *[Sustainable Water and Waste Water Systems Improvement and Maintenance Act (SWIM)*; Bill Pr 237/10] called for a series of reforms, including universal metering and a regime to foster economic regulation of water and wastewater rates, administered by an independent economic regulator. While that Bill and a successor reached Second Reading – remarkable for a Private Member's Bill – they were not enacted into law (Environment Probe, 19 Feb. 2010).

During this period, the Ontario government improved training requirements and enacted more demanding regulations, in areas such as source-water protection and public asset accounting. But too often, the essential financial and operational building blocks of system sustainability have largely been left to municipalities and water utilities. Some have made great progress, while others struggle to make gains in a demanding fiscal environment, filled with institutional and political hurdles.

Overall, we found that real progress has been made in key areas. Building on widespread metering and despite a chilly fiscal environment, water rates and other levies have generally risen to meet the financial challenge of system sustainability and the need to refurbish for an era of climate change. Infrastructure and economic stimulus programs by the governments of Canada and Ontario have allowed municipalities to deliver ambitious and long-overdue new, expanded and refurbished water, wastewater and stormwater infrastructure.

But much remains to be done. Despite the lessons of Walkerton, many smaller Ontario communities – and some larger municipalities – do not adequately fund their waterworks and sanitary sewage systems or their storm drainage infrastructure. This may be due to local economic and political considerations, or the burden of trying to fund a modern water system from a limited or resistant customer base. It

may reflect outdated water rate structures and hidden subsidies that fail to promote conservation and efficient usage. Too often, they neglect modernization, increased system resilience, and the impacts of urbanization and extreme weather events.

Planning efforts need to reflect the close interrelationship among waterworks and waterlines, sewage collection and treatment, and stormwater and agricultural drainage. A capacity to spread fixed costs over a wider customer base, and to develop economies of scale, have stalled and need to be revitalized. Smaller water authorities often lack in-house expertise to address emergencies and to embrace 21st-century technology. All of these factors argue for consideration of a watershed or county-level approach to managing water systems and potential for an expanded role for the private sector in designing, building, operating and maintaining our water systems. Available capital funds must be spent prudently and on a pro-active basis, including attracting pension fund investment. Above all, water rates must be at a level that will sustain potable water, wastewater and stormwater systems into the future.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

WATER RATES

1. Water rates should be set to recover all operating costs and an annualized portion of capital costs.
2. The pricing structure is critically important in leading to efficient levels of consumption, promoting water conservation and proper levels of infrastructure investment. Some municipalities have achieved this by implementing water-rate structures using the criteria of efficiency, accountability, transparency, fairness and ease of administration, but many others have not.
3. The goal of moving Ontario's municipal residential and industrial water customers to consumption-based water meters has largely been achieved, moving from four out of five in 1991, to 98% in 2009. For the most part, only isolated rural areas remain outstanding.
4. If the definition of full cost pricing is limited to recovering operating costs, paying debt service costs, and making an annual allocation for system maintenance and repair, most Ontario municipalities can claim that they are at or approaching "full cost pricing." If other factors are incorporated, however, such as depreciation, systems upgrading, expanded resilience and even a range of opportunity costs, there is still a considerable distance to travel.
5. Water rates in Ontario tend to be low, with water payments rarely exceeding 1% of after-tax family income, Ontario's water rates are thus highly affordable even when benchmarked against other provinces and countries. For consumers where this may not be true, there are income relief measures that can be accessed. Where economic hardship exists among water consumers, we should subsidize users of water, not the use of water.
6. Although steady progress is being made, existing water and wastewater rates will need to rise, or significant improvements in productivity will need to be realized, if water services are to achieve true financial sustainability over time.

INFRASTRUCTURE PROJECTS

7. The economic benefits of infrastructure projects need to be emphasized. Recent studies have suggested that infrastructure investment also produces significant net fiscal benefits for the Canadian taxpayer.
8. After a generation of underinvestment in water-related infrastructure, the scale of reinvestment will necessarily be large and will need to be sustained over time.

9. In addressing the infrastructure deficit, the opportunity to secure one-time or capital program funding should not be allowed to undermine the need for ongoing fiscal sustainability of water services and infrastructure. Among the due diligence cautions in determining capital projects to address the infrastructure deficit are these:

   a. The quality of the infrastructure inventories and the reliability of survey materials;

   b. Relying largely on engineering standards, without economic context;

   c. Differing perceptions of the need and cost to restore or rebuild;

   d. Fiscal and tax assumptions;

   e. Period of review; and,

   f. Operating costs and other similar variables or uncertainties (location, performance, condition assessments, etc.).

10. The eagerness to invest in infrastructure by federal and provincial governments can result in "ready-to-go" projects displacing projects with greater potential priority and benefit, but with longer lead times and approval processes. Calculations of the infrastructure deficit should be approached with similar discernment, to differentiate real investment priorities from mere historical projections or contemporary wish lists.

THE UTILITY MODEL

11. System operators and municipal authorities will need to identify alternatives to conventional sources of capital, moving away from wholesale reliance on capital grants and development charges.

12. Most water and wastewater systems have adopted the utility model, at least insofar as utility accounting and asset management practices are concerned. This progress has been accelerated by the disclosure obligations under Public Sector Accounting Board (PSAB) financial reporting and by the Ontario government's promotion of asset inventories to support PSAB reporting and the preparation of asset management plans and funding strategies.

13. Decision-making about water rates should be governed by a regulatory framework, which would ensure that over time, rates attain a level sufficient to sustain the water-related systems into the future.

INNOVATING IN WATER AND WASTEWATER SERVICES AND DELIVERY

14 Consistent with their public commitments to open data and data accessibility, the governments of Canada and Ontario must assume responsibility for collecting, analyzing and disseminating comparative information on water, wastewater and stormwater rates and the water services plans of municipalities and indigenous communities.

15 The potential impact from re-organizing and integrating water, wastewater and stormwater services on a regional or watershed basis should be explored, as should the contracting or franchising of these operations to an organization with deep resources and/or regional scope for delivery on behalf of all participating municipalities. Particularly, in the case of small, local waterworks systems, there needs to be widespread consolidation or alternatively, local systems need to be contracted to an operator with technical depth and financial resources beyond that typically available to local municipalities. This latter course is particularly applicable to isolated or remote water systems in northeastern and northwestern Ontario.

16 The nature of infrastructure is changing and will change even more rapidly in the future. New environmental risks need to be reflected in engineering designs and replacement costing. Promoting innovation, adaptability and potential for third-party funding and financing all need to be part of the strategy. Water-related facilities and systems must be built (and rebuilt) to a performance level and new standards that will reflect future requirements, including integration of water, wastewater and stormwater management, not simply replicating past practices and traditional standards.

17 The initial costs of technological improvements in the construction and operation of water, sewage and stormwater infrastructure will have to be incorporated into water rate structures, but can yield improved quality and resilience.

GLOBAL PERSPECTIVES

18 Canada's and Ontario's water policy should recognize the growing continental importance of water-source access, preservation and conservation, and new forms of economic activity related to water use. The focus should be on preserving water resources, levering competive economic advantage (especially in the Great Lakes Region), and ensuring full-cost compensation for water withdrawals. Ontario should seek opportunities to be a leader in these efforts.

EVOLUTION OF WATER POLICIES AND PRACTICES OVER A QUARTER-CENTURY

THE WATER WORLD IN 1990

In 1990, the OSWCA commissioned an independent study on the status of water and wastewater systems, including their financing, across Ontario. Released in October of that year, the report "Water and Wastewater Charges for Ontario: The User Pay Principle" was prepared by Prof. Bruce Mitchell of the University of Waterloo's Department of Geography and Environmental Management, and Michael Fortin of the firm Ecologistics in Waterloo, Ont. (referenced hereafter as the "Fortin/Mitchell" study or report).

The Fortin/Mitchell study was, in part, a follow-up theoretical and evidence-based corroboration to OSWCA's earlier 1989 slate of policy resolutions:

a. **Municipalities must raise the price of water to reflect its true cost;**
b. **Municipalities must charge for water according to the volume consumed;**
c. **Revenues received from water must be reserved and spent only for operating and maintaining the water and sewage system; and,**
d. **Senior governments must commit or arrange for special funding for catch-up where municipalities are unable to do so.**

The Fortin/Mitchell report mapped out a clear path to water and wastewater system sustainability, based on the situation as it stood at in 1990. In hindsight, it was an important contribution to the literature and public policy. At the time, however, water and wastewater services were still an infrastructure and public policy issue that was "out-of-sight and out-of-mind" for many Ontario communities and their municipal governments.

Much has happened in the water and wastewater field in the subsequent quarter-century, most notably the events surrounding and responding to the Walkerton tragedy. As we mark the 25th anniversary of the Fortin/Mitchell report, OSWCA has commissioned this independent study, to look at the progress that has been made, and the challenges that remain.

EVOLUTION OF WATER POLICIES AND PRACTICES OVER A QUARTER-CENTURY

Main findings of the 1990 Fortin/Mitchell report

The Fortin/Mitchell report identified five key issues standing in the path of water-system sustainability:

1. Investments in water and sewer systems in the preceding decade of the 1980s were about 50% of need, provincewide;
2. Then-current provincial subsidies and municipal rate structures reduced the incentives for water conservation;
3. Fixed asset depreciation accounting policies were needed in utility operations, but generally not used by municipalities;
4. Sustainability was needed, in light of emerging environmental problems; and,
5. There were few incentives to be more efficient in response to the early 1990s period of fiscal restraint.

Based on their findings, the report's authors made a number of recommendations for remedial action and future progress, with these as the most prominent:

- Provincial / municipal water conservation policies were needed;
- Universal metering and charges based on volume-of-use, using economic principles, should be implemented;
- Grant programs should be phased out; substitute alternative mechanisms to promote municipal investment in water and wastewater;
- Organize integrated water supply and wastewater services, especially at the level of system planning and system financing;
- Organize water and wastewater on a utility basis, featuring fixed asset accounting;
- Dedicate revenues from water and wastewater consumption to water and wastewater operations (rather than using water-related revenues as a general purpose municipal revenue stream, or subsidizing water operations and capital investment from general municipal tax revenues);
- The Ontario Government should regulate water and wastewater rates and the performance of water and wastewater utilities, through an existing regulatory tribunal, such as the Ontario Municipal Board; and,
- The Ontario Government should establish a stakeholders' committee of affected parties, along with municipal and provincial governments, to inform and educate the public and decision-makers about water-related issues and to evaluate alternative models for promoting water conservation.

Developments since 1990

Before Walkerton

There was steady but incremental progress to achieving more efficient water rates, sewer surcharges and conversion to residential water metering over the next decade, especially by the "upper-tier" regional municipalities assigned statutory responsibility for water and wastewater services and capital financing.

Progress was more limited in the rest of the Province, where large-scale municipal restructuring had not yet occurred, and where water services remained at the local level. In an era of municipal tax and property assessment increases, local municipal councils and their small public utilities remained very sensitive to residents' reactions to cost increases for water and wastewater services. At the provincial level, a new Progressive Conservative government, elected in mid-1995 on a platform of reduced public expenditures and eliminating annual deficits, was not inclined to make expanded investments in water and wastewater infrastructure.

OSWCA and others continued their advocacy throughout the last decade of 20th century. The water contamination crises (*Cryptosporidium*) in Milwaukee in 1993 (affecting 400,000 residents) and then closer to home, in the Collingwood municipal water system in March 1996, illustrated the risks. In a Cassandra-like moment prior to the Walkerton tragedy, NDP Leader Howard Hampton quoted OSWCA's Sam Morra with this warning to the Ontario Legislature on April 16, 1996: "Communities across Ontario will be facing problems like those in Collingwood, yet we know the money isn't there to do anything about it."

In a Cassandra-like moment prior to the Walkerton tragedy, NDP Leader Howard Hampton quoted OSWCA's Sam Morra with this warning to the Ontario Legislature on April 16, 1996:

"Communities across Ontario will be facing problems like those in Collingwood, yet we know the money isn't there to do anything about it"

Even steady progress with the installation of residential water meters, and moving away from flat-rate, monthly charges for water, did not significantly advance the case for full-cost pricing of water services. Until 1992, provincial capital grants and operating subsidies were maintained for both municipal and provincial facilities. The Province's water and wastewater facilities operator, the Ontario Clean Water Agency (OCWA),

had a continuing and expanding interest in managing local water and wastewater facilities, both those it owned and those it operated under municipal contract. These factors combined to reduce the willingness of municipal and provincial decision-makers to implement efficient water rates.

The resulting lack of revenue had the inevitable consequence of slowing investment in discretionary areas, like deferred maintenance and technological and safety-related improvements.

A warning signal of the importance of maintaining water quality came in 1996, with the *cryptosporidium* outbreak in Collingwood, Ont. Although hundreds were affected, fortunately there were no deaths and public concerns quickly abated. Although the rest of Ontario did not heed the warning, Collingwood did. Despite the expense, the municipality upgraded its water filtration system in 1998 with state-of-the-art, Ontario-pioneered, membrane technology.

Impact of Walkerton crisis

In May 2000, Ontario's complacency on this issue was suddenly and dramatically apparent. The municipal water system in Walkerton became tainted with the dangerous O157:H7 strain of Ecoli bacteria, affecting more than 2,500 water consumers, of whom seven died and many others endured long-term health effects. As if to reinforce the point for Canadian decision-makers, in April of the following year, the Saskatchewan city of North Battleford's water system was infected with *cryptosporidium*, affecting some 5,800 residents.

After the Walkerton crisis had been brought under control, the Ontario government appointed Justice Dennis O'Connor to review the circumstances of the Walkerton tragedy, with a mandate to recommend measures to prevent a repetition (O'Connor, 2002). At the same time, as Justice O'Connor noted (O'Connor 61-67), the province undertook an internal review of the Ministry of Environment and the regulation of water services, directed by former deputy minister Valerie Gibbons, focusing on adopting "best practices"(Gibbons, 2001).

The O'Connor Inquiry made many constructive suggestions in its 121 recommendations. Among the most relevant for our purposes was its advocacy for fiscal sustainability of water services, by implementing full-cost accounting and full-cost pricing. It also argued for economies of scale, on a regional, watershed or commercial basis, citing both operational and financial benefits from this approach, including overcoming the political reluctance to embrace full-cost pricing at the local level.

O'Connor Inquiry recommends full-cost accounting and full-cost pricing

To achieve fiscal sustainability, the O'Connor Inquiry report recommended that the province require a plan for water-system sustainability, as a pre-condition for operating a municipal waterworks system (and presumably, the related responsibility for wastewater services) …

> *Recommendation 47: The provincial government should require municipalities to submit a financial plan for their water system, in accordance with provincial standards, as a condition of licence for their water systems …*
>
> *The plan would depend on two components: full-cost accounting and full-cost recovery. The former is a prerequisite for the latter. Once in place, municipalities should update their plan periodically, probably on an annual basis …*
>
> *Municipalities should therefore be required to submit a financial plan that lays out the resources required to run and sustain the water system, and how those resources will be raised ... (O'Connor, 2002, at 300).*

Despite the fiscal constraints of the period, Justice O'Connor also challenged the conventional wisdom among municipalities, utilities and local water consumers that water and wastewater services should benefit from ongoing provincial subsidies:

> *Recommendation 48: As a general principle, municipalities should plan to raise adequate resources for their water systems from local revenue sources, barring exceptional circumstances. (O'Connor, 2002, at 312)*

The inquiry report also made it clear that full-cost pricing[1] included more than just the cost of ongoing operations and repairs. It extended to all aspects of waterworks system sustainability, including depreciation, replacement, upgrading, expansion and technological improvement. In an era before widespread public concerns about climate-change impacts and prudent water use, it employed those conservation arguments, despite the reality that water revenues from metering were greater when consumption was greater. By taking a full-system approach, the inquiry recognized that short-term gains from higher, often wasteful consumption rates, inevitably led to demands for very expensive capital expansions and the costly consequences of unaddressed system leakage issues. (O'Connor, 2002).[2]

The inquiry report also made it clear that full-cost pricing included more than just the cost of ongoing operations and repairs. It extended to all aspects of waterworks system sustainability, including depreciation, replacement, upgrading, expansion and technological improvement

O'Connor Inquiry on consolidation and regionalization

Some submissions made the case to the Inquiry that many local municipal waterworks systems were operated on a scale that was both physically and financially too small to be reliable and sustainable (Conservation Ontario, 2001).[3] O'Connor was persuaded by this argument, but stopped short of prescribing institutional restructuring …

> *Regionalization is a vehicle to improve the quality of the overall management and planning for a water system. It functions within a decision-making framework that allows for public accountability across the entire service region. As importantly, increasing the overall size of a water system allows for a higher level of expertise within the management and operation of the system. This also leads to greater financial strength and the ability to allocate resources to where they are most needed, whether to address infrastructure challenges or to improve source water and treatment requirements. [O'Connor, 2002, footnote # 27] On the whole, regionalization generally improves the safety, reliability, and effectiveness of water services, while preserving a measure of direct accountability for participating municipalities. (O'Connor, 2002, at 289)*

O'Connor found the case for consolidating and regionalizing water services especially compelling where municipal restructuring had already produced an upper-tier "regional municipality" (O'Connor, 2002).[4] Although administrative boundaries did not always match watershed-based conservation authority boundaries, regional municipalities typically operated on a watershed scale and had the financial and engineering capacity to operate water and wastewater systems with technical expertise and broad financial resources. Judge O'Connor concluded:

> *"First, as discussed above, regionalization allows for greater economies of scale in the operation of water systems. Second, the regional government is in a better position to coordinate the management of distribution across the entire system; it is important to coordinate water treatment and distribution since decisions that relate to one frequently impact on the other.*

> *Third, the regional government is in a better position to implement common standards of service across the service region. Further, in cases where residents in different parts of a region have different levels of services at different costs, regional representatives are in the best position to decide how new or improved service should be allocated, and how the costs should be recovered. Finally, dividing the responsibility for water services may discourage lower-tier municipalities from promoting conservation through full-cost pricing. [O'Connor Footnote #44]" (O'Connor, 2002, at 293-29)*

The Walkerton events also produced a number of consequences for the management of water systems in Ontario that went beyond the O'Connor Inquiry and Gibbons recommendations. For example, the debate about private investment in public water systems largely ended in Ontario, despite the fact that globally, private operators had both scale and expertise-in-depth to overcome the shortcomings catalogued by O'Connor. One might make the obvious observation that the Walkerton system was both very small in size and technical capacity, and publicly owned and operated (Milia, 2000).[5]

The OSWCA campaign for Bill 175/02

A number of stakeholders and advocacy groups, led by the OSWCA, pressed the Eves government to take action on the O'Connor recommendations. The government's response was Bill 175/02, known as the *Sustainable Water and Sewage Systems Act 2002*, which would have made full-cost pricing and financial sustainability plans mandatory. Despite resistance by a number of municipalities due to the cost implications, when the Act was passed, it "prompted many municipalities to look more closely at their costs and revenues" (Region of York, 2015; pg. 20). The findings of this study confirm that observation. Although the Act received Royal Assent, it was never proclaimed into law and was repealed in 2010, so the necessary implementation regulations were not enacted by either the outgoing Eves government or the incoming McGuinty administration.

However, the work of OSWCA and others had a significant effect. *The Safe Drinking Water Act 2002* element of the legislative package was implemented, and a 2007 Regulation under that Act "requires a financial plan for drinking water systems to be approved by the municipal council and submitted to the Ministry of the Environment and Climate Change. Such plans are encouraged, although not mandatory, for wastewater systems." (York Region, 2015; pg 19).

Overall, the government's approach to remediation tended to focus on improved regulation and enforcement of the existing structures, rather than on improved organizational and financial capacity. Even in the area of technical capacity, the emphasis was on training those involved in the maintenance and oversight of the existing systems, rather than expanding system capacity and depth, through reorganization, requiring increased capital investment, and deepening the ranks of available technical staff. Worthwhile initiatives included the creation of two organizations to improve the performance of Ontario's water sector: WaterTAP and the Walkerton Clean Water Centre.

Five years after Walkerton: the Swain Expert Panel

After five years of intense activity by the Ontario government, its agencies and municipal water utilities in response to the O'Connor Inquiry, the government took stock of Ontario's water services. Under Order-in-Council 1494-2004, the Minister of Public Infrastructure Renewal appointed the Water Strategy Expert Panel, consisting of experts Jim Pine, Fred Lazar and Harry Swain (Panel Chair). The Swain Expert Panel produced a report in May 2005, entitled *"Watertight: The Case for Change in Ontario's Water and Wastewater Sector"*.[4] (Swain et al, 2005, at 3,7).

Findings of Swain Panel: "Watertight" Report (2005)

Following its review, the Swain Panel made six major recommendations[5] (emphasis in original document):

> *"The Needed Reforms:*
>
> *"The panel believes that a wide range of changes to the water sector will be needed to meet the challenges ahead. We have focused on the following reforms to ensure that systems are sustainable and rates reasonable:*
>
> *"The scale and capacity of systems must increase …*
>
> *"Governance must be strong and effective ...*
>
> *"Regulation should be results-based and as light-handed as is compatible with the goal of safe, affordable water services ...*
>
> *"Systems must look to their customers for financial sustainability ...*
>
> *"Innovations in technology and training should be used to reduce costs ...*
>
> *"The Ontario Clean Water Agency should be revitalized ..." (Swain, 2005, at 11)*

"Benefits of Recommendations:

"If the panel's recommendations are adopted, and as water services move to full-cost recovery, the Ministry of Provincial Infrastructure Renewal (PIR) estimates that billions of dollars can be saved, as indicated in Table 7. The savings would accrue through economies of scale, letting costs define demand and eliminating the backlog of deferred maintenance over 10 years.

"These estimates rely on a number of critical assumptions – an asset base of $72 billion, an average asset lifespan of 84 years, an annual failure probability of 3.5 per cent for assets whose repair or replacement has been deferred beyond planned lifespan, a premium for emergency replacement of 75 per cent, and annual growth in demand in line with that assumed in the investment needs model. As a result, the table is indicative, and not a forecast. However, it shows that the actions recommended and endorsed in this report would save Ontario water services and their customers more than $8 billion over 15 years." (Swain et al, 2005, at 75)

On the fiscal and system sustainability issues, despite reasoned and well-researched findings, the Swain recommendations and the O'Connor recommendations before them, seemed to meet strong headwinds. While the recommendations called for increasing investments in water systems, and by implication, higher water rates to sustain those investments, there was often strong, local resistance to increasing rates and provincial officials were sensitive to cost increases. The result was tight budgets that rationed investment in refurbishment and improvements to existing water, wastewater and stormwater infrastructure. Likewise, public attitudes towards municipal restructuring, P3s and rising electricity rates combined to forestall organizational and governance reforms in waterworks that were seen elsewhere in the local utility sector.

Echoing the O'Connor Inquiry's call for improved, arm's-length water-system regulation, the Swain Panel's "Watertight" Report summarized the situation:

"In the water sector, however, a consistent problem in Ontario has been that municipal councils, which represent both the owners and customers of water systems, are reluctant to set rates high enough. In this situation, a regulator with the powers or mindset of, for example, the OEB would not enforce increases. ["Watertight" Footnote #21] This may explain why economic regulation is less common for government-owned than for private-sector water services. In the case of Australia, there is a regulatory framework that covers water pricing, but it focuses on both full-cost recovery – that is, ensuring rates are high enough – as well as maximum rates. ["Watertight" Footnote #22] Such concerns led to SWSSA, whose regulations will require a plan to recover full costs, based on asset management needs."[6] *(Swain, 2005, at 37, fn. 21)*

In a presentation to the Canadian Bar Association, two experts catalogued the progress made over the subsequent decade, notably in the areas of regulation, training and testing. But they observed that some of the more fundamental, underlying recommendations of the O'Connor Inquiry remained largely unaddressed, notably those related to financing and institutional/operational capacity. (Abouchar, 2010, at 12, 14)

A decade after Walkerton:

In 2010, the Ontario Government enacted the multi-faceted *Water Opportunities Act, 2010*, which among other features empowered the province to require municipalities to submit water system sustainability plans (including financial plans and asset management plans).

Those plans aimed to address the fundamental issues that gave rise to the Flint tragedy: inadequate investment in restoring, reburishing and upgrading water and wastewater systems, and failure to allocate sufficient funds to construct and operate safe and efficient water and wastewater systems.

However, the Act's substantive financial sustainability objectives depended on Regulations to give effect to full-cost pricing by municipalities and local utilities. Those proposed Regulations proved to be difficult to design, while direct Ministry regulation of rates was unpopular with municipalities, so those Regulations were not enacted (Region of York 2015, at 20).

At the same time, a Private Member's bill introduced by MPP David Caplan (*Sustainable Water and Waste Water Systems Improvement and Maintenance Act* (SWIM); Bill Pr 237/10) called for a series of reforms, including universal metering and a regime to foster economic regulation of water and wastewater rates, administered by an independent 'economic' regulator. While that Bill and a successor reached Second Reading – remarkable for a Private Member's Bill – they were not enacted into law. (Environment Probe, 19 Feb. 2010)

WATER SERVICES – A MATTER OF FINANCE AND ENGINEERING

Historically, the management of water and sewer systems has been viewed as an engineering issue rather than an economic issue. Local politicians and administrators, reluctant to use water prices to promote efficiency and conservation, have relied on technological improvements and non-price demand management tools such as restrictions on use. These are important but they are not as effective or efficient as

properly designed prices and pricing structures in generating outcomes and proper levels of infrastructure. Fortunately and recently, improvements have been made in the way in which prices are structured, and through the Public Sector Accounting Board (PSAB) requirements and asset management programs, costs are recorded and recovered through these prices. There remain, however, a number of issues around pricing, cost inclusion and infrastructure financing that should be improved.

What is full-cost pricing?

While the objective of "full-cost pricing" for water has been proposed by several reviews over the last quarter-century, there is no consensus on the definition of full-cost pricing. Many practitioners argue that full cost pricing is achieved if revenues from water and wastewater systems cover all production and maintenance costs. Most medium and large municipalities in Ontario are doing this now, although some municipalities are phasing in full-cost recovery programs over a 10- to 15-year period. Others, mainly the smaller systems, are concerned that they may not be able to achieve full cost recovery because of the impact of water rates on their customer's ability to pay (Watson and Associates with Dillon, 2012).

Others take a more expansive view of the costs of a water system, in part as a response to contemporary utility accounting practices. They also recognize that replacement costs may be greater than anticipated, due to more demanding technical specifications, greater system resilience to deal with climate change, and enhanced environmental provisions, such as those segregating stormwater run-off from sanitary sewers (e.g., combined sewer overflow cisterns). These calculations of "full-cost" would add full valuation of water-related assets and liabilities, the use of depreciation and provision for replacement, and lifecycle capital planning.

Still others argue that the current approach to full-cost pricing ignores additional costs that should be included. They suggest that the definition of annual operating and capital costs is too narrow, because it ignores the opportunity cost of water withdrawn from the natural environment, the opportunity cost of land holdings, the opportunity cost of invested capital and the harm caused by pollution (Renzetti, 2009). From an economics perspective, opportunity costs are a complete and accurate way of measuring all costs. This approach captures the return that would be generated if the resources were put into their next best alternative. Furthermore, these costs are not insignificant. To illustrate, a study on one municipality in Ontario in the

late 1990s concluded that the wholesale price for water would have to increase by at least 15 per cent and possibly by as much as 45 per cent if all of these costs were to be recovered (Renzetti and Kushner, 2001). On this basis, one may infer that most Ontario municipalities are far from full-cost pricing if all financial and social costs are to be included (Environment Canada, 2011 at 14). We are, however, closer to full-cost pricing than we were in 1990 largely because of the advances in accounting rules[7] and provincially mandated asset management programs. As well, the elimination of the provincial capital grant program in 1992[8] forced municipalities to raise their prices annually to recover an annualized portion of capital costs.

Why is the pricing structure so important?

If full-cost recovery means covering all costs, every pricing structure can achieve this. Water utilities or municipal departments can set their water rate(s) at a level budgeted to generate sufficient revenues to cover annual operating and capital costs. Each pricing structure, as discussed below, comes with a different set of incentives and leads to different outcomes. In setting water and sewer rates, however, it is especially critical that these be set with efficiency objectives in mind (Manahan, 2012); otherwise, we end up with a demand for services and subsequently, a demand for physical infrastructure that is not allocatively efficient or optimal/desirable (Kitchen 2006a).

More specifically, inefficiently set water rates lead to overinvestment and larger facilities (and obviously more costs) than would exist if more efficient pricing practices were in place (Clayton, 2014). To illustrate, in 1996, it was estimated that the dependence on provincial (Ontario) grants caused some systems to be built for a growth in population that never transpired. At the same time, municipalities collectively failed to include capital recovery costs in prices and pricing structures. Both combined to produce an overall plant capacity for Ontario's municipalities that was 44% in excess of what was needed to meet the needs at that time (Strategic Alternatives et al, 2001, at 39; and Swain et al, 2005, at 53-54).

Failure to price properly also results in considerable unplanned and implicit income redistribution, much of which would be unacceptable if it were made explicit. For example, the tendency to charge a fixed price for water, regardless of quantity consumed, on the premise that people on fixed incomes (poor and seniors) could not afford to pay, provides an implicit subsidy for higher-income households with larger lawns to water and more cars to wash. Clearly, income distribution considerations are very important but they should be handled through transfer programs that target the

poor (Boadway and Kitchen, 1999) or through special concessions such as lifeline rates for water (sometimes done through a very low first block rate) rather than changing or distorting prices where the rich frequently benefit more than the poor.

Not only have Canadian studies found that the price level affects demand (Kitchen, 2010), there is some evidence suggesting that households respond to the structure of water prices as well. For example, Reynaud, Renzetti and Villeneuve (2005) found that the sensitivity of Canadian residential water demand to a 1 % increase in price differs according to the pricing scheme used. For flat rates, demand increased by .02 %; for constant, decreasing and increasing block rates, demand decreased by 0.16%, 0.10%, and 0.25% respectively. An earlier study on the manufacturing sector concluded that firms also respond to water prices; specifically, water intake fell by 0.8% for each 1% increase in price (Dupont and Renzetti, 2001). Hence, both the price level and structure play an important role in affecting demand.

What criteria should be used for setting water/sewer rates?

The underlying objective behind water and sewer rates is straightforward: those who benefit from local infrastructure and the service it provides should pay for it. (Canadian Consortium, 2015, at 16-23; Kitchen and Tassonyi, 2012; Manahan, 2010b and 2012) This approach is particularly important because it has the ability or capacity to satisfy five important criteria. These are described in Box 1.

Box 1: Criteria for setting water, sewer and stormwater rates

Efficiency[9] is achieved when the price or fee per litre of water equals the extra cost of the last litre consumed. This is the well-known marginal cost pricing principle. The price per litre, by definition, is an expression of what consumers are willing to pay and marginal cost, by definition, measures the cost of resources used up in producing that additional litre.

Perhaps this can be illustrated by reference to a simple example. Suppose the extra (marginal) cost of producing the last litre of water is 10 cents and customers are willing to pay 15 cents for it. This is not an efficient level of output because the value that customers place on this litre is greater than the cost of producing it. In other words, the community is the beneficiary of a net gain of 5 cents for this litre. Collectively, the community would be better off if water consumption increased as long as the price paid for each additional litre exceeded the cost of producing that litre; that is, for each of these units, marginal benefit would exceed marginal cost— a net gain.

If, on the other hand, the marginal cost of producing the last litre is 10 cents and customers are only willing to pay five cents for it, this is not an efficient level of output either. The benefit that customers get from this unit is less than the cost of the resources used up in producing it and the community is worse off – worse off by 5 cents for this unit. As long as the extra cost of producing the unit is less than its price, too many resources are being devoted to its production. It follows, then, that resource efficiency is achieved where marginal cost equals price because this is the point where the community secures the greatest net gain.

At this point, it is worth noting that one study on 77 water utilities in Ontario (Renzetti, 1999) estimated that the marginal cost of water supply exceeded the price for water in every municipality studied. More specifically, the average price to residential customers was $0.32 per cubic metre while the estimated marginal cost was $0.87 per cubic metre. By comparison, the average price for the non-residential sector was $0.734 per cubic metre and the estimated marginal cost was $1.492 per cubic metre. At the same time, the average marginal cost of sewage treatment was $0.521 per cubic metre while the average price was $0.128 per cubic metre. Evidence such as this can easily lead to the conclusion that we

have larger water and sewer systems than we would have if more efficient prices had been in place. The main economic reason for imposing correctly designed water prices is to provide an incentive to the provider and the consumer to use resources in the most efficient manner.

Accountability is most easily achieved when there is a close link between the beneficiaries of a government service and payment for that service. The principal advantage of linking expenditures to user fees is that the cost of a service may be seen clearly by beneficiaries. Consumer demand, then, is based on some knowledge of service costs and a realization of what must be paid for its consumption — people know what they are getting for the fee charged and better able to judge whether the expenditure is appropriate. Prices or fees assist local managers in determining efficient or optimum service levels. Whenever a price or charge for a unit of service is linked to its per unit cost of provision, consumers have enough information to determine desired levels and hence, managers are able to provide these levels. Accountability is best achieved if revenues are earmarked for specific services, such as water and sewers.

Transparency is an extension of the accountability argument. Transparency is enhanced when citizens/taxpayers have access to information and decision-making forums so that the general public is familiar with the way in which user fees are set. Emphasis on transparency is intended to mitigate the risk of corruption by making information available and by ensuring that all public policy decisions are made in an open and transparent manner (International Monetary Fund, 2001).

Fairness is achieved because those who consume the service pay for it, just as someone who benefits from a private good such as a litre of milk or a movie ticket pays for it. Concerns about the burden on low-income individuals should be addressed, as was noted above, through income transfers and social assistance programs targeted to individuals in need or through so-called "lifeline" water rates, not through arbitrarily set water rates that are lower than efficiently set rates.

Ease of Administration is achieved when the rate is not confusing to understand and does not require an unnecessary amount of time and effort to administer.

How should water rates be set?

In principle, water rates should be set so that the charge per litre equals the extra cost of producing the last unit; that is, price equals marginal cost. In practice, prices may have to deviate from the straightforward price equals marginal cost principle. For example, how should water rates be set when marginal cost is not calculated; when economies of scale are prevalent; when capacity constraints are a reality; when demand differs in peak and non-peak periods; and when distance from source of supply affects costs (Bird 2001; Bird and Tsiopoulos, 1997; Kitchen and Tassonyi, 2012). These are discussed next.

What if marginal costs are not calculated?

If marginal costs are not calculated, either because the data are not available in a form that permits its calculation or if the equating of marginal cost to price generates a financial loss (as it would if marginal cost were lower than average cost), one solution is to set price equal to average cost. Every water provider knows its average cost. Average cost pricing simply takes the total cost and divides it by the number of units currently produced to obtain the price per unit. A positive feature of this approach is that prices are easier to calculate especially if only financial costs are considered as is almost always the case.

However, average cost pricing produces some important differences when compared with marginal cost pricing. If average cost is declining, too little of the good is provided and the price is too high. If average cost is rising, too much of the output is produced and the price is too low. In either case, an inefficient level of output results. Only if marginal and average costs are constant (the same regardless of the level of output) will the average cost generate the efficient level of output. In spite of potential efficiency losses, average cost pricing is the most common practice.

Average incremental cost pricing is a variant of average cost pricing. Like marginal-cost pricing, it attempts to calculate the cost of providing the service to an additional user, but the calculation in this case is an easier one for public sector managers to estimate. Briefly, the calculation divides all of the additional costs associated with providing an increased level of service to an area or neighbourhood by the anticipated number of additional users. Each user is charged the average of the incremental total cost. This approach does not amount to marginal cost pricing in the strict sense but it may be as close as one can get in practice.

What if economies of scale exist?

If economies of scale[10] are prevalent, equating price to marginal cost results in annual operating losses. This loss has to be subsidized by other local revenues – a solution that for political reasons is unlikely to be adopted and almost certain to be allocatively inefficient, since the subsidy will likely come from taxes that create distortions elsewhere.

A feasible alternative in many instances – one that is both economically efficient and should be politically acceptable – involves adopting a two-part price. In its simplest form, the price consists of a variable charge equal to the marginal cost of the last unit consumed and a fixed charge for gaining access to the service. The variable charge, if correctly set, ensures that the level of consumption is efficient (or as close to it as possible), and the fixed charge provides enough revenue to cover the fixed costs without distorting consumption choices. More complicated versions include more than two pricing variables. Multi-part pricing policies are often used for utility services, since they have substantial fixed production costs and declining average and marginal costs.

What if capacity constraints exist?

Capacity constraints arise when the service provided by a given infrastructure is limited. If capacity is uneven and can be expanded only in discrete amounts, marginal-cost pricing will typically lead to under or overprovision relative to the efficient level. Here, when consumption presses on capacity, the price should be raised to allocate the limited supply efficiently. This approach justifies a price above short-run marginal cost whenever consumption is at or close to capacity. Peak-load pricing (see next topic), time of use pricing and seasonal pricing are mechanisms to implement this approach and provide enough revenue to help cover fixed costs.

Although generally more difficult to implement, there is another approach to setting prices above marginal cost to fund fixed costs. Since prices will be too high, consumption will be less than its desirable level. The lost satisfaction from reduced consumption can be minimized if there are several classes of consumers, by raising the price the most for those whose demand is most inelastic,[11] meaning that they will not reduce their consumption much in response to high prices — this is known as Ramsay pricing (Church and Ware, 2000, ch. 25).

What about peak periods?

Efficient pricing calls for higher fees in peak periods and lower fees in off-peak periods. This arises because peak demand strains capacity and only lasts for a fraction of the demand cycle. The marginal benefit to peak users occurs over only a portion of the demand cycle, whereas the marginal cost of capacity expansion is incurred over the entire demand cycle which means that the marginal benefit to peak users exceeds their marginal costs. In addition, since off-peak users gain no additional benefit from capacity expansion, the additional capacity costs should be shouldered entirely by peak users. In other words, the off-peak price should be set equal to marginal operating costs while the peak price should be set equal to the sum of marginal capacity and operating costs.

What if distance from source of supply affects costs?

The marginal cost generally increases with distance from the source of supply. If the unit price or rate does not vary to reflect this circumstance, users with lower marginal costs subsidize users with higher marginal costs. If this subsidy is capitalized into land values, the properties that are farthest from the source will be priced higher than should otherwise be the case. One way in which to prevent this outcome is to impose differential fees on customers in remote or more expensive areas.

Have rate structures changed in the past 25 years?

Water rates in Ontario have been characterized by two general structures for the past 25 years – flat rates that do not vary with consumption and a variety of volume-based charges. Each of these is discussed below with an emphasis placed on the incentives that each structure creates for improving efficiency and leading to conservation practices along with the change in their use since 1990. All systems can be accountable and transparent as long as revenues are deposited in accounts that are dedicated to funding water and sewer capital and operating costs. All volume-based structures are fair as long as those who use the service are those who pay for the service. Flat rate charges are not fair on this basis because the payment for water is not related to consumption. Box 2 comments on data availability (or lack thereof) in assessing the change in water rates and consumption over time.

Box 2: A Note on Data Availability

Given the rising importance of water services in the 21st century, one might assume that the resources devoted to data collection and analysis by federal and provincial agencies and water-related associations would be sustained and expanded, and the outputs would progressively improve in quality, reliability and usefulness. Unfortunately, that does not appear to be the case.

Somewhat surprisingly, researchers and policy makers will find that the traditional source of survey and analysis on water and wastewater services in Canada, Environment Canada, discontinued publishing its work, with the 2009 survey (reported in 2010 and 2011). For their part, the Ontario Ministry of Environment and Climate Change or other provincial ministries and agencies (which routinely collect all manner of municipal data and plan documents) do not have publicly available information on comparative water rates, water consumption and full-cost pricing. Given the considerable (and encouraging) efforts that have gone into ensuring that municipalities develop plans for both asset management and water-system planning over the past 15 years, it would appear logical to make public those results on a comparative basis (e.g., progress towards full-cost pricing, cataloguing of rate structures, expansion of water metering, reductions in water consumption and energy consumption, etc.).

In the absence of such information, we have used samples from disparate municipal data sources and projections based on anecdotal evidence, supplemented with interviews and inquiries. While it makes comparison to past, more comprehensive data sets less consistent and reliable, we believe that our approach has proved sufficient for the task at hand. Furthermore, from this miscellaneous collection of material and information, it is apparent that the statistical pattern noted in the data from 1991 to 2009 has continued since 2009. As an example, the City of Peterborough was not metered in 2009 but is now metered. Actions such as this support the trends noted in the following tables.

In addition, we believe that the issues addressed in this study are important, and so are the data necessary to understand them. Federal and provincial governments are best positioned, both in vantage point and resources, to restore

this important basis for making evidence-based policy decisions, especially with the federal government's renewed interest in investing in infrastructure and addressing climate-change impacts. Municipalities and utilities often complain about intrusion in their affairs by other orders of government and their agencies. In this area, a return of federal involvement should be encouraged and welcomed.

Flat rates

Flat rates are the simplest rate structures to administer and understand. Flat rates are fixed payments per billing period, unrelated to volume consumed but may vary by customer class (residential vs. commercial) and property type, such as the number and types of rooms, the size of the lot, the number of water-using fixtures, whether or not there is a swimming pool, and so on. For flat rate charges, meters are not required because the water price is not related to consumption. In a few very small municipalities, water rates may be based on assessed property values.

Because the rate is unrelated to volume consumed, there is no incentive to economize on the use of water or to engage in conservation practices such as fixing leaking taps, turning off sprinkler systems during rainstorms, not washing cars excessively and so on. In municipalities where flat rates have been used over the past 25 years, average daily residential consumption per capita has been considerably higher than in municipalities where volume-based charges have been used (Table 1). In fact, as reported in column 4 of Table 1, the average daily residential consumption per capita under flat-rate systems exceeded volume-based consumption by something between 37% and 133%, depending on the year. Regardless of the rate structure, however, water consumption per household in most Canadian cities has declined over the past two decades, largely because of two initiatives — higher water rates and a variety of water-conservation initiatives.

Perhaps most significant for purposes of this study, flat-rate charges have almost disappeared in Ontario. In 1991, 18.6% of the residential population with water systems was served by flat rate pricing structures (column 2 of Table 2). By 2009, only 2.1% of the residential population was served by flat rate charges, a considerable decrease from the early 1990s. This is illustrated in Figure 1, on pg. 39.

Table 1: Residential Flat Rate vs. Volume-based Rate Average Daily Flow (ADF) Ontario from 1991 to 2009

Year (1)	Flat ADF in litres per capita (2)	Volume ADF in litres per capita (3)	Percent by which flat rate use exceeds volume based use (4)
1991	392	234	67.5%
1994	412	230	79.1%
1996	416	239	74.1%
1999	428	254	68.5%
2001	425	258	64.7%
2004	573	246	132.9%
2006	495	249	98.8%
2009	302	221	36.7%

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, selected years. Reported in the Table called "Residential Flat versus Volumetric Rate Average Daily Water Use Per Capita . . ."

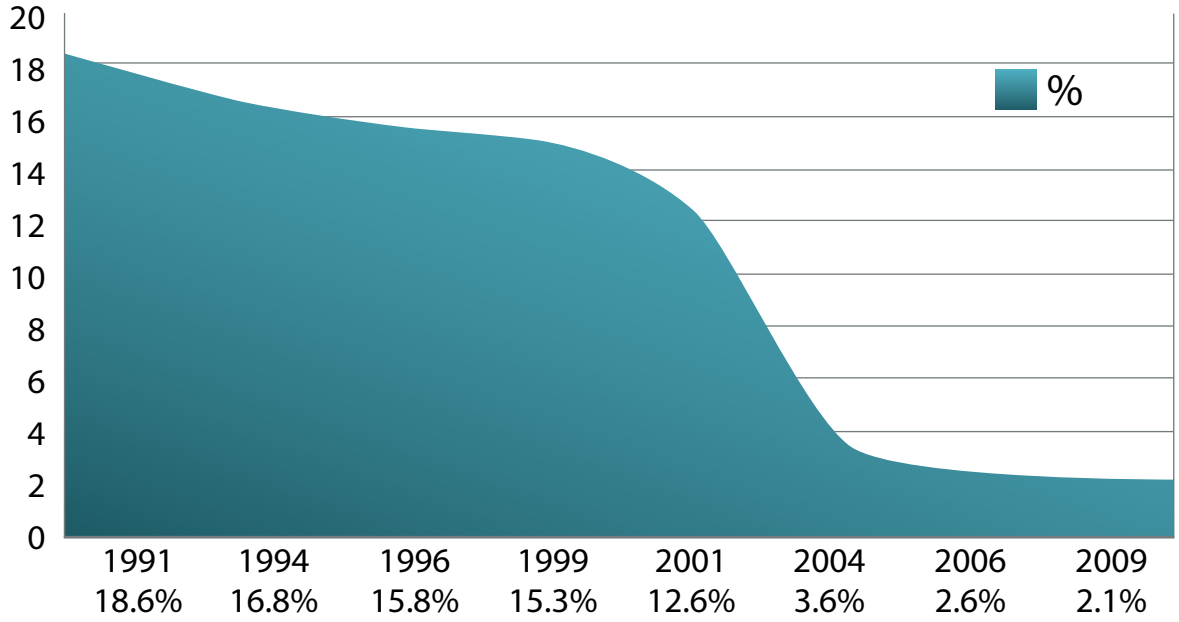
Table 2: Residential Water Rate Structure: Percentage of Population Served by Each Rate Structure in Ontario from 1991 to 2009[1]

		Volumetric Rates				
Year (1)	Flat Rate (2)	CUC[2] (3)	DBR[3] (4)	IBR[4] (5)	Complex[5] (6)	Total Volume[6] (7)
1991	18.6%	52.7%	23.3%	4.1%	1.0%	81.4%
1994	16.8%	61.5%	11.9%	4.9%	5.0%	83.2%
1996	15.8%	62.8%	11.2%	5.1%	5.0%	84.2%
1999	15.3%	63.1%	11.7%	4.8%	5.0%	84.7%
2001	12.6%	45.6%	1.2%	39.0%	1.5%	87.4%
2004	3.6%	55.8%	3.8%	36.8%	—%	96.4%
2006	2.6%	51.8%	9.8%	35.8%	—%	97.4%
2009	2.1%	79.6%	8.7%	9.6%	—%	97.9%

(1) Note: Prior to 2009, municipalities that had more than one pricing scheme (for different water-distribution systems or different areas of the municipality) only reported the one which applied to the largest number of people. For 2009, all of the pricing schemes and their associated populations were reported. 2009 is the last year when data were collected. (2) CUC is constant unit charge. (3) DBR is declining unit rate. (4) IBR is increasing unit rate. (5) Complex systems have decreased in popularity and are no longer reported as a separate category. They may combine two different DBRs (one for residential and one for commercial) onto one schedule or they may arise if sewer charges are calculated on the basis of block limits that differ from block limits used for the water-rate schedule. (6) Total may deviate because of rounding.

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, selected years. Reported in the Table called "Residential Population Served Water by Rate Type, by Province . . ."

Figure 1: Flat Rates – % of Ontario Populaton Served



Volume-Based Rates (VBR)

Volume-based rates link the amount paid for water to the amount of water consumed. They require the use of meters. Box 3 comments on the importance of water meters.

Box 3: The Importance of Meters

Meters are important because they provide customers with an incentive to consume less water while, at the same time, assuring customers that they are only paying for the water they consume. Conversely, failure to use meters means that customers have less incentive to conserve water. Indeed, this was observed in the data in Table 1.

The impact of metering on water consumption has been addressed in a few Canadian studies. The results uniformly suggest a decline in water use with the introduction of water meters. The usual pattern is for consumption to fall substantially after meters are installed and then to rebound somewhat as consumers become familiar with the new pricing scheme. The ultimate impact of metering depends on the post-metering water pricing regime. In general,

the early studies concluded that a 10% increase in price caused a two to four percent reduction in the indoor demand for water (Tate, 1990). More recent studies found that outdoor residential use in the summer declines by around ten percent (Strategic Alternatives et. al., 2001, at 33) or more (Renzetti, 2002, at 22 and 33). This suggests that differential prices are effective in reducing peak demand (Report, 2005, at 55) during the summer months. As well, different classes of users respond to higher prices in different ways with industrial users being more sensitive to water pricing than residential customers (Mayer et. al., 1999). All consumers, however, are more responsive to water prices over the long run if increases are deemed to be permanent - they invest in or buy equipment or appliances that use less water (Renzetti, 2002, at 29).

The major technological innovation in metering has been the advent of remote reading of domestic meters, which reduces staff time needed to read meters and avoids the issues caused by delays in timely meter reading for meters that are not easily or externally accessible. In addition, residential water consumption remains a good surrogate for sewage flows, in the absence of wastewater flow meters. In future, the metering innovations are more likely to come in the areas of more sophisticated monitoring stormwater flows, especially in legacy combined sanitary/storm sewers, or identifying wholesale water loss due to leakage, or in ensuring adequacy of water flow and water pressure for fire suppression purposes.

Since meters are the pre-condition for consumption-based water-rates, the installation of meters had been opposed throughout the 20th century in older cities by those who paid flat rates and who assumed that installing meters would inevitably lead to paying higher costs for water and wastewater services. From the vantage point of 2016, however, those battles of the 1990-era to compel homeowners and small business owners to install meters are largely won. Some compromises, such as installation only on change of home ownership, or retention of significant residual block charge components in transitional rates, have likewise eroded with the passage of time.

Volume based rates take a variety of forms including constant unit charges, decreasing block rates, increasing block rates, or some combination of these. For a discussion of the efficiency and conservation impacts of each volumetric structure, the reader is referred to Appendix "A". As noted in column 7 of Table 2, the use of volume-based

charges and hence, meters covered about 98% of the residential population served by water utilities/departments in 2009, up from a little over 81% in 1991. This is illustrated in Figure 2.

Figure 2: Volumetric Rates – % of Ontario Populaton Served

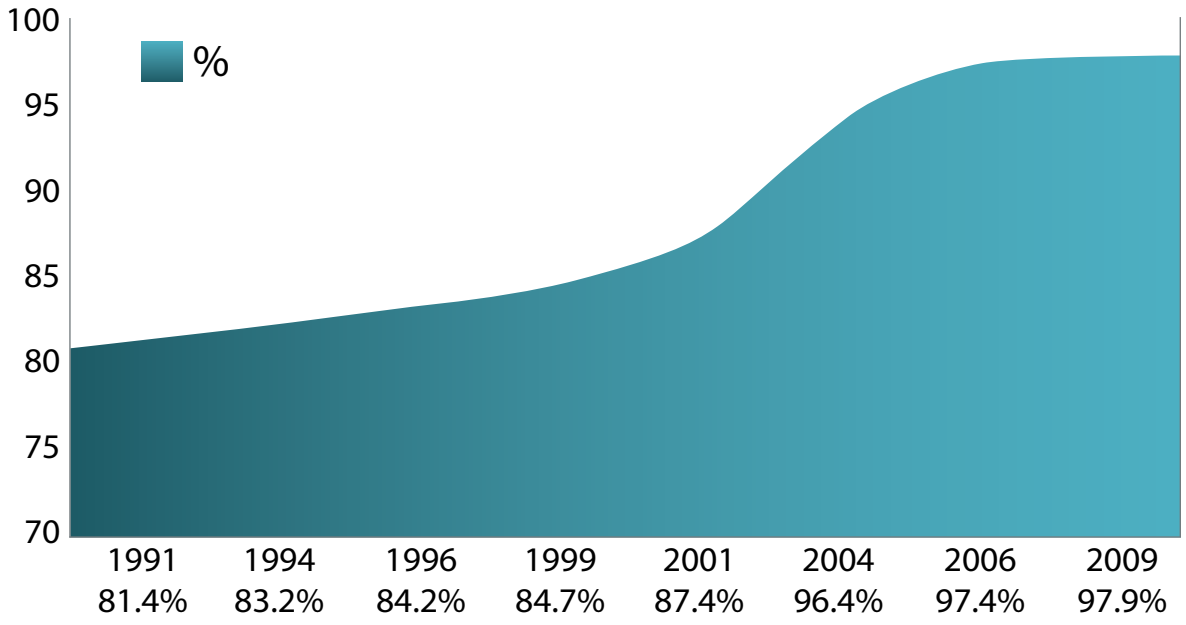


Table 3 records the use of volumetric rates for business properties for the period from 2001 to 2009 in the six largest provinces (data were not available before 2001). Meters for commercial properties in Ontario covered close to 100% of all properties over the decade. This was comparable to Saskatchewan and Manitoba, slightly higher than British Columbia and Alberta and much higher than in Quebec where meters were used for less than 50% of business properties. The lower use of meters in Quebec arises because water systems are largely funded from the general property tax base — a practice that is not permitted in Ontario.

Constant unit charges (CUC) are, by far, the most common volume-based charge (column 3 of Table 2). It served almost 53% of the population in 1991, rising to more than 60% through the remainder of the 1990s before falling to about 45% in 2001 and then rebounding to almost 80% by 2009.

Table 3: Percentage of Business Properties that were Metered in the Six Most Populated Provinces, 2001 to 2009[1]

Year	Ontario	Alberta	British Columbia	Saskatchewan	Manitoba	Quebec[2]
2001	98.4%	98.9%	93.9%	99.6%	98.6%	32.8%
2004	98.2%	98.9%	87.1%	98.9%	96.7%	34.9%
2006	97.5%	88.6%	81.7%	98.9%	97.2%	36.6%
2009	97.3%	91.2%	85.9%	98.2%	96.8%	46.0%

(1) The data were not available for the years prior to 2001. (2) Metering is lower in Quebec because water systems are largely funded from the general tax base — a practice that is not permitted in Ontario

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, selected years. Table 1 in each report

Declining block rate (DBR) structures generally include a basic or fixed service charge per period combined with a volumetric charge that decreases in blocks (discrete steps) as the volume consumed increases (the more you use, the less you pay per unit). DBRs were more common in the 1990s than they are now. Their use fell from servicing more than 20% of the population in 1991 to serving less than 5% in the early 2000s before rising to around 8 to 10% by 2006 and 2009 (column 4 of Table 2).

Increasing block rate (IBR) structures are the opposite to DBRs in that the more you use, the more you pay per unit. IRBs were not very prominent in the 1990s, accounting for 5% or less of all water systems (column 5 of Table 2). In the early 2000s, their reported usage increased dramatically rising to between 35 and 40% of all systems. By 2009, their reported use had decreased to less than 10%. It is not clear why this dramatic decline, but it may have been partially triggered by a change in reporting methodology (see note in Table 2).

Seasonal-rate systems and peak-load demand rates are used in some municipalities. As well, municipalities often use variations or combinations of the pricing structures described above. Two-part pricing schemes, for example, are fairly common. They consist of a fixed charge designed to cover costs of meter reading, billing, customer accounting, and capital and maintenance costs of meters plus a constant commodity charge applied to all consumption. Another variant is the "lifeline" rate which is an artificially reduced price for a minimum amount of water that is deemed to be required for essential water consumption. It is designed to assist low-income households. Lifeline pricing is most common in cities with a fixed charge as all customers must pay

the fixed charge regardless of consumption. Other variants include "vintage" rates, which distinguish between new and existing customers, or seasonal or peak-demand rates to reflect increased cost of delivery or a desire to reduce consumption during certain seasons or times of the day. A few municipalities have combined components of residential and commercial pricing systems into one schedule.

Sewer rates

Sewage collection and treatment expenses are almost always recovered through surcharges on water bills, not on sewage flow. Flat-rate charges are the most common type. Not only are these used in municipalities with flat-rate water charges, but they are also used in municipalities with metered water rates. For other municipalities, the sewage charge is a percentage of the water bill.

Where sewage charges are unrelated to the volume of sewage discharged and treated, economic efficiency is almost certain to be violated. The design of an optimal pricing scheme for sewage requires detailed knowledge of the incremental cost of collecting and treating it. A multi-part pricing structure best approaches the efficient pricing principle, "...with, for example, a connection fee to cover per unit average costs for transmission and treatment capacity, a front footage charge to cover collection costs, and a monthly fee, preferably related to water usage, to cover out-of-pocket operating charges" (Bird, 1976, at 125). In fact, one could vary the connection fee to reflect higher costs of servicing areas that are a considerable distance from the sewage treatment plant.

In practice, pricing schemes for sewage collection and treatment are far from optimal. Seldom is there any attempt to separate the costs associated with treatment, collection and transmission of sewage. In a few municipalities, particularly larger ones, a surcharge is imposed on industrial users because industrial waste is generally denser and contains a more damaging discharge and hence, is more expensive to treat. Flat-rate charges are inefficient because they do not capture the marginal cost of the service. Charges prorated on the basis of the water bill are inefficient because they fail to reflect accurately the marginal cost of sewage disposal. The assumption that water is directly and positively correlated with sewage generation may not be accurate. For example, a large component of water consumption may be attributed to lawn sprinkling, car washing, swimming pools and many other household uses, almost all of which are unrelated to sewage generation; that is, the run-off generally goes into the stormwater system, not the sanitary system, unless the sewers are combined.

Like the underpricing of water, the underpricing of sewage collection and treatment leads to a higher level of use than is allocatively efficient primarily because there is no incentive to restrict use. Underpricing has also led to investment in sewage treatment facilities that are larger than they would be under a more efficient pricing policy (Renzetti, 1999). One empirical study on pricing of sewage by Norwegian local governments (Borge and Rattso, 2003) showed that sound user charge financing of sewer services significantly reduced the cost of providing sewer services. Finally, it has been observed that underpricing of both water supply and sewage treatment has discouraged the development of alternative water and sewage treatment technologies (Gardner, 1997; and Postel, 1993).

Rates for stormwater

As noted elsewhere, there is a close inter-relationship between stormwater run-off and water-related utilities. Surface water is a direct source of potable water for some water systems, and its impact on the recharging of aquifers affects the groundwater sources of many municipal and private drinking water systems. Many older waterworks systems are still working to separate stormwater and sanitary sewage carried in the same pipes, either routinely, or during peak flows. These combined flows must, of course, be treated as sanitary sewage when they reach the end of the pipe, creating significantly higher demands on sewage treatment plants and overflow cisterns. The majority of municipal water departments and utility corporations in cities and towns in Canada do not have a separate charge for stormwater. It is lumped in with the wastewater charge and calculated as part of water consumption. This aggregation, however, means that consumers don't know what they are paying for stormwater management.

Since 1990, with the increasing impact of climate change (severe storms and flooding), there are design requirements for more robust and resilient systems, and correspondingly, increased funding required for stormwater infrastructure (sewers, spillways, retention and detention ponds, etc.) and where they persist, for separation of sanitary sewers from storm sewers. These developments have given rise to a desire by some municipalities to convert stormwater facilities to a utility model, supported by "user" charges. More specifically, it has been suggested that (BMA Study for the City of London and reported in LAC & Associates, 2015, at 23):

- Stormwater users are properties that add runoff or are served by the provision of stormwater services.
- Beneficiaries are those who benefit from stormwater management.
- Service fees are dedicated charges paid by stormwater generators based on the estimated amount of water that leaves their property or in relation to the services that they receive.

An Ontario pioneer in stormwater management user fees is the City of Kitchener (paralleled by the phased implementation program of its neighbour, the City of Waterloo). Since that time, treating stormwater as a utility function has been embraced by other progressive municipalities, including the Town of Richmond Hill (effective 2013) and the City of Mississauga (effective 2016).

Kitchener's Stormwater Management Utility Program:

> *"In 2010, following public consultation and input, the City of Kitchener, in southwestern Ontario, introduced a new structure for stormwater management under its Stormwater Management Utility Program. A tiered flat-fee stormwater rate is applied to properties based on their 'impervious' area, which directly correlates to a property's contribution of runoff volume to the collection system. This new rate structure encourages stewardship for property owners and allows them to qualify for stormwater rate credits." (Canadian Consortium, 2014, at 16)*

HOW HAVE PRICES AND SPENDING ON WATER CHANGED?

There are a number of ways in which one might measure the change in water/sewer prices and spending over time. Table 4 records the monthly residential water rate per cubic metre for Ontario for the period from 1991 to 2009. Here, it may be noted that the price per cubic metre more than doubled under almost all of the measures.

Table 4: Residential Price per Cubic Metre for Water and Sewers, Ontario 1991 to 2009

	Constant Unit Charge[1]				First Block Prices[1]				Last Block Prices[1]			
	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.
Year	$	$	$	$	$	$	$	$	$	$	$	$
1991	0.81	0.76	0.48	1.21	0.70	0.72	0.41	0.92	0.54	0.56	0.29	0.80
1994	0.92	0.87	0.62	1.39	0.85	0.92	0.40	1.00	0.66	0.65	0.36	1.11
1996	0.94	0.93	0.74	1.36	0.97	0.92	0.50	1.47	0.76	0.65	0.36	1.58
1999	0.98	0.98	0.68	1.32	0.98	0.93	0.57	1.47	0.79	0.70	0.36	1.58
2001	1.17	1.17	0.82	1.49	1.16	1.18	0.90	1.47	1.22	1.22	0.90	1.58
2004	1.16	1.00	0.73	1.56	1.23	1.23	0.90	1.69	1.24	1.27	0.72	1.88
2006	1.35	1.25	0.85	1.98	1.28	1.42	0.91	1.42	1.24	1.47	0.67	1.47
2009	1.98	1.89	1.33	2.53	1.43	1.50	0.53	1.89	1.34	1.43	0.75	1.65

(1) All prices include the costs for both water and sewer services where available. Mean is the average of all water and sewer operations. Med. is the median or mid value for all water and sewer operations. 10th Per. is the value at the tenth percentile. 90th Per. is the value at the tenth percentile.

Source: Same as Table 1.

Table 5 records water prices for 2011 to 2015 for a handful of Ontario municipalities. As the reader will observe, prices vary widely. Some municipalities use only variable charges (Toronto, Mississauga, Brampton, Markham and Vaughan). Some have both a fixed charge and a volumetric charge. Where fixed monthly charges are high, Sarnia for example, volumetric charges are low. London, as with some other cities, has a lifeline rate (first seven cubic metres per month are free) to assist low-income users.

Table 5: Average Water Rates for 20 Cubic Metres Per Month in Selected Ontario Cities, 2011 to 2015

	Ottawa		Markham		Hamilton[1]		London[2]		Toronto	
	Fixed Water Rate.	Variable Cubic Metre	Fixed Water Rate.	Variable Cubic Metre	Fixed Water Rate.	Variable Cubic Metre	Fixed Water Rate.	Variable Cubic Metre	Fixed Water Rate.	Variable Cubic Metre
Year	$	$	$	$	$	$	$	$	$	$
2011	2.63	2.8644	n.a.	2.2129	16.16	1.7127	12.24	3.0422	n.a.	2.2842
2012	2.73	3.038	n.a.	2.4164	16.84	1.7856	13.11	3.2701	n.a.	2.4897
2013	2.93	3.2507	n.a.	3.6277	17.56	1.86	14.03	3.515	n.a.	2.7137
2014	3.14	3.4785	n.a.	3.0649	17.64	1.96	38.01	2.54	n.a.	2.9579
2015	3.33	3.6868	n.a.	3.3154	18.25	2.05	42.11	2.72472	n.a.	3.195

	Peel Region (Mississauga Brampton)		Vaughan[3]		Thunder Bay		Sarnia		Windsor	
Year	$	$	$	$	$	$	$	$	$	$
2011	n.a.	1.52517	n.a.	2.4084	29.335	2.1105	67.77	0.4248	—	—
2012	n.a.	1.64987	n.a.	2.624	31.3	2.2523	67.77	0.4248	—	—
2013	n.a.	1.7577	n.a.	2.8347	33.51	2.4115	67.77	0.4248	—	—
2014	n.a.	1.64987	n.a.	3.0856	35.53	2.5568	71.23	0.4473	—	0.429
2015	n.a.	2.02817	n.a.	3.391	39.76	2.8595	72.96	0.4582	—	0.477

(1) Hamilton has a tiered rate. The rate in this Table is a blended rate. For 2015, the rate on the first 10 cubic metres was $1.37 per cubic metre and, on subsequent cubic metres, it was $2.73. (2) London has a tiered rate; however, the first 7 cubic metres per month are free – referred to as a lifeline rate. (3) A minimum monthly charge of $16. (n.a.) – fixed charges do not apply.

Source: "City of Ottawa – Water and Wastewater Rate Review Study," LAC & Associates Consulting, Ottawa, October 2015, Annex 2.

Table 6 is another way in which one might compare residential spending on water. In particular, it records mean (average) and median monthly residential spending at specific consumption levels (10, 25 and 35 cubic metres) along with expenditures at the tenth and ninetieth percentiles for the same years. Like Table 4, mean and median expenditures more than doubled over this period. For commercial water rates (Table 7), prices increased modestly for 10 cubic metres, more than doubled for 35 cubic metres and in some cases tripled for 100 cubic metres. In every scenario, water rates increased and spending rose over the two decades; some might even say significantly. This is not surprising because increased prices and spending have been driven by a number

of factors not the least of which is the higher cost of labour and materials, increased emphasis on improved treatment especially from large industrial consumers, greater monitoring and reporting requirements to meet tougher legislative requirements, and a reduced reliance on provincial grants for capital purposes which has forced municipalities to carry a higher proportion of rehabilitation costs and to recover them through higher water rates.

Table 6: Residential Water Prices (dollars per month) for Selected Volumes of Service in Ontario, 1991 to 2009

	10 cubic metres per month				25 cubic metres per month				35 cubic metres per month			
	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.
Year	$	$	$	$	$	$	$	$	$	$	$	$
1991	11.92	12.20	6.53	15.80	23.82	23.33	14.40	34.00	31.91	30.93	20.60	46.60
1994	14.42	15.00	8.20	22.00	27.65	27.14	20.50	40.13	36.58	34.67	26.23	53.20
1996	15.18	16.00	8.00	20.00	29.04	30.00	20.00	40.00	38.51	39.00	28.00	51.00
1999	15.59	15.52	7.50	21.31	30.00	30.45	18.75	39.96	39.83	39.15	26.25	54.45
2001	18.97	19.27	10.03	23.74	34.52	38.63	20.46	42.16	45.19	50.80	28.64	56.91
2004	23.46	15.56	8.86	40.17	41.11	32.74	22.15	63.79	53.50	43.65	31.01	77.77
2006	23.28	14.91	10.58	62.13	43.07	35.75	26.46	74.90	56.55	50.44	37.04	83.41
2009	25.31	20.02	13.32	43.32	53.52	47.29	33.31	75.04	72.41	66.20	46.63	103.95

Mean is the average of all water operations. Med. is the mid value for all water operations. 10th Per. is the value at the tenth percentile. 90th Per. is the value at the ninetieth percentile.

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, selected years. Reported in the Table called "Residential Prices ($ per month) for Volume Based . . ."

Table 7: Commercial Water Prices in (dollars per month) for Selected Volumes of Service in Ontario, 1991 to 2009

	10 cubic metres per month				25 cubic metres per month				35 cubic metres per month			
	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.
Year	$	$	$	$	$	$	$	$	$	$	$	$
1991	23	20	9	41	36	32	16	56	71	68	20	129
1994	26	24	10	44	40	38	17	61	82	84	24	138
1996	27	24	11	48	42	41	19	67	84	87	24	141
1999	29	26	13	49	45	43	20	74	91	90	28	149
2001	37	28	12	58	54	46	22	80	101	91	28	162
2004	38	28	10	63	58	50	22	97	110	101	28	207
2006	40	36	9	70	62	52	24	99	124	115	32	216
2009	26	20	13	42	74	66	47	105	200	189	133	263

Figures are rounded to the nearest dollar. Mean is the average of all water operations. Med. is the mid-value for all water operations. 10th Per. is the value at the tenth percentile. 90th Per. is the value at the ninetieth percentile.

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, selected years. Reported in the Table called "Commercial Water Prices ($ per month) for Volume Based . . ."

Whether this increase is significant is a debatable question. To shed light on this, let's cast this pricing and spending pattern another way. Take the average monthly spending on water at each cell in Table 6 and multiply it by 12 to obtain an estimate of yearly spending for 10, 25 and 35 cubic meters respectively. Next, take the yearly expenditures for each cubic measure as a percentage of after-tax economic family income. This is a definition of a family unit that is used by Statistics Canada. These percentages are reported in Table 8 for three different consumption levels. Depending on the measure and the year, spending on water seldom exceeded 1% of after-tax family income. More specifically, it only exceeded 1% for the 90th decile of users at 25 and 35 cubic metres and only since 2004. And it amounted to 1% of after-tax family income for the mean and median user at 35 cubic metres per month. In none of these cases does spending on water appear to have reached critical levels when it comes to affordability. For those where it might be a problem, there are income relief programs that may be accessed.

Table 8: Estimated Total Residential Water Payments Per Year as a Percentage of After-Tax Economic Family Income in Ontario, 1991 to 2009[1]

	10 cubic metres per month				25 cubic metres per month				35 cubic metres per month			
	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.	Mean	Med.	10th Per.	90th Per.
Year	$	$	$	$	$	$	$	$	$	$	$	$
1991	0.2	0.2	0.1	0.3	0.4	0.4	0.3	0.6	0.6	0.6	0.4	0.8
1994	0.3	0.3	0.1	0.4	0.5	0.5	0.4	0.7	0.7	0.6	0.5	1.0
1996	0.3	0.3	0.1	0.4	0.5	0.5	0.4	0.7	0.7	0.7	0.5	0.9
1999	0.3	0.3	0.1	0.3	0.5	0.5	0.3	0.6	0.6	0.6	0.4	0.9
2001	0.3	0.3	0.2	0.4	0.5	0.6	0.3	0.6	0.7	0.8	0.4	0.9
2004	0.4	0.2	0.1	0.6	0.6	0.5	0.3	1.0	0.8	0.7	0.5	1.2
2006	0.4	0.2	0.2	0.9	0.6	0.5	0.4	1.1	0.9	0.8	0.6	1.3
2009	0.4	0.3	0.2	0.6	0.8	0.7	0.5	1.1	1.1	1.0	0.7	1.5

(1) Total yearly residential payments obtained by multiplying average monthly payments from Table 3 by 12 months and taking this total as a percentage of after-tax economic family income.

Source: Same as Table 3 with after tax income data from Statistics Canada, CANSIM.

How do water rate structures in Ontario compare with other jurisdictions?

Questions are sometimes asked about pricing structures in other provinces. Table 9 notes the percentage of the population served by residential flat and volumetric rates in the other five most populated provinces from 1991 to 2009. Alberta, Saskatchewan and Manitoba have been heavily metered since 1991. Ontario, while lagging behind these provinces in 1991, is now almost entirely metered. British Columbia has become more heavily metered in the past decade but still lags behind those provinces already mentioned. Quebec is an outlier in that it falls far behind the other provinces in terms of the percentage of the residential population served by metres.

A similar pattern may be observed for business properties. Table 3 (reported earlier) compared the percentage of business properties metered in the same six provinces for the years from 2001 to 2009. Close to 100% of all business properties were metered in Ontario, Saskatchewan and Manitoba; slightly more than 90% in Alberta; slightly less than 90% in British Columbia; and in the range of 30 to 40% in Quebec.

Table 9: Interprovincial Comparison of the Relative Importance of Residential Flat Rate and Volumetric Prices: Percentage of Population Served by Each Type, 1991 to 2009

	Ontario		Alberta		British Columbia		Saskatchewan		Manitoba		Quebec	
	Flate Rate	Vol.	Flat Rate	Vol.	Flat Rate	Vol.	Flat Rate	Vol.	Flat Rate	Vol.	Flat Rate	Vol.
Year	%	%	%	%	%	%	%	%	%	%	%	%
1991	18.6	81.4	4.9	95.1	76.4	23.6	1.1	98.9	2.6	97.4	78.3	21.7
1994	16.8	83.2	4.3	95.7	76.8	23.2	1.4	98.6	4.4	95.6	80.2	19.6
1996	15.8	84.2	2.7	97.3	75.2	24.8	1.3	98.7	4.2	95.8	78.4	21.6
1999	15.3	84.7	2.6	97.4	76.7	23.3	1.3	98.7	3.4	96.6	79.0	21.0
2001	12.6	87.4	2.6	97.4	73.7	26.3	1.5	98.5	3.4	96.6	77.5	22.5
2004	3.6	96.4	1.9	98.1	59.7	40.3	1.8	98.2	3.3	96.7	85.3	14.7
2006	2.6	97.4	3.6	96.4	30.9	69.1	1.1	98.9	2.6	97.4	77.1	22.2
2009	2.1	97.9	6.6	93.4	20.3	79.6	1.8	98.2	2.8	97.2	78.9	21.2

Source: Same as Table 2.

Tables 10 and 11 compare average monthly payments for residential (Table 10) and commercial (Table 11) water consumption at three different levels of use. For both property types, Ontario's payments were considerably higher than those in Quebec, but they were frequently well below the levels in most of the other provinces. At this point, it should be repeated that lower payments in Quebec are a direct consequence of funding a large portion of water costs from the general property tax base rather than by charges on users. Municipalities in Ontario, by comparison, are not permitted to fund municipal water systems from the general property tax base; rather, funds must come from charges on users (LAC & Associates, 2015, at 3).

Table 10: Comparison of Average Residential Monthly Payments for Water[1] (in 2009 dollars)[2] Including Volume-based and Flat Rates in the Six Most Populated Provinces, 1991 to 2009

Province	1991	1994	1996	1999	2001	2004	2006	2009
	Average rate at 10 m³/month							
	$	$	$	$	$	$	$	$
Ontario	18.79	21.49	21.55	21.59	22.07	25.63	24.34	25.31
Alberta	26.41	29.41	30.39	30.01	31.18	32.74	28.32	31.98
British Columbia	18.35	22.68	25.57	29.81	28.81	34.67	33.24	27.53
Saskatchewan	24.22	23.60	24.22	25.43	21.75	27.57	21.61	40.39
Manitoba	19.19	22.91	25.02	27.33	25.82	37.82	23.69	35.20
Quebec	16.91	17.86	18.64	18.99	18.68	19.76	18.14	18.23
Average rate at 25 m³/month								
Ontario	31.32	36.31	36.59	36.69	40.16	44.91	45.03	53.52
Alberta	46.70	53.27	52.71	52.62	54.34	56.33	52.52	58.42
British Columbia	17.54	24.07	27.41	31.71	30.97	39.12	40.85	43.09
Saskatchewan	40.87	40.49	45.39	46.31	41.68	46.98	41.95	66.40
Manitoba	39.44	48.10	53.96	59.59	56.84	68.54	58.42	81.34
Quebec	18.00	19.08	19.82	20.13	20.75	21.74	27.45	20.18
Average rate at 35 m³/month								
Ontario	39.86	46.32	46.86	46.98	52.57	58.44	59.13	72.41
Alberta	60.66	68.94	68.38	68.15	69.68	72.23	68.68	76.17
British Columbia	18.57	25.21	29.18	33.58	32.70	42.34	48.49	54.19
Saskatchewan	53.60	53.28	59.31	59.87	54.73	59.55	55.85	83.69
Manitoba	52.80	64.74	73.17	81.07	77.50	89.00	81.56	112.34
Quebec	19.06	20.22	20.98	21.22	22.86	23.29	21.33	22.21

(1) Includes both water and sewer. (2) In 2009 dollars – adjusted by the Consumer Price Index.

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, 2009 Summary Tables, Table 11.

"When water rates in Canada are compared with those in other countries, the Canadian rate is one of the lowest in the world …"

Table 11: Comparison of Average Commercial Monthly Payments for Water[1] (in 2009 dollars)[2] Including Volume-Based and Flat Rates in the Six Most Populated Provinces, 1991 to 2009

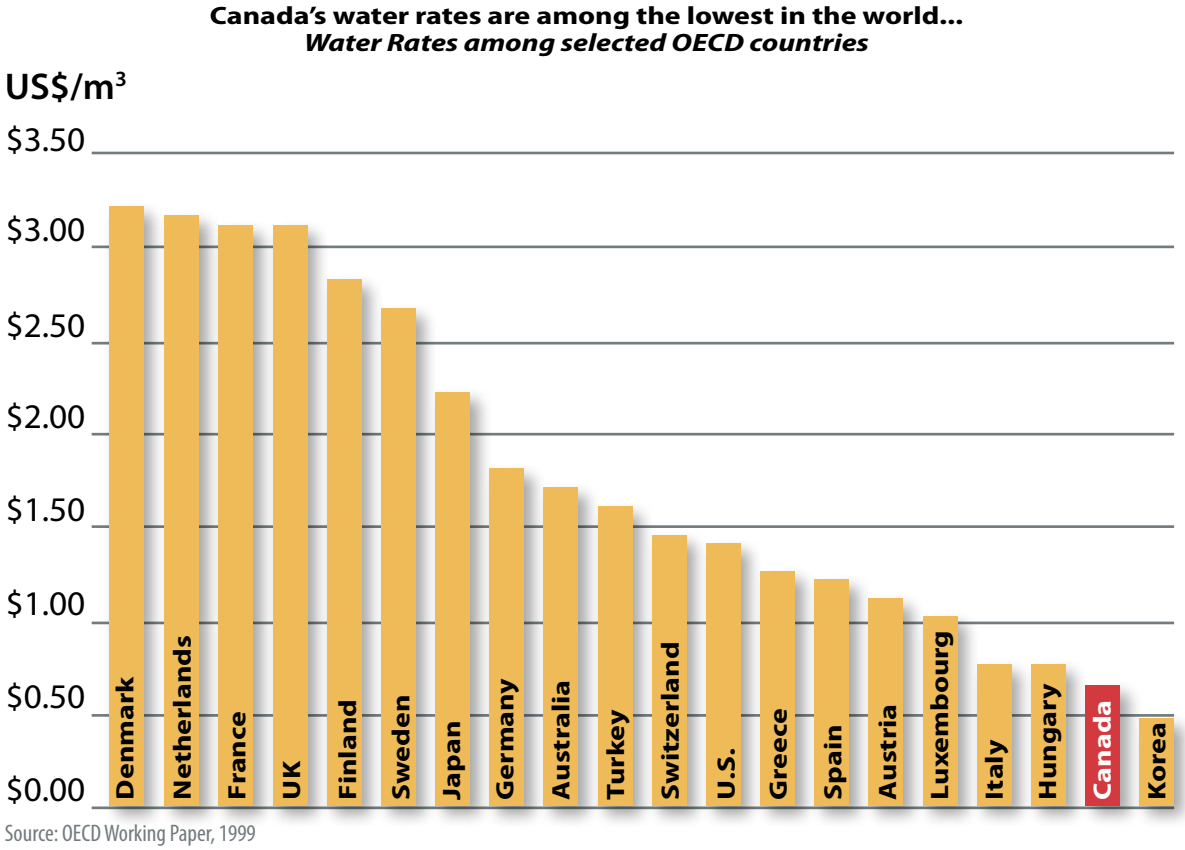
Province	1991	1994	1996	1999	2001	2004	2006	2009
	Average rate at 10 m³/month							
	$	$	$	$	$	$	$	$
Ontario	32.02	34.49	35.08	35.51	43.40	42.00	42.20	25.84
Alberta	39.62	41.48	41.47	43.90	47.86	37.26	36.53	42.49
British Columbia	24.85	27.81	31.10	34.23	34.48	30.28	26.68	29.10
Saskatchewan	29.06	30.11	31.23	31.77	33.32	31.72	28.13	51.42
Manitoba	33.80	37.32	36.25	37.34	31.54	27.76	22.12	37.36
Quebec	20.71	21.14	21.99	23.31	24.35	22.47	25.73	24.84
Average rate at 35 m³/month								
Ontario	49.40	54.17	54.14	55.44	62.43	63.13	64.86	74.10
Alberta	64.83	68.21	69.61	72.09	74.84	63.69	61.86	93.36
British Columbia	29.67	33.10	37.31	41.58	40.97	60.62	33.77	58.13
Saskatchewan	53.23	54.27	55.28	57.04	57.05	53.93	52.64	97.30
Manitoba	57.41	61.03	59.84	60.65	52.16	47.20	43.29	113.31
Quebec	24.34	24.98	25.53	26.76	27.36	43.15	30.59	34.07
Average rate at 100 m³/month								
Ontario	98.94	109.76	108.73	112.57	117.93	120.46	129.92	200.00
Alberta	137.74	147.61	151.49	158.58	152.53	138.17	133.22	228.13
British Columbia	46.40	50.97	57.68	65.80	62.61	257.08	57.27	137.71
Saskatchewan	123.32	125.87	126.41	129.65	125.04	119.35	126.80	216.67
Manitoba	141.58	151.58	149.76	150.07	129.12	116.99	106.64	310.05
Quebec	36.65	37.64	37.39	38.59	37.72	147.53	44.53	80.98

(1) Includes both water and sewer. (2) In 2009 dollars – adjusted by the Consumer Price Index.

Source: From Municipal Water and Wastewater Survey, Environment Canada, Ottawa, 2009 Summary Tables, Table 16.

When water rates in Canada are compared with those in other countries, the Canadian rate is one of the lowest in the world. In particular, the following figure from a 2005 study (using 1999 data) by the Organization for Economic Cooperation and Development (OECD) concluded that Canada's water rate was the second lowest in the world (Swain, 2005, at 10, Figure 2).

Figure 3: Water Rate Comparisons (OECD, from Swain Figure 2)

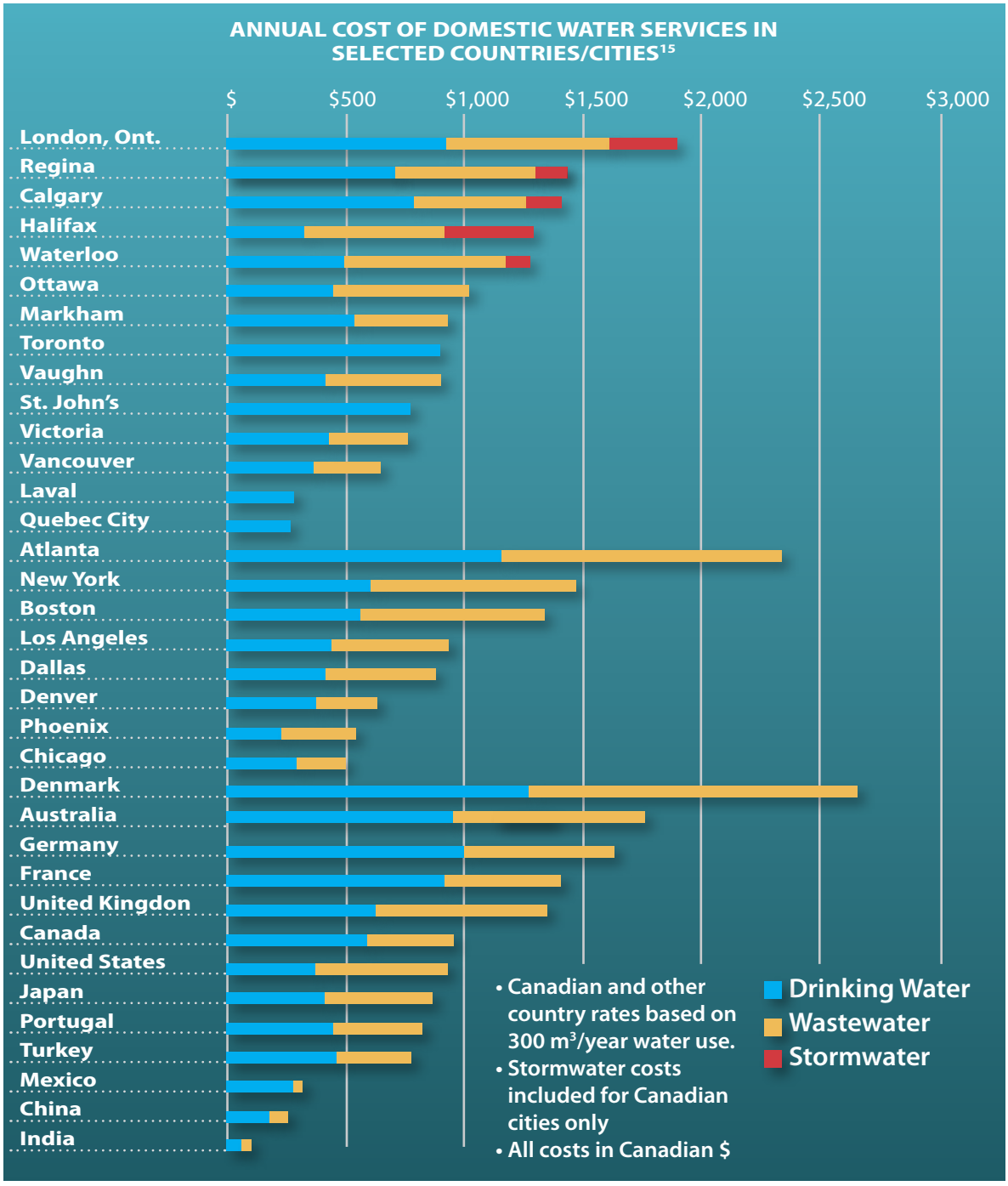


Source: OECD Working Paper, 1999

A decade later, in 2014, the Canadian Water Network's Municipal Water Consortium suggested that many Canadian municipalities, and Canada as a whole, still did not value water to the same extent as many other parts of the world. As the Figure 4 (next page) illustrates, however, some progressive Canadian municipalities have been making progress towards charging a higher, more sustainable amount for water, wastewater and stormwater services (Canadian Consortium, 2014, at 19, Figure 3).

"… many Canadian municipalities, and Canada as a whole, still did not value water to the same extent as many other parts of the world …"

Figure 4: International Comparison
(from Figure 3 of 2014 Water Consortium Report)



Source: 2014 Canadian Municipal Water Priorities Report Canadian Municipal Water Consortium

How much should the Ontario consumer pay for water?

An interprovincial, international and intermunicipal comparison of prices and payments for water is interesting but it should not be the basis for answering the question "how much should we pay for water?" A higher (lower) price/payment in one jurisdiction, by itself, is not a defensible justification for raising (lowering) the price/payment in another jurisdiction. Prices should vary as costs vary. Variation in costs may be attributed to a number of things including cost of extracting water at source and cost of treatment which is rising because of stricter environmental standards, rising energy costs, geographical and typological differences that can impact on delivery costs, higher cost for materials and labour, and rising maintenance costs that go with an aging infrastructure and so on. Most of these are beyond the control of local water providers, however.

To repeat what has been argued earlier in this report, prices should be set to cover all financial, economic and social costs of providing water and sewer services. If costs vary from jurisdiction to jurisdiction because of these factors, then prices should vary accordingly and customers should be charged whatever is necessary to cover all costs. Attempts to artificially hold down prices lead to inefficient use, limit incentives to conserve water, a larger demand for infrastructure than is necessary, and income distributional consequences that would not otherwise be desired.

How affordable is water?

The issue of affordability often arises when water utilities are considering a rate change. It is not uncommon, for example, to hear local politicians and residents say such things as "rates can't be increased because users won't be able to afford them." This begs the question of what is meant by affordability. Obviously, there is no benchmark or objective measure of affordability. It means different things to different people. However, a common practice or general tendency is to look at water rates in comparable municipalities (LAC & Associates Consulting, 2015) and what other utilities such as natural gas and electricity are charging.

Table 12 compares water and wastewater rates and monthly costs for water and wastewater at three different consumption levels for a number of cities/region in Canada for 2015. Readers will note the different structures – constant unit rates in most of the cities and increasing block rates in three of them (columns 2, 3 and 4); no fixed charges in five (column 5) and both fixed and volumetric charges in the rest.

Table 12: Comparison of Water and Wastewater Rates and Monthly Costs for Selected Cities in Canada, 2015

City (1)	Water & Wastewater Rates per m³			Fixed Charge (5)	Monthly Water & Wastewater Costs		
	0-7 m³ (2)	8-15 m³ (3)	>15 m³ (4)		10 m³ (6)	20 m³ (7)	30 m³ (8)
	$	$	$	$	$	$	$
Ontario:							
Ottawa	3.68	3.68	3.68	3.4	40.20	77.00	113.80
London	0	3.7732	4.856	42.11	53.43	96.58	145.14
Markham	3.3154	3.3154	3.3154	0	33.15	66.31	99.46
Windsor	2.827	2.827	2.827	32.71	60.98	89.25	117.52
Toronto	3.1945	3.1945	3.1945	0	31.95	63.89	95.84
Hamilton[1]	1.365	2.22	2.73	18.25	34.47	59.22	86.52
Peel Region	2.028	2.028	2.028	0	20.28	40.56	60.84
Thunder bay	2.8595	2.8595	2.8595	39.76	68.36	96.95	125.55
Waterloo	3.76	3.76	3.76	9.65	47.25	84.85	122.55
Vaughn	3.391	3.391	3.391	0	33.91	67.82	101.73
Kitchener	4.1121	4.1121	4.1121	0	41.12	82.24	123.36
Kingston	1.9824	1.9824	1.9824	52.87	72.69	92.52	112.34
Other::							
Vancouver[2]	4.501	4.501	4.501	9.67	54.68	99.69	144.70
Calgary	2.87	2.87	2.87	47.36	76.06	104.76	133.46
Edmonton	2.5846	2.7553	2.7553	11.00	36.85	64.40	91.95
Regina	3.26	3.26	3.26	64.53	86.13	118.73	151.33
Saskatoon[3]	6.646	6.646	6.646	17.60	84.06	150.52	221.69
Winnipeg	3.73	3.73	3.73	10.65	47.95	82.75	122.55
Halifax	2.503	2.503	2.503	28.78	53.81	78.84	103.87

(1) Lower rate only applies to first 5 m³ per month. (2) Rates are 33% higher from June 1 to September 30 (3) Rate increases after 21.2 m³.

Source: "City of Ottawa – Water and Wastewater Rate Review Study," LAC & Associates Consulting, Ottawa, October 2015, Annex 1.

Columns 6, 7 and 8 of Table 12 list monthly water and wastewater costs for all cities for three different levels of consumption. In Ontario cities/region, monthly charges ranged from a low $20 for 10 m³ in Peel Region to a high of almost $72 in Kingston. For

the cities in other provinces, monthly costs ranged from a low of $37 in Edmonton to a high of $86 in Regina. A similar pattern, but at higher levels, is observed for monthly costs for 20 m^3 and 30 m^3. A recent study done by the Halifax Regional Municipality noted that the average household cost for water, wastewater and stormwater across 15 large Canadian cities was $822 in 2014 (Water Talk, 2015).

The evidence in Table 12 and other reports does not answer the question about whether water rates are affordable. What it suggests, however, is that there is considerable variation across cities and those at the lower end have a lot of room for raising rates if their benchmarks are rates in other cities.

It may also be argued that any effort to compare the affordability of household water rates needs to consider the cost in relation to other domestic utility-type charges. This is important for both public acceptance and economic development because residents and business operators want to know what these costs are in comparative and competitive jurisdictions. Table 13 shows a comparison in York Region in 2011 (York, 2011, Tables 2 and 3).

Table 13: Typical Yearly Cost of Services for Households in York Region

Service	Yearly cost ($)
Average Water and Wastewater	750
Basic Cable TV	490
Basic Phone with Long-Distance Plan	650
Electricity	1200
Natural Gas	1000

Given the quarter-century perspective of this study, however, one may safely assume that the rates for most other household services including telephone, television and electric power have all risen far more quickly than water for the overwhelming majority of Ontarians. Of course, one could also contrast the dramatic cost differential between potable municipal tap water against the per-litre cost of bottled water, which seems to command a great deal of consumer acceptance, even at a premium price.

How should water/sewer infrastructure be financed?

At the outset, it is worth repeating that from 1974 to 1992, provincial grants funded 85% of the capital costs of community water systems. Increasing strains on provincial finances and an expanding demand for funds to finance a larger range of services demanded by a growing urbanized population in the late 1980s and early 1990s led to the program's elimination. This put increased pressure on municipalities to come up with ways of financing their own water and sewer systems, both new and existing.

For financing purposes, a distinction should be made between infrastructure expenditures for growth-related projects and infrastructure expenditures for renewal or rehabilitation. In either case, however, the underlying principle or criteria is the same as the criteria for financing the operating costs of water and sewer systems (see Box 2 earlier); that is, those who use the system should be those who pay for it. In particular, payments should be in the form of user fees that reflect usage levels (Ontario Institute for Competitiveness and Prosperity, 2015; Clayton, 2014).

Growth-related infrastructure

Development charges are used by all large and medium-sized Ontario municipalities to finance the off-site capital cost[14] of new development. In the early 1990s, they were mainly used by larger municipalities and a few medium-sized cities and towns. Since then, their use (in coverage and dollar value) has expanded to include more services and all cities, towns and municipalities that are trying to cope with the cost of providing infrastructure to service new growth.

An efficient development charge must cover the full cost of delivering the service. This should include a capacity component which covers the capital cost of constructing the facility, plus a location or distance/density charge that reflects the capital cost of extending the service to properties or neighbourhoods (Kitchen and Tassonyi, 2012). The most efficient development charges vary by type of property (residential, commercial or industrial), neighbourhood and distance from source of supply, so that each charge captures the extra cost of the infrastructure required to service the new growth.

However, most Ontario municipalities do not use variable charges to capture cost variations. Instead, they impose identical charges on all properties of a particular type, regardless of location. While administratively convenient, this practice levies the same charge on residential dwellings in low-density neighbourhoods as it does on residential

dwellings in high-density neighbourhoods. This occurs even though the marginal cost per property of infrastructure projects in low-density areas is higher, which can lead to urban sprawl (Slack, 2002). Developments close to existing infrastructure are charged the same as developments far away. As well, similar charges are often levied on properties that absorb different amounts of resources, due to factors such as terrain or soil type. Practices such as these encourage development in the wrong places. While it may be naive to expect municipal officials to calculate the infrastructure cost for each new property, costs could and should be calculated for each new development area or neighbourhood, to discourage inefficient patterns of development (Kitchen and Tassonyi, 2012).

A recent study, however, has taken a different view of development charges for water and sewer (Clayton, 2014). In particular, it argued that development charges for these services should be terminated and replaced by user fees that are high enough to cover the costs of new infrastructure (which could be financed initially by borrowing). The argument continues that development charges are not used for other similar monopolistic-type community utility businesses such as natural gas.

"… development charges are not used for other similar monopolistic-type community utility businesses, such as natural gas …"

This change, it was argued, would lead to increased efficiency and conservation because each litre consumed would be priced more efficiently. At the moment, the development charge is a lump sum up-front payment and as such, there is no reason to recover this cost through annual water prices. Consequently, prices are lower than they would be if they captured all annualized costs on a per unit basis. Lower prices lead to over-consumption and over-investing in infrastructure. As well, the report continues, it would be fairer because new users, through existing water rates, pay a share of the costs of providing water to existing customers while new customers are not being supported likewise by existing users. It could also improve housing affordability.

Renewing or rehabilitating infrastructure

Renewing or rehabilitating existing infrastructure has become a major concern at the municipal level. In fact, it has led to a number of estimates on the size of the infrastructure deficit and what should be done to eliminate it. Before considering

financing tools, Box 4 offers a number of cautionary comments on the way in which these estimates have been made.

It is difficult to find a clear-cut definition of what is meant by the infrastructure deficit. In general, one may argue it exists if the level of government responsible for spending on a physical asset to meet some desired or acceptable standard is deemed to have insufficient revenue or a lack of revenue capacity to pay for the asset. Such a definition, however, begs the question of what is insufficient revenue or lack of revenue capacity or, for that matter, what are the desired standards appropriate?

Municipal governments, by and large, have the capacity to pay for their infrastructure, but quite often not the political will to do so if it means raising taxes or user fees. As such, it is politically more expedient and acceptable to constituents if elected officials simply claim that they have an infrastructure deficit and require funding from a more senior level of government. Indeed, this is the scenario that plays out annually at the municipal level in Canada (Curry, 2015). Municipalities through their respective municipal associations claim that there is a revenue imbalance in the Canadian political system and that they deserve/need additional revenue from senior governments, generally in the form of more grants to finance their so-called infrastructure deficit.

"… $39 billion is needed for improving wastewater systems;
$25.9 billion for drinking water; and
$5.8 billion for stormwater systems.
All of the studies have a similar conclusion …"

The bulk of the empirical evidence on the size of the deficit appeared more than a decade ago (for a summary, see Kitchen, 2003), although there have been occasional updates replicating the methodology of the earlier studies. The most recent estimate for Canada has been provided by the Federation of Canadian Municipalities where it was noted that $39 billion is needed for improving wastewater systems; $25.9 billion for drinking water, and $5.8 billion for stormwater systems (FCM, 2012). All of the studies have a similar conclusion – a municipal infrastructure deficit exists although its size varies from study to study.

Box 4: Seven Cautions About Measures of the Size of the Infrastructure Deficit

First, some of the studies relied on information **collected from surveys**, many of which were conducted by associations – water and wastewater operators, public transit systems, municipal engineers – whose respondents had an incentive to include their wish list as being equivalent to needs, especially if they perceived or believed that the larger the list and the larger the deficit, the greater the likelihood of provincial and federal grants (Kitchen, 2003).

Second, some of them were based on estimates of deviations from a benchmark or standard that identified needs. The concern here is that the benchmark or standard is often set by the association that is advocating for the assets. Once again, this creates an incentive to set high standards or benchmarks if there is a possibility that it could lead to increased grant funding and investment. Furthermore, these standards or **benchmarks are almost always based on engineering standards** and do not include any form of economic reasoning or assessment based on economic performance. This distinction is important because the former relies on technical measures of conditions and needs for development and spending, and not on economic performance that includes an analysis of why the need came about or what caused it — is it an asset management problem, or a pricing problem?

Third, depending on the respondent, there may be differing views or **estimates of the amount of upgrading or rehabilitating** that needs to be done to bring the quality of the asset up to a certain standard, regardless of how the standard is set. Engineering needs assessment, while technical in their approach, have elements of subjectivity in determining current quality and what is required to rehabilitate or repair it to meet specific standards.

Fourth, studies relying on existing public sector measures of capital stock may be inadequate. For example, in cases where there is **incomplete or inadequate information on both the quantity and quality of public capital stock** (as with many municipalities), it must be estimated leading to possible questions and disputes over the validity of these estimates. Even if these estimates are correct, reliance on aggregate measures of capital stock in Canada may encounter further

problems because it is sometimes unclear what is included in capital stock. It may include expenditures on construction and renovation of government buildings; expenditures on the carrying out of civil engineering works (roads, water, sewers, public transit and so on – generally defined as public sector infrastructure), and expenditures on machinery and equipment (assets with a lifespan of more than one year including telephones and computers) used by public administration or it may include only a portion of these.

Studies and reports using all public capital investment as a measure of public infrastructure likely overstate the real physical infrastructure need or deficit. Capital spending on roads, highways, water, sewers and public transit are the most appropriate for commenting on the state of infrastructure and determining needs. This point is made simply to indicate that there are important limitations on the data currently available and to emphasize that reliance on it as a base for commenting on the infrastructure deficit in Canada must be treated with caution. We need to know more.

Fifth, studies that take some infrastructure spending measure (capital stock per capita or per thousand dollars of gross domestic product or something else) from some point in the past — 25 or 30 years ago — as the base for deriving the current infrastructure deficit must also be treated with caution. These studies and reports estimate the current infrastructure gap as the difference between today's current stock of public infrastructure (ignore the problems of measuring it for the time being) and what it would have been if the measure from 25 or 30 years ago had increased at the rate of population growth, or inflation, or gross domestic product, or some combination of these. In other words, the size of the gap will depend on the starting point (year). Why was the starting point chosen as the appropriate benchmark or base? What evidence do we have that the starting point reflects the right level of investment? How do we know that the starting point was not a period of over-investment or under-investment? **Clearly, the starting point has a strong influence on the final results.**

Sixth, there is no **consistency or clarity** in the way in which infrastructure need and, hence, deficit is estimated. In some cases, it has been left to individual respondents to determine their needs; in other cases, respondents have determined their needs by comparing their existing infrastructure with

what it would be if it met national or provincial standards or benchmarks. Furthermore, where shortfalls have been identified, they have been based on an assumption that **existing taxation/pricing policies** for the services provided by the assets will continue rather than on an estimate of what the need would be if more effective demand management and conservation-based pricing policies were implemented.

Seventh, measuring infrastructure needs in the current environment must be treated with caution — as was mentioned previously — because many municipalities, where around 60% of all Canadian public infrastructure exists, do not have reliable information on the status, location, capacity, performance, condition and operating costs of existing infrastructure. This is particularly true for underground assets, especially for water and wastewater operations where there is often incomplete or inadequate information on the expected life of many of their assets and less information on its quality.

In summary, methodological and data problems associated with existing studies lead one to wonder if discussions around the so-called infrastructure deficit aren't largely driven by political objectives to achieve grant funding. At the same time, one could argue that it is more important to know whether current practices should be changed to assist in correcting the alleged shortfall rather than knowing whether or not a deficit or need exists and its size. An important start here would be a requirement that municipalities set efficiently designed prices for water and wastewater (discussed earlier). Here, it may be important to remind the reader that efficiently structured fees (prices) play an important role as a mechanism for revealing the true demand for – and therefore, indicating the efficient supply of – water and sewer infrastructure.

"… many municipalities, where around 60% of all Canadian public infrastructure exists, do not have reliable information on the status, location, capacity, performance, condition, and operating costs of existing infrastructure. This is particularly true for underground assets, especially for water and wastewater operations where there is often incomplete or inadequate information on the expected life of many of their assets and less information on its quality"

WATER SERVICES – A MATTER OF FINANCE AND ENGINEERING

Although the Conference Board of Canada has been a leading proponent of the concept of an infrastructure deficit and the need to address it, its report *Tapped Out: Efficiency Options for Closing the Municipal Gap*, by Vijay Gill, makes some important observations with implications for the relationship between the level of capital investment required for water and wastewater infrastructure and the impact of water rates.

> *"Due, in part, to a prolonged period of underinvestment, Canada is faced with an infrastructure gap. Recent infrastructure funding increases have started to address this issue. However, increased public funding alone cannot address the entire gap. The reason for this is that competition for public funding has stretched the public purse to such an extent that the whole gap cannot be eliminated. As a result, other methods of reducing the infrastructure gap — such as through enhancing the productivity of infrastructure services and managing demand through pricing mechanisms — are required." (Gill, 2011)*

Selecting the right capital financing instruments

There are three main instruments that are often used for financing existing infrastructure — reserves, borrowing and grants.

Reserves

Reserves (both budgetary reserve provisions and segregated reserve funds)[15] are created when a portion of current water rates (for example, one cent per litre of water) are set aside annually in a special account accumulating interest until it is eventually withdrawn and used to finance or partially finance water and sewer infrastructure. Financing through reserves is essentially the reverse of financing through borrowing. Instead of borrowing to finance capital expenditures now with debt repayment in the future, reserves reverse that timetable.

Reserves have grown in popularity over the past few years. However, their application is not without problems. In particular, asking current users to pay for infrastructure that will benefit future users creates intergenerational inequities and has the potential for leading to a level of capital spending that is not allocatively or economically efficient.

Borrowing

Borrowing makes considerable sense for water and sewer systems because the benefits from this infrastructure accrue to future users. As such, this form of financing is fair, efficient and accountable. At the moment, many cities and regions have the capacity

for more borrowing (Kitchen, 2013) but are reluctant to do so. This is attributed to a number of factors, the greatest of which seems to revolve around the cost of borrowing – a number of municipal officials still remember the high interest costs of the 1980s and early 1990s – and a general desire on the part of many municipal officials to finance on a pay-as-you-go basis rather than by borrowing (Kitchen, 2006a and 2006b) even when best practices suggest the latter.

Grants

Grants for water and sewer infrastructure have declined substantially since 1992 when they were reduced from covering around 85% of capital costs to zero. In the interim, there have been the occasional one-off grants to accommodate specific requests for municipalities with financial problems. Grants resurfaced as a revenue source through the stimulus grant program from 2009 to 2011. These, by and large, concentrated on shelf-ready projects because of the difficulty in meeting the short timeline for project approval and spending commitments, a timeline which municipalities generally could not meet for large costly projects requiring extensive planning and often time-consuming environmental assessments (Kitchen, 2013).

As well, there are capital grants from the federal and provincial gas tax fund. The federal Gas Tax Fund (GTF), in particular, is a per capita grant awarded to provinces that, in turn, allocate grants to municipalities. The latter are able to use these for 17 different types of infrastructure; 90% is spent on water, sewer, wastewater, local roads and public transit.

In general, commentary at the municipal level over water and sewer infrastructure has had little to do with reforming existing water rates to achieve more efficient consumption levels and much to do with the need for more grants. Is there a case for grants for water and sewer? In response, water and sewer systems provide goods that economists would classify as private goods — that is, specific beneficiaries can be identified and charged for the service and non-users can be excluded. As well, levels of consumption can be measured easily and per unit costs calculated readily. This suggests that those who use the service should pay for it. Indeed, this was a recommendation of the Drummond Commission where he recommended (#12.2) that user fees cover all costs of water and sewer systems. This, he continued, would lead to stable investment in infrastructure and efficient levels of consumption, would be fair on an intergenerational basis and would promote conservation (Drummond, 2012, at 45). In short, setting user fees to cover full costs is efficient, fair, accountable and transparent.

"In short, setting user fees to cover full costs is efficient, fair, accountable and transparent"

Briefly, economic arguments for capital grants are not strong. Their use, where they are prevalent, should be conditional on recipient governments setting efficient water rates. As well, recipients should have proper asset management programs along with a requirement that asset replacement costs be included in the charge or price for water consumed. This seems to be progressing and is in place in some municipalities, but still has a long way to go in a number of municipalities.

Capital Expenditures

Comparisons of local capital spending across municipalities in any specific year and over time must be treated with caution, primarily because of the inherent lumpiness of capital spending; that is, expenditures are high in years when a major project is under completion often funded by capital grants and low in years before and after the project's completion. This often leads to a variable and fluctuating pattern over time. Even so, it is still useful to review the pattern of capital spending on water and sewers in Ontario over the past decade or so. Table 14 does this. In particular, it may be noted that in constant dollars per capita, capital spending on:

- Water in 2004, 2005 and 2006 was basically the same as in 2012, 2013 and 2014, leading to a quick observation that it hasn't really increased over the last decade.
- Wastewater, by comparison, has increased noticeably over the past decade.
- Water and sewers combined have increased over the past 10 years or so, largely driven by spending on wastewater.

Table 14: Capital Spending Per Capita in Constant Dollars (2002) in Ontario Municipalities

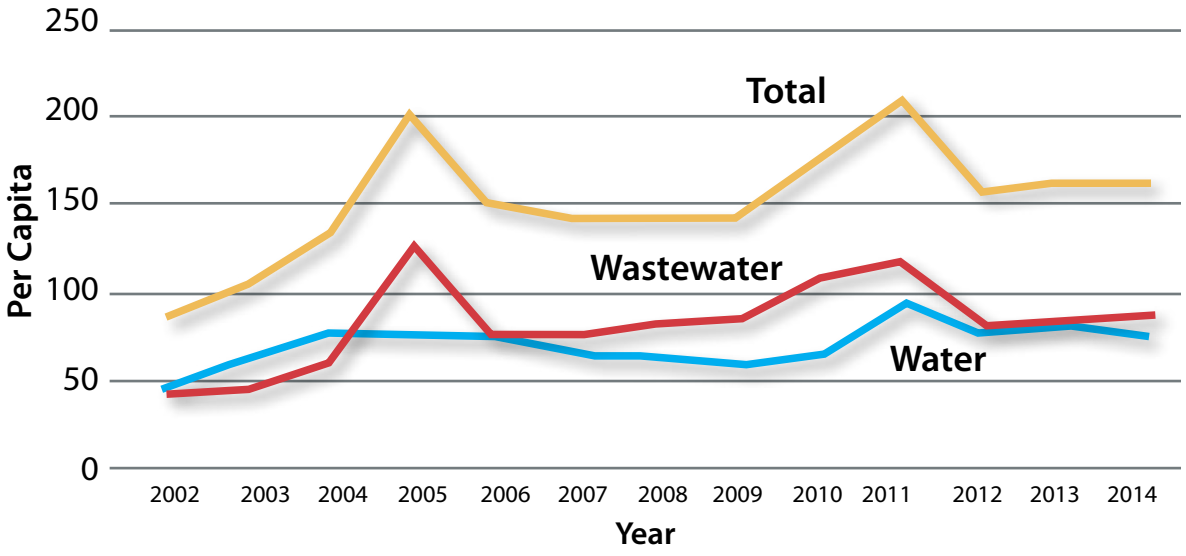
Year	Water	Wastewater	Total
	($)	($)	($)
2002	48	45	93
2003	67	47	114
2004	83	64	147
2005	80	137	217
2006	79	82	161
2007	70	82	152
2008	66	88	154
2009	63	91	154
2010	69	116	185
2011	102	126	228
2012	81	88	169
2013	86	88	174
2014	81	94	175

Most recent years for which data are available. Per capita dollars remove increases due to population growth and constant dollars remove increases due to inflation.

Source: Calculated from Ontario Financial Information Returns, Ministry of Municipal Affairs and Housing, annual

In short, capital spending in total was not considerably higher in 2014 than it was in 2004. For the increase that came about, it was driven largely by the availability of stimulus grants from 2009 to 2011 and by federal and provincial gas tax funds which were introduced in the early part of the decade and increased over this period. This pattern of spending is more clearly illustrated by reference to Figure 5. Here, one notes the lumpy nature of capital spending over the years.

Figure 5: Capital Spending Per Capita in Ontario in Constant Dollars, 2002 to 2014



Another interesting observation from Table 14 and Figure 5 is the difference between spending on waterworks and the spending on wastewater systems. There was a significant increase in municipal spending on both water and wastewater at the turn of the Millennium, so that per capita expenditures were more than 50% higher by 2004. In the decade that followed, inflation-adjusted expenditures on wastewater in continued to rise, including two spikes in capital expenditure in 2005 and in the years following the 2008-09 financial crisis (both likely explained by matching, time-limited infrastructure capital grants programs). However, in the case of waterworks, allowing for the annual ups-and-downs of capital spending, per capita capital expenditures in "constant dollars" were reported as being lower in 2014 than they were in 2004.

"… in the case of waterworks, allowing for the annual ups and downs of capital spending, per capita capital expenditures in constant dollars were reported as being lower in 2014 than they were a decade earlier, in 2004"

WHAT PROGRESS HAS BEEN MADE TOWARD ACHIEVING THE UTILITY MODEL?

Both O'Connor and Swain placed emphasis on adopting the so-called "utility" model for organizing and delivering water-related services. This might best be understood as a combination of three practices, to distinguish these services from the manner in which other municipal services are delivered, priced and financed.

First, a utility model implies that the service being operated is a separate line-of-business, with virtually no cross-subsidization and with operational mandates that are closely tied to service delivery and sustainability, rather than important but extraneous considerations, such as, social equity, economic development or avoiding municipal debt financing. It may also include transferring the responsibility for water billing to another entity, such as an electricity utility or another level of municipal government, for reasons of cost, efficiency or alignment.

Second, a utility model implies organizing the delivery of the physical infrastructure in a way that is most efficient, safe and economical, even if it involves intermunicipal cooperation or transferring the responsibility to an entity that is better suited to build and operate water-related infrastructure.

Third, it implies adopting business accounting principles that are employed by consumer utilities, including full valuation of assets and liabilities, the use of depreciation and provision for replacement, lifecycle capital planning and so on. In other words, adopting accounting practices that enable full lifecycle cost accounting, the foundation for full-cost recovery pricing. As O'Connor and the provincial auditor noted, historical municipal fund accounting practices discouraged recognition of the full range of obligations and thereby permitted ignoring future obligations in favour of lower prices for current consumers.

In the following section, we look specifically at the evolution of water services, accounting and budgeting practices over the past quarter-century.

Utility accounting practices

Given the circumstances of the Walkerton tragedy, the O'Connor Inquiry spent a considerable amount of time on accounting issues. At the time, water and wastewater were frequently municipal departments, governed by the fund-accounting rules that prevailed in the municipal sector. Traditionally, the focus of municipal fund

accounting was on ensuring that municipal budgets were balanced each year, and that debentures and other long-term borrowing reflected fiscal capacity and modest levels of property taxation.

Municipal balance sheets of the day rarely included an accounting of municipal assets, beyond statements of outstanding indebtedness and cash reserves. Deferred maintenance obligations were not systematically recorded, much less addressed. The concept of depreciation, even with capital assets like waterlines, was at a rudimentary level, if employed at all. Repair and replacement was typically done on an as-needed basis or funded by an annual budget allocation adjusted for inflation.

O'Connor, like the OSWCA and Fortin/Mitchell recommendations before him, suggested that a more appropriate approach would be to employ accounting standards that were applicable to private and public utilities. Using utility accounting standards would require municipalities to recognize their ongoing obligations more explicitly. More relevant accounting standards would document the need to invest in system refurbishment and improvement. This kind of accounting would also form the basis for charging consumers an amount that corresponded to the full cost of water and wastewater services, over their useful life and without requiring cross-subsidization from the property tax base or other governments.

Since that time, three important developments have occurred.

First, virtually all public sector institutions in Ontario have been required to adopt the generally accepted accounting principles of the Public Sector Accounting Board (PSAB). While municipalities have been later adopters, PSAB accounting has required municipalities to value and record their assets and their liabilities much more thoroughly than in the 1990s. Among other things, the effect of PSAB has been to make transparent the outstanding obligations faced by municipal utilities, like water and wastewater, in areas such as deferred maintenance and future capital obligations.

Second, the Ontario government has undertaken an ambitious program to promote asset management among municipalities. This work has been embraced by the Association of Municipalities of Ontario (Burke, et al, 2015; Watson and Dillon, 2012) and by many other organizations in the municipal sector. With PSAB illustrating the nature and extent of previously unrecognized financial obligations, preparing asset inventories and recording a wider scope of liabilities has raised the spectre of significant unbudgeted expenditures facing municipalities. By the end of municipal fiscal year

2014, asset management plans were in place for virtually all municipal corporations. Those asset management plans map out orderly, prudent and consistent approaches to meeting future financial obligations, often beginning with making provision for those financial obligations over time through increased levies or reserves.

Third, coincident with the timing of the O'Connor Inquiry and the adoption of PSAB accounting, the reformed *Municipal Act* of 2000 and related legislation afforded municipal governments much wider scope of authority in the ways that they could govern and finance utilities and other municipal activities with a commercial aspect. To that end, many municipalities commercialized their electricity distribution functions and some have more recently established municipal service corporations to operate other municipal service-delivery activities.

The overall effect of these changes has been to establish municipal water and wastewater functions, whether operated by the municipality, a public utilities commission or the Ontario Clean Water Agency (OCWA), as increasingly self-financing utilities for both capital and operating purposes. The most obvious consequence has been to see water meters installed for almost all urban and industrial water systems. Installation of water meters, as noted earlier, is a necessary precondition for imposing volumetric rates for water, wastewater and even stormwater services. Volumetric rates, in turn, lead to an efficient level of water and wastewater services and, facilitate budgeting to cover the full operating cost of waterworks and sewage treatment, including the cost of depreciation, rehabilitation and capital improvement. They also make provision for the expansion and upgrading of water-related services to meet the twin challenges of population growth and climate change impacts.

Challenges of implementing full-cost pricing

Going forward, a segregation of waterworks financial operations from the rest of the municipal budget also facilitates efforts to commercialize or contract water-related services. Investors and contractors, whether in public-private partnership ventures, or merely fee-for-service contracted services, view segregated revenues and rate-setting geared to full cost-recovery as a positive pre-condition for major investments.

One of the challenges in advancing the concept of pricing for full-cost recovery is to reach a conventional understanding of what costs should be included in full cost. After the O'Connor Inquiry, there was initially an effort to establish a standard approach to calculating the total cost of water. *The Sustainable Water and Sewage Systems Act*

WHAT PROGRESS HAS BEEN MADE TOWARD ACHIEVING THE UTILITY MODEL?

(SWSSA) passed by the Legislature in 2002 authorized the Ontario Government to enact regulations that would specify the ingredients to be included in a formula for full-cost recovery by municipalities and water utilities. It would, in turn, have been the basis for a suite of water rates and fees to achieve that level of financial recovery. The Act was not proclaimed (Abouchar and Vince, 2010, at 8).

This approach aimed to recognize the true cost of water on a global basis, but it evidently proved to be a challenge to reflect the actual and varied circumstances across Ontario. The effort was abandoned by 2010, and the government fell back on the O'Connor recommendations that more contemporary and appropriate accounting practices should underpin the effort to recognize full cost. Building on its decision to mandate both asset management planning and water system planning by municipalities, the government reasoned that municipalities would be in a position to tailor their response to reflect local needs and better define both system costs and lifecycle requirements.

The effectiveness of such an approach obviously depends on whether individual municipalities and water utilities are willing to accept the financial and policy consequences of what their asset management plans and financial statements now reveal about the degree of cost recovery and reinvestment needs.

WHAT PROGRESS HAS BEEN MADE TOWARD ACHIEVING THE UTILITY MODEL?

Respecting unique local conditions did not imply simply retaining existing arrangements, especially in the area of water rates. The advent of asset management plans and water quality regulations imposed an obligation on most water services to increase their efforts to achieve comprehensive full-cost recovery. It also caused them to attempt it in a fashion that promoted environmental goals, including water conservation, technologically advanced water and wastewater treatment, better surface-water and aquifer management, and waterworks energy reduction.

Our observation is that most waterworks have adopted the utility model, at least insofar as utility accounting and asset management practices are concerned.

There remains, however, considerable subjectivity around full-cost recovery, as the failed effort to develop a SWSSA full cost regulation illustrated. As a result, even a notional commitment to full-cost recovery allows rates to be set at a level that does not reflect true cost, particularly when those costs are projected into future replacement costs. Replacement costs may not entail simply replacing existing water and sewer infrastructure: there may be expanded resiliency demanded by a world affected by climate change impacts and upstream and intensification development activity.

Overall, our conclusion is that the existing water and wastewater rates will need to rise, or significant improvements in productivity will need to be realized, if water services are to achieve true financial sustainability over time.

Another obstacle to implementing full-cost pricing has been a desire to retain existing rate structures to preserve and possibly increase revenues. Many system operators have argued that moving to efficiency based prices will discourage consumption, thereby reducing total revenues, making it difficult to cover costs. If this is true, there are a couple of comments that should be made. First, it suggests that the existing plant capacity may be too big and there is evidence that some municipalities have overbuilt largely because of inefficient prices in the past (as discussed earlier under the heading "Why is the pricing structure so important?" and referenced by Strategic Alternatives et al, 2001, at 39, and Swain et al, 2005, at 53-54). Second, because the demand for water is inelastic, an increase in price will be accompanied by a much smaller percentage reduction in quantity leading to an overall increase in total revenue, not a decrease. In other words, this concern is not a justifiable argument to oppose the implementation of efficiently set prices.

There have been many worthwhile government initiatives in relation to water policy, including source-water protection, training initiatives, the Walkerton Clean Water

Centre and the creation of WaterTap. But many have argued that these measures are somewhat tangential to the main focus of the findings of the succession of detailed reviews mentioned earlier in this report (ranging from Fortin and Mitchell, through O'Connor and Swain, to Drummond, the Environment Commissioner of Ontario, and the Canadian Municipal Water Consortium).

In its submission on the *Ontario Water Opportunities and Water Conservation Act*, and the regulatory framework associated with it, the Residential and Civil Construction Alliance (RCCAO) summarized the preferred course very succinctly:

> *"Bill 72 provides a clear opportunity to ensure that municipalities go beyond just tracking their historical investment in water/wastewater assets to actually planning for and funding their ongoing needs. This new Act can institutionalize the requirement to plan for maintenance, system growth, rehabilitation and funding from user fees. Without such requirements, many municipalities will continue to divert water funding to other purposes, and foist most of the costs of water/wastewater infrastructure on federal, provincial and municipal taxpayers, rather than on water users." (Manahan, 2010a, at 5).*

RATIONALIZING WATER SERVICES DELIVERY

Organizing the delivery of water service

There is an historic, dynamic tension in the organization and delivery of water services in Ontario. On the one hand, natural forces create conditions where regional factors determine the availability of water – watersheds, aquifers, marshlands, freshwater lakes and rivers. On the other hand, municipal waterworks have evolved historically from the efforts of several hundred local communities to provide safe drinking water, sewage treatment, and channeling stormwater in urban areas and agricultural drainage works in rural areas. As a result, water and wastewater systems and flood control have been local municipal government responsibilities since the earliest days of Ontario's urban development.

Where these localized arrangements proved inadequate in scale and resources, beginning after World War II and highlighted by Hurricane Hazel in 1954, mandates were shifted to regional entities, such as conservation authorities after 1946 and, in the late 1960s and early 1970s, to regional municipalities and their amalgamated successors. But for the rest of Ontario, the situation remains: local authorities manage water-related functions that often transcend their political boundaries and, in smaller communities, test their technical and financial capacity.

RATIONALIZING WATER SERVICES DELIVERY

In other parts of the world, water services are often organized quite differently. In many parts of the U.S.., autonomous water and sewer districts manage their systems on a regional basis, using a utility model similar to electricity distribution. In the U.K., the essential watershed linkages between water, wastewater and stormwater produce entities that are integrated and organized regionally on a very large scale and frequently with private management or ownership (introduced to ensure more adequate investment and efficiency than was the case before 1989). In Europe, public ownership of water utilities is less common, with national and even transnational utility companies providing water services on contract or by franchise, much as Ontario does with natural gas distribution. The features that all of these arrangements share are: (a) a watershed-wide approach to the sourcing, treating and managing of water resources; and, (b) an in-depth capacity to deal with the many engineering, financial, water quality, environmental and customer service issues that arise over time.

Some might argue the case for a greater degree of private operation, ownership and investment in Ontario's municipal water or wastewater utilities. It is a route that was followed by the U.K. government to overcome chronic problems with its water and wastewater utilities, which came to a head in the 1980s. It is a model that works safely, efficiently and economically in many developed countries. In an era where infrastructure investment is a priority but government tax resources are constrained, it is a model that is favoured by pension funds and other pools of patient investment funds, with an interest in public infrastructure as a class of assets.

> *"Around the world there are good and bad water utilities in public ownership, just as there are in private ownership.Ontario, Ministry of the Attorney General, Walkerton Inquiry Commissioned Paper 18 – Drinking Water Safety: Do Ownership and Management Matter?, by David Cameron (Toronto, Queen's Printer for Ontario, 2002)" (Swain et al, 2005, at 33, fn. #20)*

Others might argue that we do not need to move to a full-scale privatization or contracting-out model, provided we can introduce the efficiency and operational sustainability disciplines of commercial practices, while retaining public ownership or at least strong regulatory control. The Swain Expert Panel agreed:

> *"Whether the assets are publicly or privately owned, it is the details of management and operations that dictate excellence with respect to public health, environmental quality and cost containment. These matters are best handled through a business-like, corporate structure." (Swain et al, 2005, at 33).*

Our conclusion is that there would be real merit in exploring the potential for re-organizing and integrating water, wastewater and stormwater services, and to do it on regional or watershed basis. The alternative would be to transfer these responsibilities by contract or franchise to a public or private organization with deep resources and/or regional scope, which could deliver these services on behalf of the participating municipalities.

Does size matter?

There are a number of recurring questions, especially after the Walkerton tragedy:

- Does the size of the municipality and its water utility (and their operational model) have any bearing on either its viability or its willingness to embrace the user-pay principle or full-cost-recovery?[16]
- Does the all-in cost of smaller water and wastewater systems necessarily mean an unsupportable per customer water rate, if full-cost recovery is the standard for setting water rates?
- Do local political considerations make it impractical to increase water rates to a level that reflects full-cost recovery?
- Do local political boundaries cause decisions to be made about the scale and design of water and wastewater systems that should be made on a broader, regional basis?

If the answer to these questions is "yes", the discussion should turn to why consolidation is not pursued or required.

- Are there incentives that would encourage consolidation or regionalization? Are there obstacles to be overcome, such as local employment and economic losses, control of rates and services, transfer tax impediments, customer service declines, and so on?
- Should options involving third parties be considered, such as OCWA, a major private operator, a new role for the county, or a waterworks variation of consolidated local electricity distribution companies?

Regardless of the model employed, however, it seems obvious that safety assurance, and financial and technical capacity, are more easily achieved with a broader, more in-depth organization operating waterworks and sewage collection and treatment facilities (Manahan, 2010b). Realistically, it is also likely that rate setting on a regional

basis reduces some of the political impediments to imposing a water-rates regime that will sustain the system into the future, as experience with regional municipalities has demonstrated since the 1980s.

The Swain Panel concluded that water systems do not necessarily need to leave the municipal sector to be able to address issues of system sustainability and quality assurance. But they do need to be operated on a broader scale and following a utility model.

> *"Of the available models, the Panel therefore believes that the corporatized utility model, where the municipality owns the corporation, offers the greatest benefits in terms of governance, transparency, financial sustainability and accountability. This is especially the case where the water system is large and could be financially viable on its own" (Swain et al, 2005, at 34).*

It should be noted that the Swain Expert Panel was not speaking simply of improving the business practices of the local utility. It championed quasi-public entities that endeavour to combine the best of the public sector and the private sector in providing water services. Interestingly, the example that the Swain Expert Panel cited in 2005, Epcor, has since grown to be a significant national entity in the utilities field.[16]

Another Alberta-based, smaller-scale 'regional' model is also interesting. Facing many of the same issues as rural and small urban municipalities within Ontario counties, the municipalities in the Grande Prairie region of northwestern Alberta have created a municipally owned 'private' utility company, Aquatera. Initially providing water and wastewater services management, it has since expanded into solid waste management, and into offering a range of "utility" services to other municipalities and through a subsidiary, to industry. Aquatera appears to bring commercial discipline to utility services, while generating local economic activity and yielding dividends for taxpayers, through its municipal "ownership" (Aquatera, 2014).

Our conclusion is that there needs to be widespread consolidation of small, local waterworks systems, or local systems need to be contracted to an operator with technical depth and financial resources beyond that typically available to local municipalities. This latter course is particularly applicable to isolated or remote water systems in northeastern and northwestern Ontario.

It may be unrealistic to expect local municipal councils or local utilities to make decisions about the structure and level of water rates outside of an established

regulatory framework. Even where there is a desire to use reduced water rates for economic development purposes, or to cushion the impact on the vulnerable, system sustainability considerations should be paramount. Any such decisions to mitigate the impact of "full-cost recovery" rates should be cross-subsidized from within the rate structure, rather than relying on rates that are insufficient to pay current operations and necessary future system investments. At a minimum, the regulatory framework should be developed and used by municipal councils to establish rates and financial plans, as described in the *Water Opportunities and Water Conservation Act (Ontario) 2010*. If compliance with such a framework cannot be achieved through voluntary compliance, there may be a need to impose some form of administrative tribunal process on those unable or unwilling to comply. This concept was (unsuccessfully) espoused by MPP David Caplan's Private Member's Bills 13/10 and 237/10, which contained a number of other full cost provisions. (Manahan, 2010c).

It is our conclusion that decision-making about water rates should be governed by a regulatory framework, which would ensure that over time, rates attain a level sufficient to sustain the water-related systems into the future.

From Theory to Best Practice – Trendsetting Models and Municipalities

Municipal councils and management staff facing the challenge of increasing water rates to address past neglect and future obligations can encounter stiff resistance. As noted earlier, underground infrastructure is out-of-sight and out-of-mind for most until a crisis arises and the environment for demanding more from taxpayers makes even well justified increases a matter of public discontent.

The challenge is multi-faceted and it must be tackled through a multi-faceted strategy. First, the case for making best use of existing resources must be clearly made. As noted above, simply asserting an infrastructure deficit and a need for more public funds is a weak case with taxpayers in the current economic climate. Second, the importance of linking consumer benefits with necessary investments needs to be strongly made, with water rates being among the best vehicles. Third, the nature and scope of the work needs to be scientifically identified, with a focus on both repair and system refurbishment and enhancement.

In the United States, the Environmental Protection Agency (EPA) devotes considerable effort to outlining the findings of its research into municipal and water authority best practices. In addition to its high-level goals of mitigating climate change, it offers

practical, experience-based advice on the challenges facing municipal leaders and public works professionals. These include overcoming political obstacles, designing sustainable financing models, and adopting technologies that allow more targeted identification of system weaknesses and opportunities for reducing water-loss and energy-consumption. As the EPA notes, the International City/County Management Association (the professional organization for city managers) has a complementary suite of online advice and practical experience.

In the U.K., privatized regional water authorities, with responsibility for water, wastewater and stormwater have put rigour into business practices and advanced full-cost pricing, in order to restore the crumbling legacy water-related infrastructure of England and Wales. While these public-private ventures have been controversial with the trade union movement and subject to vigorous enforcement for spills, there have been great improvements in the U.K.'s water systems, under a regulatory regime designed to ensure system sustainability. One of the largest of the regional water authorities, serving six million customers in eastern England, is Anglian Water, which is one-third owned by the Canada Pension Plan Investment Board.

In Ontario, the Association of Municipalities of Ontario's "Ontario Municipal Knowledge Network" has produced a suite of tools specifically targeted to municipal council members to assist in developing and implementing good asset management plans, which are the foundation of any serious effort to implement cost-recovery

water-rate regimes for municipal water, wastewater and stormwater infrastructure.[17] These are complemented by tools for municipal professionals, citing the experience of cities like Ottawa and Cambridge which have adopted asset management frameworks that are instituting targeted, cost-reducing preventative maintenance and capital refurbishment programs in their water and wastewater infrastructure, and linking it with scheduled repair of roadways.

There are a number of examples where, in the absence of regional governance, municipalities have cooperated in developing major water and wastewater facilities, or contracted for sharing unused capacity. The cities of London and St. Thomas have a jointly operated facility to draw water from Lake Huron to serve their communities. The City of Hamilton and the County of Haldimand have contracted to share Hamilton's surplus potable water supply.

Cities like Kitchener (Waterloo Region) and Mississauga (Peel Region)[19] have expanded their utility approach from water and wastewater to include stormwater rates, effectively removing those management costs from the property tax budget and the tax-supported capital budget.

Many small communities have demonstrated leadership in this area, as the annual AMO awards program demonstrates. To a growing extent, there is evidence of water-conservation measures, encouraged by the kind of healthy inter-municipal competition in conservation that organizations like the RCCAO have recommended in recent years, and aided by evidence of costly losses in treated water and infrastructure undermining due to system leakage.

A canvass of the Internet indicates that a great many smaller and rural municipalities have, in response to regulatory requirements, contracted for a review of the finances of their water and wastewater systems and the associated water and wastewater rate structures. Many of these studies are similar – explaining the concepts of full-cost pricing and full-cost recovery, as well as outlining the various rating structures that would potentially achieve those objectives.

In some instances, this consulting advice, coupled with the impact of recently mandated asset management plans, has been sufficient incentive for these municipalities to adopt policies that will move them in a direction of greater water system financial sustainability. The pattern has, however, been uneven and in some instances, particularly in smaller municipalities, it has resulted in retrenching over time in the face of consumer complaints.

At the other end of the population scale, the amalgamated City of Toronto has moved aggressively on a phased, multi-year basis to increase its historically low and unsustainable water rates to a level that will begin to address past and future needs, particularly in the area of stormwater infrastructure.[20] After increasing water rates by 9% per year for nine years, City Council added a further 8% annual increase for three additional years, citing increased investments in stormwater refurbishment as preferable to the recurrent impact and cost of flooding.

As municipalities develop reserves from the capital portion of water, wastewater and stormwater rates, they also find that they have funds available to match periodic infrastructure funding programs from the governments of Canada and/or Ontario and to address the priorities that are identified in their newly adopted asset management plans.

THE NEXT QUARTER-CENTURY

New policy objectives and other considerations – current and future

As we evaluate progress, we must realize that water services currently enjoyed are not those that will be left to the next generation. This will be a product of two factors, one retrospective, focused on past practices, and one prospective, looking to the future.

Rebuilding infrastructure – the limits of development charges

For the past half-century, when Ontario's urbanization was at its peak, suburban water-related infrastructure was either installed by developers or financed by development charges. This reflected a prudent municipal finance philosophy that might be termed "growth should pay for growth." Municipalities conscientiously avoided incurring debenture debt for all purposes, including water and sewer infrastructure, unless it could be financed using development-related revenues or matching capital grants from senior levels of government. The early part of this period was characterized by high interest rates and borrowing costs, so that any debt issued yielded debt-service costs which encroached on operating revenues, whether from rates or property taxes.

With the size, ready availability and ease of collection of development charges, traditional sources of funding for water and sewer infrastructure fell into disuse. Special area rating and local improvement charges have largely disappeared as a capital funding mechanism, particularly in urban areas. Only for agricultural drainage under the *Drainage Act (Ontario)* is such capital cost-sharing still used extensively.

Purpose-specific and project-specific debentures for water-related infrastructure have been replaced by general-purpose debentures, often with amortization terms that are much shorter than the infrastructure they are amortizing.

Section 37 of the *Planning Act (Ontario)* was originally termed an "oversizing" levy, to reflect its use to increase the size of piped infrastructure or to expand treatment facilities. Over time, however, section 37 levies have been diverted to a range of other capital.

The urban infrastructure of much of Ontario is now reaching the end of its useful life, requiring significant refurbishment, expansion or replacement. However, infrastructure that was built with development charges cannot be replaced or repaired from that lucrative source.

Financing major capital projects for long-lived water-related infrastructure

We live in an era of historically low interest rates. The capital cost of infrastructure could now be equitably shared across the full life of infrastructure, ensuring that all who benefit from infrastructure make a contribution to it. Private pools of capital are seeking investment opportunities in infrastructure, which is becoming one of the most sought-after asset classes for pension funds, in part because of its stable, long-term revenue and cost profile. By segregating infrastructure projects to be supported by revenue bonds (City of Toronto can now use these, but the rest of the province can't) and green bonds, new sources of capital could be attracted to infrastructure investment (Strategy Corp, 2015).

Much of the foregoing resolves itself to three elements: increasing and creative use of water rates; funding capital investment in water-related infrastructure with new (and disused) funding mechanisms (Fenn, 2014); and, resolving to apply a utility-based, user-pay philosophy in the administration of water systems.

We are seeing progress. The pattern of increases in water rates, the expanded use of sewage surcharges, and the introduction of stormwater rates have all made a contribution to improving financial sustainability. The size of municipal capital budgets devoted to waterworks has grown, in part due to higher development charges, but also due to rates incorporating a larger component of capital cost recover.

Another, often overlooked factor in expanded municipal capital budgets is the effect of cost-shared infrastructure programs, typically involving each of three levels of government contributing one-third of the cost of approved projects. The incentive to match one-time, time-limited, shovel-ready infrastructure programs has periodically benefited municipal waterworks infrastructure. Presented with the opportunity to repair or expand water-related infrastructure for 33 cents on the dollar, municipalities have found ways to pay their share, by expanding their capital budgets mainly through additional long-term borrowing.

Our conclusions are, therefore, that legacy water systems must be rebuilt using new techniques and to new standards. The rebuilding must be based on a philosophy of user-pay over the useful life of the assets. It is also our conclusion that the facilities and systems must be built to a performance level and standard that reflect future requirements, including integration of water, wastewater and stormwater management, not simply replicating past practices and traditional standards.

Improving quality assurance

While regulations aim to improve the quality and safety of waterworks, they will inevitably add cost to the existing system, not just in increasing operating costs, but also in capital investment. In fact, as operating costs come under pressure, investments in technology to enhance productivity and reduce operating costs will be much in focus. **Our conclusion is that technological improvement may improve quality and resilience, but it will cost more at the outset.**

Promoting water conservation and reuse

Despite our privileged position on the Great Lakes and with Ontario's traditionally abundant sources of clean water, the impact of climate change will be felt in a number of ways. Over time, American states facing water supply and water quality issues will look to our shared water resources. Water will become an increasingly scarce resource. In some parts of the United States and in a number of other countries, it has already become scarce. Efforts to make our water-treatment plants and distribution systems more efficient will increasingly focus on reducing system leakages and wasteful water use practices (Renzetti, Dupont, 2013). Metering is playing an important role and water rates will have an increasingly significant role to play in the future, as will new technologies and new systems,[20] including potentially greater use of grey water systems, industrial water recycling efforts and restrictions on commercial water takings from groundwater sources.

As the freshwater environment deteriorates in other North American jurisdictions and as energy costs rise to address climate change mitigation, both economic opportunities and environmental threats will emerge for Ontario. These developments will require a more sophisticated approach to the management of all aspects of our water system, including the design of water charges and the funding of capital infrastructure.

Canada's and Ontario's water policy should recognize the impending continental importance of water-source access, preservation and conservation, and new forms of economic activity related to water use. The focus should be on preserving water resources, levering competive economic advantage (especially in the Great Lakes Region), ensuring full-cost compensation for water takings, and at a minimum, the principle of net-neutral impacts on Ontario water resources. In fact, building on the work of WaterTAP and others, Ontario businesses, unions, investors and governments could be leaders in this effort. The International Joint Commission, which has bi-national responsibility for the Great Lakes, is certainly inviting Ontario and other jurisdictions to play a leadership role.[21]

Our conclusion is that Ontario should recognize the impending continental importance of water-source preservation and conservation, and new forms of economic activity related to water use. Ontario should seek opportunities to be a leader in these efforts.

Promoting reductions in use of electricity and other forms of energy

Often overlooked in discussions about mitigating climate change and promoting energy conservation is the impact of water-treatment and sewage-treatment plants.

> *"Roughly 30 to 40 per cent of operating cost for a water service is electrical power: water and sewage must be pumped, lifted and pressurized" (Swain et al, 2005, at 9, fn. 5).*

There is a significant opportunity to reduce energy consumption and to promote water conservation and leakage reduction in the water services field (Maas, 2010).

Promoting investment in new technologies and skills

The potential scale of water infrastructure repair, refurbishment and rebuilding will place a significant strain on the existing sources of revenue, both from water rates and other sources. In this environment, it will prove to be necessary to develop more targeted measures to effect repairs and system improvements, using new technologies to identify leakage, system weaknesses and opportunities for pro-active

intervention. Moving away from formulaic maintenance regimes will potentially reduce the overall cost of maintenance, or allow preventative maintenance to be used to defer capital investment.

Some of this effort is as simple as improving system reconnaissance, incorporating the on-site observations and experience of front-line staff, or improving the quality of coordination among the various agencies that share the road allowance. Other measures will be more contemporary and more costly, like installing nano-technology sensors to gauge the state of repair of underground systems and adopting new technologies to triage maintenance activities and to plan and design capital work.

Our conclusion is that the cost of technological improvements in the construction and operation of water, sewage and stormwater infrastructure will have to be incorporated into water-rating structures.

Economic dimensions of our water resources

It is important to recognize that water is not merely a community utility. It represents a significant economic opportunity as with any scarce resource. In other jurisdictions, water availability, quality and cost is increasing as a constraint on agriculture and other forms of economic activity, and is having an impact on public safety and urban development. There are significant "opportunity costs" associated with the current availability and pricing of water by utilities (Dupont, Renzetti et al., 2013).

In Ontario, greenhouses, the bottled-water industry, beverage producers and food processors each represent a source of employment and export income, as well as nearby sourcing of food products. But they can also represent threats to aquifer regeneration and water availability. Their understandable sensitivity to uneconomic prices for water can lead to plant closures, but also to creative measures for water recycling, local treatment and conservation.

Our conclusion is that the pricing of water at an appropriate level, along with targeting manageable net economic benefits, will be a key ingredient in decision-making about the use of water rates and water-taking regulations and fees.

It is also important to emphasize the productivity enhancing aspects of infrastructure investment of all kinds. A number of studies have illustrated the extent to which spending on infrastructure is very much an investment, not just an expense. The Conference Board of Canada suggests that infrastructure spending produces $1.11 increase in gross provincial product for every infrastructure dollar invested and

accounted for fully 12% of provincial labour productivity gains in the 1980-2008 period (Antunes, et al, 2010; Brodhead, et al, 2014). An independent study commissioned by the RCCAO used agent-based economic modelling to make the case that an investment in infrastructure pays net fiscal dividends to Canadian taxpayers that are much higher than previously completed studies on this topic (Smetanin, 2014).

New and emerging issues

Much has been written on the infrastructure deficit and the need for major reinvestment in civil and community infrastructure of all kinds.

Several considerations need to be kept in focus.

First, after a generation of underinvestment in infrastructure, the scale of reinvestment will necessarily be large and will need to be sustained over time.

Second, the nature of infrastructure is changing and will change even more rapidly in the future. As governments at all levels make unprecedented financial commitments to infrastructure, it is equally important to build the right infrastructure. New environmental risks need to be reflected in engineering designs and replacement costing. Promoting innovation, adaptability and potential for third-party funding and financing all need to be part of the evaluation process.

Third, eagerness to invest in infrastructure by senior levels of government can result in the ready-to-go projects displacing projects with greater potential priority and benefit, but with longer lead times and approval processes. Calculations of the infrastructure deficit should be approached with similar discernment, to differentiate real investment priorities from mere historical projections or contemporary wish lists.

Fourth, the economic benefits of infrastructure projects need to be emphasized. Recent studies have highlighted this impact. As noted above, studies have suggested there are significant net fiscal benefits for the Canadian taxpayer from investing in infrastructure.

As Canada looks to increase its global commitment to reducing greenhouse gases and to climate change mitigation, there is a significant role to be played by water-related services. The design of water-related infrastructure, the operation of water and wastewater facilities (both in volume of treatment and energy use), and the mitigation of water-related environmental risks will all need to be factored into the way we pay for water use.

THE NEXT QUARTER-CENTURY

"As Canada looks to increase its global commitment to reducing greenhouse gases and to climate change mitigation, there is a significant role to be played by water-related services. The design of water-related infrastructure, the operation of water and wastewater facilities … and the mitigation of water-related environmental risks will all need to be factored into the way we pay for water use"

Replacement costs will need to allow for more frequent and intense major storm events. System designs will need to reflect the impact of higher levels of upstream and intensified urban development, as well as anticipating the water sourcing effects of controlling invasive species, depleted aquifers, regional and transnational water diversion, and progressive silting of harbours.

New practices, ranging from the introduction of grey-water distribution systems to aggressive water-loss reduction and conservation programs may be features in future water-services capital and operational planning.

Many think of water and sewer pipes as 19th-century technology, pointing out that some European and Middle-Eastern communities still use aqueducts built by the Romans. In fact, water and wastewater systems managers will see the rapid pace of technological change (and the effects of climate change) fundamentally alter the field, as it will in all other areas of public infrastructure. From the Gates Foundation's well-funded examination of new sewage technologies, to installing nano-technology sensors to gauge the state of repair of our underground systems, we will be adopting new water-system technologies to triage maintenance activities and to plan and design the water, wastewater and stormwater projects of the next 25 years. Infrastructure is built with people and concrete and steel, but it all requires money.

This study has attempted to raise our level of understanding of Ontario's water and wastewater system over the past 25 years. The study has illustrated how incentives and disincentives are implicit in the choices made about funding, financing and governing water and wastewater systems. It has also pointed out ways in which the next quarter-century will be different than the past 25 years in this essential area of infrastructure

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and service delivery. Above all, we have attempted to identify the many practical measures needed to adopt the principles of user-pay, full-cost pricing and full-cost recovery, in order to support the exciting work that lies ahead.

Constant unit charge (CUC)

Much of the following discussion on the efficiency aspects of these rates is borrowed from Kitchen, 2007.

A constant unit charge (CUC) is an equal charge per unit of consumption (cubic metre, for example) and seldom varies across classes of customers. It may also include a fixed charge component that is unrelated to water consumption. It is the simplest form of a volumetric rate structure and is illustrated in Figure A.1.

It is an efficient pricing policy only if the marginal cost of water is constant (in which case, the average cost will be constant). We know, however, that the marginal cost is not constant – it either rises or falls with quantity consumed. Since price must equal marginal cost for efficient use, this pricing structure is inefficient and it is not very effective in encouraging water conservation.

… Many think of water and sewer pipes as 19th-century technology, pointing out that some European and Middle-Eastern communities still use aqueducts built by the Romans. In fact, water and wastewater systems managers will see the rapid pace of technological change (and the effects of climate change) fundamentally alter the field, as it will in all other areas of public infrastructure. From the Gates Foundation's well-funded examination of new sewage technologies, to installing nano-technology sensors to gauge the state of repair of our underground systems, we will be adopting new water-system technologies to triage maintenance activities and to plan and design the water, wastewater and stormwater projects of the next 25 years. Infrastructure is built with people and concrete and steel, but it all requires money."

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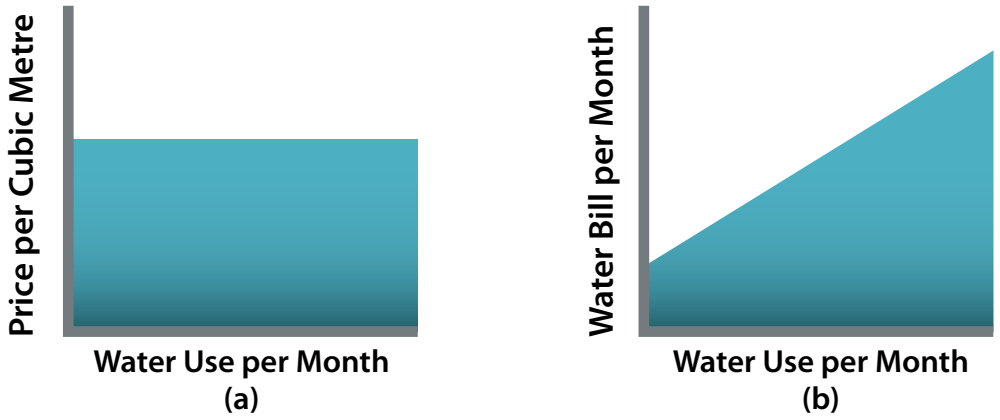
Figure A.1: Graphic representation of: (a) price per cubic metre, and (b) water bill per month for a single block rate



Declining block rate (DBR)

A declining block rate (DBR) structure generally includes a basic or fixed service charge per period combined with a volumetric charge that decreases in blocks (discrete steps) as the volume consumed increases (the more you use, the less you pay per unit). Typically, one or two initial blocks cover residential and light commercial water use, with subsequent blocks levied on heavy commercial and industrial uses. The fixed component of the charge often varies with the size of the service connection. Minimum charges that correspond to a minimum amount of water consumption in each billing period are common in systems of this kind.

Figure A.2 illustrates the concept of the declining block rate. Traditionally, the municipality sets the consumption limit for the first block to represent the largest amount of water that a consumer in a single-family dwelling might use. The second block would encompass the consumption of most middle-sized commercial customers, and the third (and any subsequent) block would encompass larger industrial users. A typical declining block rate system has at least three blocks, but declining block volumetric charge structures with only two blocks are also used.

DBRs are efficient if the marginal cost of water provision is falling, as might occur if economies of scale are present when servicing large volume customers. Critics argue, however, that DBRs do not promote water conservation since the price of water declines as more water is used, hence there may be little incentive to economize on water use. On the other hand, a declining block rate system may be an appropriate tool for water conservation if it is the small customers who are responsible for inefficient water use. Charging them a higher price gives them a greater incentive to conserve.

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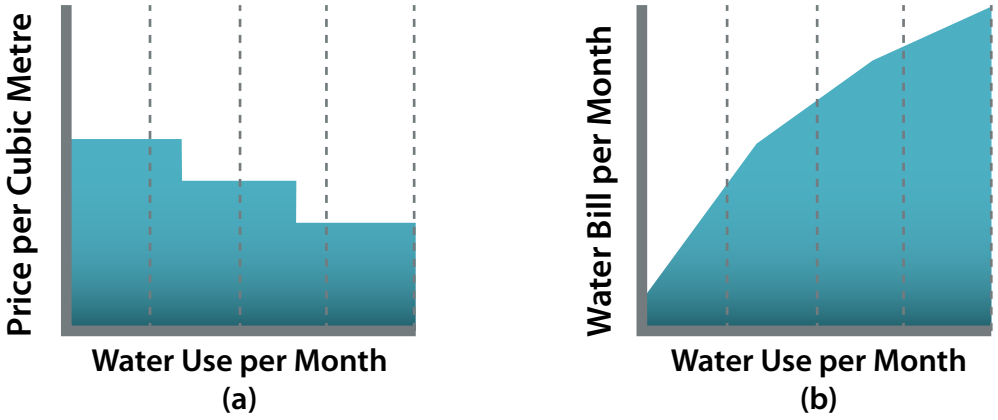
Figure A.2: Graphic representation of: (a) price per cubic metre of water used, and (b) water bill per month for declining block rate



Increasing block rate (IBR)

Figure A.3 shows how a system with an increasing block rate (IBR) works. The first block for a given class of customer is generally designed to cover the normal water use of an average customer in that class. The rate increases with each subsequent block (the more you use, the more you pay per unit).

IBRs may be appropriate for residential customers who as a customer class are the main cause of peak demand, and for industrial customers if limitations on the availability of water justify shifting the cost burden to the largest users. Here, it is these users that have the largest impact on water system planning and sizing since systems are built to meet the largest demands. Of particular interest to policy-makers interested in promoting conservation, price differences from block to block could be set in a way that would give the customer a clear and strong incentive to conserve water.

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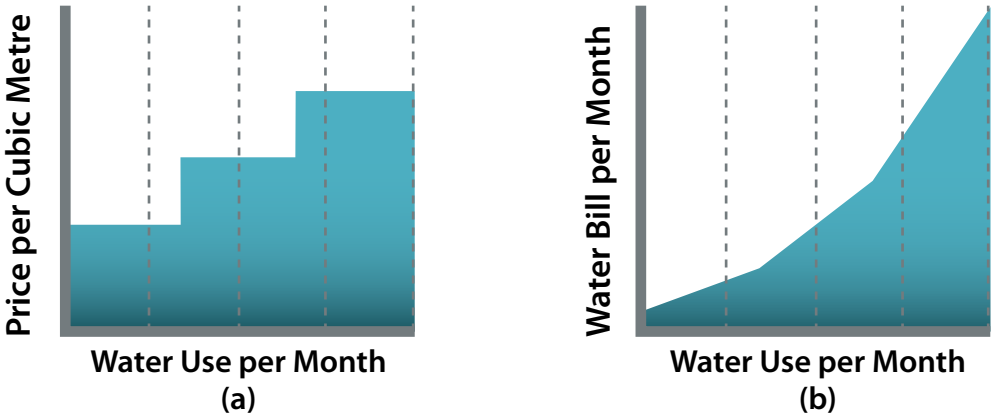
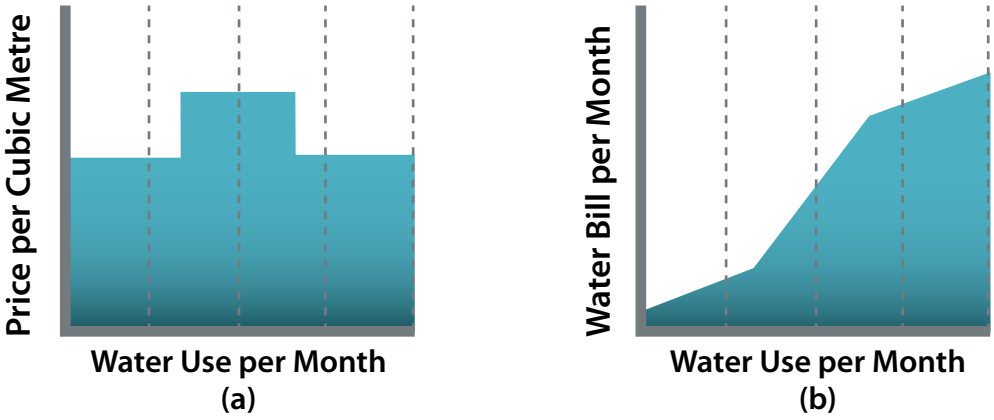
Figure A.3: Graphic representation of: (a) price per cubic metre of water used, and (b) water bill per month for increasing block rates



Humpback block rates

A humpback block rate system of water charges combines increasing and decreasing block rates to produce the rate structure, shaped like an inverted "U," shown in Figure A.4. Under this approach, the municipality applies its highest rate to the consumption block that captures the peak seasonal demand of residential customers. The intention is to encourage water conservation by residential customers by encompassing residential use within increasing block rates while offering large industrial users block rates that decline as use increases and thereby benefit from the economies of scale associated with providing water to customers of this kind.

Figure A.4: Graphic representation of: (a) price per cubic metre of water used, and (b) water bill per month for increasing block rates



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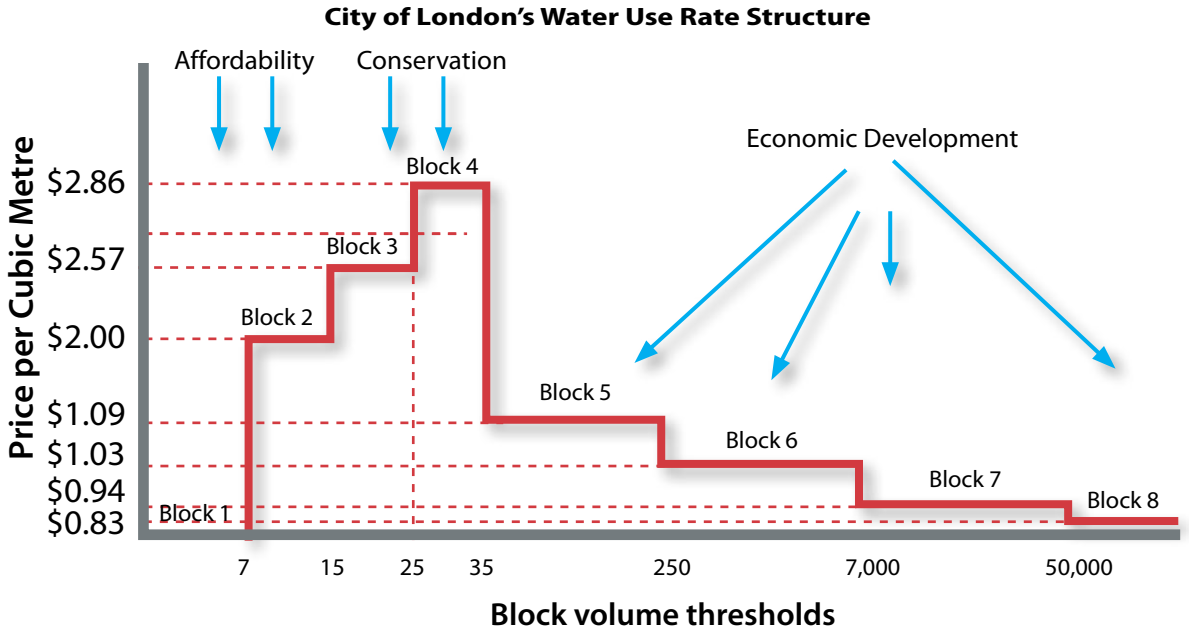
This structure is sometimes used in municipalities promoting economic development. Unlike the 1990s, when manufacturing had just begun its decline in Ontario, many municipalities today are eager to leverage any competitive advantage that they may enjoy, with a view to retaining and attracting industries and jobs. Despite some implicit cross-subsidization among classes of users, the ready availability of clean water at a reasonable price can be a distinct advantage in sectors like food processing or beverage manufacturing. For example, the City of London, Ont. (illustrated in Figure A.5) is quite explicit in characterizing a lower block rate for major users as being for "economic development" purposes (Canadian Consortium, 2015, at 19).

Figure A.5: City of London (Ont.)



Seasonal rates

A seasonal-rate system, as Figure A.6 shows, applies a high volumetric rate during the peak water-demand season and a lower rate during the remainder of the year. By targeting seasonal demand, seasonal rates promote water conservation. The economic rationale for a seasonal-rate system is that in order to meet peak demand, the municipality must maintain supply facilities that are larger than they need to be to meet demand for most of the year. A seasonal charge recovers the extra costs of this excess capacity directly from the component of demand that causes those costs.

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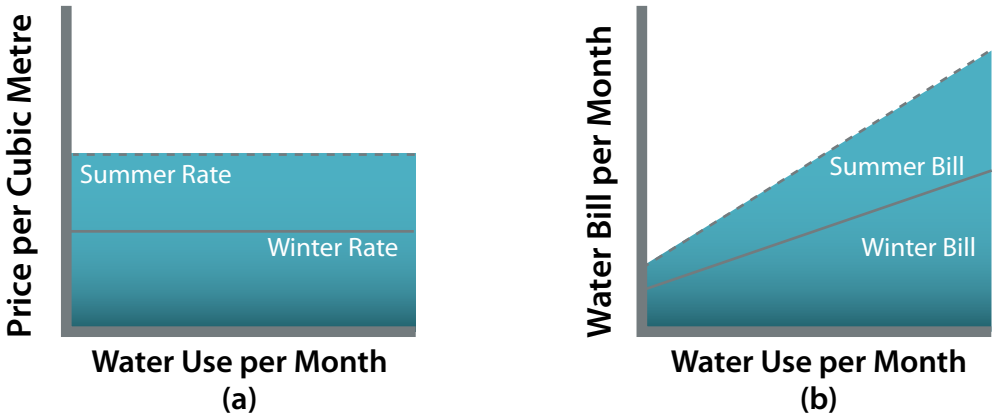
Figure A.6: Graphic representation of: (a) price per cubic metre of water used, and (b) water bill per month for seasonal rate structure



Excess-use rate

An excess-use rate, as Figure A.7 shows, is a high volumetric rate that applies to all consumption during the peak water-consumption season in excess of a threshold amount. The amount is set equal to the average off-peak-season consumption or a modest multiple of this consumption; for example, 1.3 times winter consumption. The municipality applies a base charge to all of a customer's off-peak-season consumption and to the portion of peak-season consumption that is below the threshold.

The difference between the base charge and the excess-use charge must be large enough to give customers a strong incentive to save water. One way to achieve a large seasonal change is to recover all capital costs for expansion from the peak season charge The problem with this approach is that it increases the risk that cost recovery will be inadequate, since peak-season demand tends to be more variable than demand during the balance of the year.

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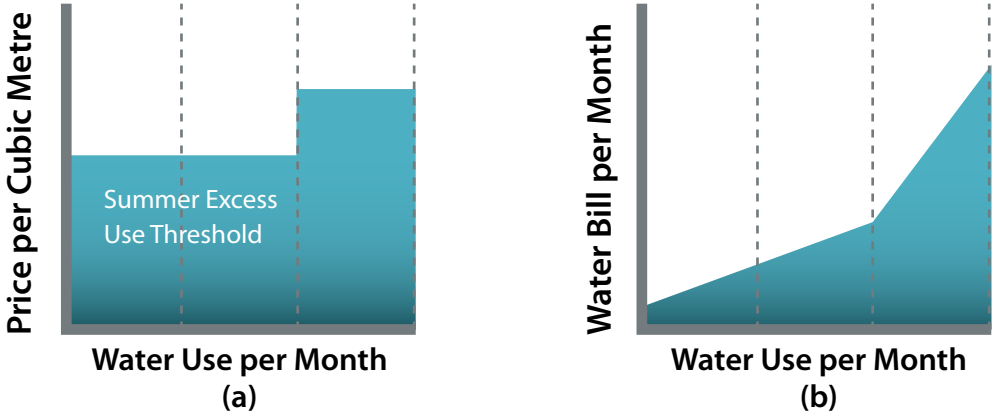
Figure A.7: Graphic representation of: (a) price per cubic metre of water used, and (b) water bill per month for excess-use rate structure.



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ENDNOTES

1 Full-cost recovery through user fees for water and sewer was also one of the recommendations (#12.2) in the Drummond Report, 2012.

2 In particular, see the following: "The full cost of providing the water services includes the operating costs, financing costs, renewal and replacement costs and improvement costs associated with extracting, treating or distributing water to the public and such other costs as may be specified by regulation" (page 301) "There are compelling arguments, for reasons of conservation and efficiency, to implement full-cost pricing and metering, to the extent they are appropriate in the local circumstances, in designing rate structures for water services."(page 316): "The term "full-cost pricing" is based on the premise of user pay: those who benefit from water services should generally pay a price that reflects the full cost of providing those services. The reason to adopt full-cost pricing in the context of water services is to require people to pay the full cost of the water they use. Doing so gives them a better appreciation of the value of water, and encourages them to use it wisely. I encourage municipalities to adopt full-cost pricing in the context of the water system. Full-cost pricing generally means that most water system costs are recouped from the water rate; only water rates allow consumers to be charged according to the amount of water they use. However, it may be that some costs are appropriately recouped from other municipal revenue sources, such as using property taxes for fire protection and capital charges for system expansion. Municipalities may also decide to adopt exceptions to full-cost pricing for reasons of household affordability, as discussed in section 10.3.7.2."(page 317).

3 See footnote 2 in the Conservation Ontario submission, 2001. "The watershed should be recognized as the viable unit for managing water. This is the appropriate unit for the management of both surface and groundwater resources." Valerie Gibbons, 2001, stated that there should be a strategic shift in managing the environment "towards a place-based approach with boundaries that make environmental sense and facilitate a cross-media, cumulative approach (such as watershed management)". While groundwater aquifers sometimes extend beyond surface water drainage boundaries, the human activities and resulting influences occur and can be managed within a surface watershed context. Drinking water source protection programs should be developed as part of an overall watershed management strategy…"

4 Page 294. "In summary, it is my view that where the ownership and operation of a water system is shared between a regional and lower-tier municipality, there are

significant advantages to coordinating the treatment and distribution of water under the direction of the regional government. [O'Connor footnote #45] The provincial government may wish to consider requiring lower-tier municipalities to transfer ownership of their water systems to the upper-tier municipality."

5 Specifically, "The Tuesday, May 30, 2000 edition of CBC Newsworld's "Counterspin" was titled, "Don't Drink the Privatized Water." That show was inspired by the Ontario opposition parties who denounced the privatization of Ontario's water supply testing as a possible cause for the outbreak. Many people, including columnists Terence Corcoran, Andrew Coyne and Lorne Gunter, have correctly pointed out that the testing was the only component of the Walkerton water system that functioned properly. Not only did the private lab detect the E. coli bacteria in the water sample, but the lab also immediately notified the municipality. In previous months, the lab had also notified the Ontario Environment Ministry about high E. coli counts. The municipality's response was to increase the chlorine levels in the town's water, and to deny that there was anything wrong with the water supply."

6 Swain, Lazar and Pine (2005) summarized their findings as follows:

- "While Walkerton was the catalyst for many recent changes in the water and wastewater sector in Ontario and indeed across Canada, there is strong evidence that the status quo is becoming untenable. The province's water and wastewater assets are the legacy of investments made over more than a century, and many of the materials used are reaching the end of their productive lives. Ontario's water prices, always low by world standards, do not approach the true cost of service in most communities. Many municipalities will be hard-pressed to invest enough to bring their systems into good repair and meet increasingly high standards while keeping their rates affordable. The need to address this issue was the Panel's starting point" (page 3).

- "Few people see roadblocks to this future. After all, the quality of Ontario's water is among the highest in the world, and the price of its water and wastewater services among the lowest. Yet there is a serious and growing problem: an unpaid bill of $11 billion for upkeep and repairs. Today its impact is felt through watermain breaks, unreliable service, power failures, shattered road surfaces and backed-up sewers — annoyances that often bring with them further costs. Far more worrisome, however, is that tomorrow it may create a threat to public health and safety, if needs continue to go unmet" (page 7).

- "How is it possible that a province bordered by the world's largest reservoir of fresh water is facing such serious concerns? The answer may lie in the very abundance of this natural resource: for too long, we have failed to give water its full value … The most serious of these is that water-related assets are wearing out, and most communities are not replacing them quickly enough. The current stock of water and wastewater assets in Ontario is estimated at $72 billion, $20 billion in treatment plants and the rest in distribution and collection systems. Over the next 15 years, water and wastewater investment needs in Ontario are expected to range from $30 billion to $40 billion. Based on existing information, PIR's best forecast of the need is $34 billion. The $34 billion is made up of $25 billion for capital renewal, including the $11 billion in deferred maintenance, and a further $9 billion for growth. The Ministry projects that, unless the rate of capital investment increases sharply from the levels of the recent past, Ontario will face a gap of roughly $18 billion between what systems need and what they receive in funding over the next 15 years" (page 7).

7 In more detail:

- **"The Needed Reforms:** "The Panel believes that a wide range of changes to the water sector will be needed to meet the challenges ahead. We have focused on the following reforms to ensure that systems are sustainable and rates reasonable:

- **"The scale and capacity of systems must increase.** Systems must join together to better manage risks, increase the depth of their expertise, gain economies of scale and scope, and help the highest-cost customers. There are many ways in which communities can achieve this. Because the answers will not be the same in every part of the province, local communities must develop local solutions – and an objective, professional regulator must ensure that those solutions are comprehensive and rigorous.

- **"Governance must be strong and effective.** Water and wastewater systems are becoming increasingly complex, and in most cases — especially after consolidation into larger units — a municipally-owned corporation would be the best vehicle to own these assets. Those who oversee them, whether drawn from municipal councils or private life, need to understand a wide range of issues that are often specific to utility operations. For transparency, the finances of water services should be kept separate from those of their municipal owners. Finally, water services

need the flexibility and tools to achieve cost savings through contracting out and other delivery options.

- "**Regulation should be results-based and as light-handed as is compatible with the goal of safe, affordable water services.** Ontario's water services will need a new style of regulator that looks at business plans and proposed rates from the perspective of optimal scale and scope, and measures performance to produce improvement. With the creation of the larger water services that this report foresees, and new licensing requirements in place, the focus of water-quality regulation should shift from detailed prescription to the results that systems are expected to achieve. Inspection and enforcement should be carried out by qualified staff members who are experts in results-based regulation that takes risk management into account.
- **"Systems must look to their customers for financial sustainability.** Consumers should pay the full cost of the services they consume, which will require full metering. This will help to ensure that systems are not overbuilt, conservation is encouraged and nature is respected. With full-cost recovery and improved economies of scale, most water systems in Ontario will be able to rely on their customer base to maintain and operate their assets over the long term. Only where systems are shown to be unsustainable should the Province provide subsidies, and in those cases it should act as trustee of the assets until the system can be made sustainable.
- **"Innovations in technology and training should be used to reduce costs.** Active support from the Province will allow water services to benefit from cost-saving technologies in a more timely fashion. There is also a role for the Province to play in making training programs more easily accessible, especially for staff of remote and isolated systems.
- **"The Ontario Clean Water Agency should be revitalized.** OCWA's front-line staff have a wealth of skills and experience, but lack of direction has led to uncertainty about its role and increasing competition in the sector has hurt its financial results. OCWA needs a revised mandate, a true arm's-length relationship with the Province and a business-oriented board."

8 See footnote 21: "OEB officials concede facing similar situations in the electricity sector, with no ability to require municipal corporations to charge higher rates to pay for needed investments"; and footnote 22: "PIR has prepared a paper on economic regulation, including the Australian and U.K. cases, "Economic Regulation," which

was posted March 10, 2005, on the Panel's website at www.waterpanel.ontario.ca. [No longer available online.]

9 Public Service Accounting Board (PSAB) accounting rules (launched in 2001 and largely implemented in the 2009 municipal fiscal year). See Tassonyi, 2002, and Altus Group Limited, 2008, for a discussion of these.

10 From 1974 to 1992, the Ontario government provided grants to municipalities that covered up to 85% of all capital costs for municipal water systems.

11 A natural monopolist is often depicted by local utility type services (water, sewers, natural gas where it is a municipal responsibility). Their predominant characteristic for analytical purposes here is that they exhibit decreasing per unit costs over the entire range of output (economies of scale).

12 An inelastic demand exists when a 1% increase (decrease) in price leads to decrease (increase) in quantity demanded of less than 1%.

13 On-site services are the responsibility of the developer in most municipalities and are included in a subdivision approval plan.

14 This discussion of reserves differs from the discussion of development charges which also go into designated and legal circumscribed reserve funds.

15 A report prepared by PricewaterhouseCoopers (2002) and quoted in Swain et al (2005) concluded that "… In the subsequent decade (after Walkerton), between ownership changes, contracting out decisions and the creation of new municipal units, the number of models for how water-related services might be structured and delivered multiplied. Indeed, a study commissioned for the provincial government in 2002 estimated that more than 650 theoretical combinations and permutations of organizational structures (reflecting both the ownership and operation of systems) could be used in Ontario's water sector. The study recorded 51 different types of arrangement actually in use in 448 municipalities at the time."

16 Swain et al at (2005) page 32: "EPCOR: Arguably Canada's most successful government-owned company, EPCOR provides energy and water services to its owner, the City of Edmonton, and increasingly to a variety of other customers … With assets of $4 billion, it is a major participant in its markets. In the water sector, the company provides operating and other services under contract to owners of water and wastewater

systems in both the public and private sectors. In 2004, EPCOR was named the Overall Winner of the 2004 National Award in Governance from the Conference Board of Canada and Spencer Stuart. Its board is made up of outside professionals and does not include any members of the council of the municipal shareholder. More information about EPCOR is available at www.epcor.ca"

17 Ontario Municipal Knowledge Network online resource centre, found at: http://www.omkn.ca

18 City of Mississauga / Regional Municipality of Peel "Stormwater Charge"; found at: http://www.mississauga.ca/portal/stormwater/charge

19 "Toronto water rates going up 9 per cent: City council approved a 9 per cent water rate increase for 2014 and tentative hikes of 8 per cent a year in 2015, 2016 and 2017," Toronto Star (Toronto: Dec. 18, 2013); Found at: http://www.thestar.com/news/city_hall/2013/12/18/toronto_water_rates_going_up_9_per_cent.html

20 Swain et al (2005) at page 11: "Innovations in technology and training should be used to reduce costs. Active support from the Province will allow water services to benefit from cost-saving technologies in a more timely fashion. There is also a role for the Province to play in making training programs more easily accessible, especially for staff of remote and isolated systems."

21 Shawn McCarthy, "Ottawa urged to protect Great Lakes – Liberals should support provinces in upgrading sewage and drinking-water infrastructure, International Joint Commission says," Globe and Mail (Toronto: Jan. 20, 2016)

OUR MISSION

On behalf of our members, the OSWCA will champion the sewer and watermain industry to promote the delivery of clean water and safe wastewater management through advocacy, education and environmentally sustainable practices to enhance the quality of like for all Ontarians. We will foster health and safety, professionalism, ethical practices, sound infrastructure investments, good governance and fiscal responsibility.

OUR VISION

To be Ontario's champion of sustainable clean water and safe sewage infrastructure.

CANADA'S ONLY SEWER AND WATERMAIN ASSOCIATION

The OSWCA is a champion of environmental protection and best practices in safety and water system management. We have represented the sewer and watermain construction industry in Ontario since 1971. We represent over 750 companies across Ontario including contractors, manufacturers, distributors and consulting engineers. The OSWCA membership is structured by ten local associations, two pipe producers and one independent association. Collectively, we perform over $1 billion a year in capital projects to ensure clean safe drinking water and environmentally responsible wastewater treatment and disposal.

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