Water Governance in Transition:

Utility restructuring and water efficiency in Ontario

Policy Report

September 2007

PROGRAM ON WATER GOVERNANCE

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PROGRAM ON WATER GOVERNANCE

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ASD	Alternative Service Delivery
AWWA	American Water Works Association
CAO	Chief Administrative Officer
CSA	Canadian Standards Association
CWWA	Canadian Water and Wastewater Association
DSM	Demand-side Management
EI	Economic Instrument
MoE	Ministry of Environment
MPIR	Ministry of Public Infrastructure Renewal
MSB	Municipal Services Board
NPM	New Public Management
O&M	Operation and Maintenance
P3	Public-Private Partnership
PSP	Private Sector Participation
PUC	Public Utilities Commission
SDWA	Safe Drinking Water Act
SWSSA	Sustainable Water and Sewer Systems Act
WEC	Water Efficiency Committee
WEP	Water Efficiency Plan

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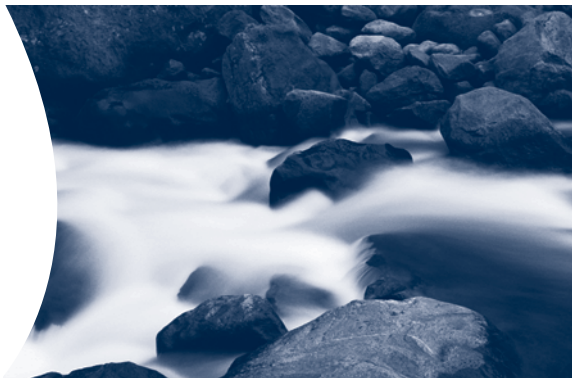
EXECUTIVE SUMMARY

This report presents key findings in the first phase of the research project "Municipal Water Supply Infrastructure Governance in Canada: Uptake of water conservation technologies in the context of utility restructuring" funded by Infrastructure Canada.

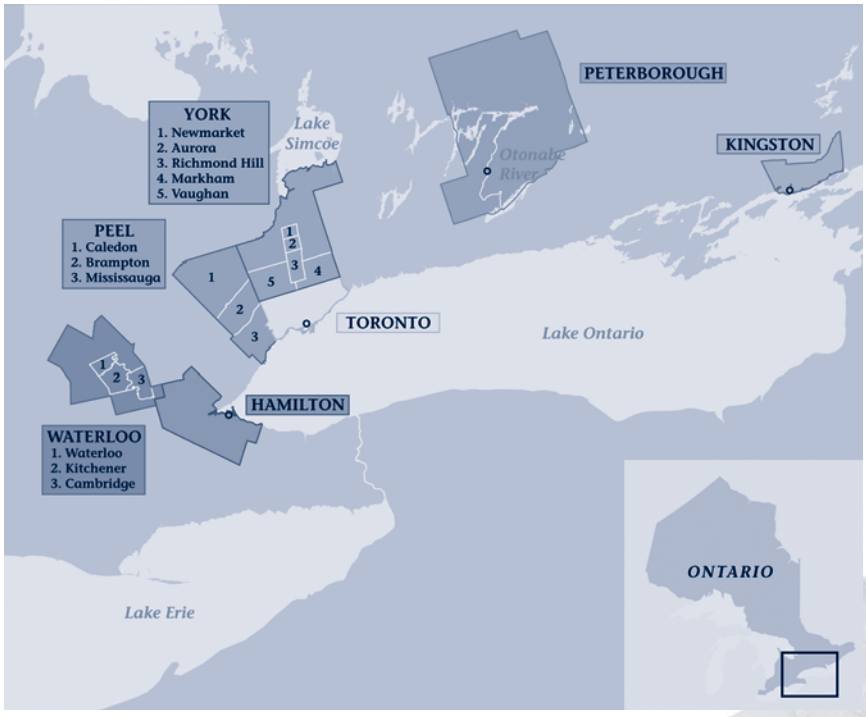


Project summary: Our research examines the relationship between changes in governance and practices of sustainable water management by municipal water supply utilities. Specifically, the report examines the implications of the changing governance of municipal water supply utilities on the uptake and application of water conservation programs. We focus on water conservation because it is generally regarded by water experts as a key element of sustainable water management, and has increasingly been applied across Canada in the past decade. However, the degree of implementation and the approaches to water conservation by individual utilities vary significantly across the country. Little research has been done on the factors influencing this variation. Our research emphasizes how governance models can either constrain or enable water conservation. The findings also indicate that a utility's water conservation mandate can have broader implications for overall governance.

Focus of the report: This report describes the first phase of research for the project, which consisted of a pilot project in Ontario — a province that has experienced some of the most significant changes in the water supply sector of any province in Canada over the past decade. Focusing on one province simplified the research process, eliminating the need to control for inter-provincial variability. The second phase of the project, which begins in mid-2007, consists of a pan-Canadian analysis.

Data: Research for this report was undertaken between February 2005 and June 2006. The primary data were collected through a province-wide expert survey, seven municipal case studies (Figure 1), key informant interviews, and archival material consisting of municipal and utility annual reports and committee minutes going back to 1975. The survey, conducted from June to September 2005, received a 24.3% response rate, with 82 responses from 340 surveys. The interviews were conducted with officials from municipal and provincial

Figure 1: Case Study Location: Ontario



governments and boards, utilities, unions, NGOs, conservation authorities, professional associations, consultants and researchers. Fifty-four people participated in 50 interviews. Finally, 38 experts in water supply management took part in a workshop on April 13, 2007.[1] Participants provided feedback on an earlier draft of this report and contributed to the research through breakout group discussions. The secondary data include reports from a variety of organizations and government bodies as well as other research on the topic.

Structure of the report: The report is divided into three main chapters. Chapter 1 examines drivers, trends and concerns with respect to municipal water supply restructuring in Ontario. A summary of the report highlights pertaining to restructuring is provided in Box 1.

Chapter 2 draws on data from interviews and the survey. It examines the links between governance and sustainable water management through an analysis of governance and related incentives and disincentives for water efficiency[2] programs. Chapter 3 then turns to a discussion of **the case of water conservation,** focussing on various methods to manage demand. A summary of the report highlights pertaining to water efficiency from Chapters 2 and 3 are provided in Boxes 2 and 3 respectively.

Box 1: Restructuring – Report Highlights Drivers, Trends and Concerns

Drivers:

- Post Walkerton legislation has been the most significant driver of utility restructuring in Ontario.
- The Sustainable Water and Sewer Systems Act (SWWSA) is both driving change and causing stagnation, while utilities wait for regulations.

Trends:

- Restructuring has been most motivated by full cost recovery, financial sustainability and improved infrastructure management.
- Restructuring has been least motivated by equitable consumer access to water supply.

Concerns:

- Decision-making roles: Restructuring often seeks to reduce the influence of municipal councils in water supply and to enable utilities to acquire services purchased from the municipality by other means. In practice, strict divisions of roles for council and utility professionals can prove difficult. Many technical decisions have political and social repercussions. Metering is one example.
- Workplace challenges: Restructuring can present challenges to job security, job mobility, loss of expertise, and increased liability and responsibility.
- Public influence over policy: Public interest groups are concerned that arm's length business models will reduce public influence over management policy.

Box 2: Linking Governance and Sustainable Water Management – Report Highlights: Incentives, Challenges and Roles in Governance

- Delaying infrastructure expansion and long-term cost savings are strong incentives to implement Demand-side Management (DSM). Conservation and user accessibility are weak incentives.
- DSM is motivated by scarcity rather than a management philosophy. Consequently, programs are more likely to be limited and temporary.
- Given insufficient federal and provincial standards for water-efficient retrofit devices, utilities may work together to fill the gaps left by regulatory shortfalls, but broader uptake of DSM will require regulation and enabling policies from senior levels of government.
- Municipal governments play a variety of roles in water efficiency programs. They can motivate, mediate or hinder programming. Business models can influence how the potential benefits of a council's input are realized.

Box 3: The Case of Water Conservation – Report Highlights – Water Conservation Measures: Implementation, Techniques and Debates

General

Among efficiency measures listed in the survey:

- Metering was adopted most, and was considered the most beneficial;
- Pricing ranked second;
- Retrofit programs were adopted least and were considered the most difficult to implement; and,
- Public education had the largest gap between its level of adoption and the level respondents thought it should be adopted.

Metering

- Metering is used for a variety of purposes other than regulating demand, especially for system data collection.
- Meter reading and billing must be planned so as not to nullify consumer price signals.

Pricing

- Full cost pricing based on volume used, and without direct pricing subsidies for vulnerable groups, is strongly supported by nearly all respondents.
- Workshop participants included research and development (R&D), ecological integrity, and regulation as elements to be included in the calculation of full cost pricing. They excluded price subsidization (social equity) and extra costs associated with firefighting.

INTRODUCTION: THE RELATIONSHIP BETWEEN SUSTAINABLE INFRASTRUCTURE MANAGEMENT AND GOVERNANCE

Advancing water efficiency, water conservation and water supply and demand management in Canada requires attention to the evolution and diversity of governance and business models for water supply delivery across the country.

In terms of sustainable infrastructure management, we focus on water conservation because it is generally regarded by water experts as a key element of sustainable water management, and has increasingly been applied across Canada in the past decade. However, the degree of implementation and the approaches to water conservation by individual utilities vary significantly across the country. Little research has been done on the factors influencing this variation.[3] The findings in this report seek to at least partially address this research gap, focusing on the relationship between governance and sustainable infrastructure management.

Scope of the report

Our research emphasizes how governance models can either constrain or enable water conservation. And the findings indicate that a utility's water conservation mandate can have broader implications for overall governance. In addition, the report considers how water supply management is simultaneously affected by trends in governance and infrastructure, as the robustness of this relationship is crucial to improving the sustainability of water supply management in Canada. Water supply management may be influenced by governance reforms that affect staffing levels, for example, as well as by technological innovations that increase the automation and complexity of operations (Woo & Vicente, 2003). Another example is the integration of municipal networks, which may be driven by governance changes (municipal amalgamation) and infrastructural drivers (inability to meet large capital costs) (McFarlane, 2003). Improving the sustainability of water supply management thus requires attention to infrastructural improvements and governance reform. In response to the Walkerton tragedy and the subsequent public inquiry (O'Connor, 2002), more stringent standards for drinking water quality have been adopted in Ontario. Meeting these standards requires new infrastructure improvements, the sustainability of which relies in part on governance innovation — improved transparency and accountability, and new pricing and accounting mechanisms. Advancing water efficiency, water conservation and water supply and demand management in Canada requires attention to the evolution and diversity of governance and business models for water supply delivery across the country. For this reason, the report examines water conservation in relation to governance processes and models within utilities, between utilities and municipal governments, and between municipal and provincial governments.[4]

Sustainable water supply management: The case of DSM

Many of Canada's experts on water management see Demand-side Management (DSM)[5] as the optimal solution for future water management in Canada (Mass, 2003).[6] Although efforts to implement DSM are relatively new, Canadian municipalities are increasingly attempting to use DSM to reduce water treatment costs; the

economic and physical burden on water and wastewater infrastructure; and, the environmental impact on water sources and bodies of water that receive effluent. At the national level, the government is encouraging innovative approaches that reduce infrastructure production costs and the burdens on infrastructure through projects such as the *National Guide to Sustainable Municipal Infrastructure* (Various, 2003). Waller's research involving 65 municipalities from across Canada demonstrates that DSM-related activities have included both "soft" and "hard" approaches to infrastructure, and have been primarily aimed at staving off expensive investments in new and refurbished infrastructure (Waller, 1998).

Key concepts

The term DSM is often used interchangeably with the terms "water conservation" or "water efficiency." In this report, these three terms have distinct definitions:

- ***DSM*** refers to a set of measures or techniques used to manage demand (such as metering, pricing and retrofitting). Tate classifies DSM measures into three categories: economic, socio-political (e.g. legislation, public education), and structural-operational (e.g. home retrofits, system audits) (Tate, 1990). In this report, we refine Tate's classification by bisecting his groupings according to whether or not the measures address the supply-side or demand-side of water management. This helps to understand how specific measures may relate to governance. A matrix outlining this supplementary classification is presented in Appendix A.

- ***Water efficiency*** refers to an input-output measurement (such as the water produced per unit cost, or a ratio expressing water system losses). Efficiency may be improved using DSM techniques.

- ***Water conservation*** refers to a set of strategies (which may include DSM measures) employed with the goal of reducing water consumption.

Governance is the process through which decisions are taken within or among organizations, including the inclusion (or exclusion) of stakeholders, and rules for accountability. Governance is distinct from management. Simply put, "water governance" refers to the decision-making process followed and "water management" refers to the operational approaches adopted.

For further discussion of these and other key terms in the report, please refer to Appendix B.

Structure of the report

Chapter 1 sets the context of research in terms of recent and continuing transitions in municipal water supply governance in Ontario. It examines financial and legislative pressures facing the municipal water sector, which largely emanate from the provincial government. And it examines responses to these pressures in terms of trends and concerns related to organizational governance for utilities, the municipal-utility relationship, and unions.

Chapter 2 draws on the data from interviews and the survey to examine the links between sustainable water management and governance. It focuses first on the links related to utility governance and is followed by discussions about the interactions between municipal and provincial levels of governance.

Chapter 3 draws on the data from interviews and the survey to summarize different methods of pursuing water conservation, and to assess their uptake in Ontario municipalities.

Chapter 4 builds on this analysis to present tentative conclusions and hypotheses to be explored in Phase 2 of the research.

1. MUNICIPAL WATER SUPPLY GOVERNANCE IN TRANSITION: DRIVERS, TRENDS AND CONCERNS

The governance and business models of municipal water supply utilities in Ontario were significantly restructured between 1990 and 2005. This has yielded a wide array of new and distinctive models for water governance, signalling a period of experimentation and adjustment (Bakker & Cameron, 2005).

The range of new business models adopted by municipalities includes a variety of Public-Private Partnerships (P3s), municipal corporations, and hybrid models involving corporations, public commissions, and delegated management.

1.1 DRIVERS: FINANCIAL AND LEGISLATIVE PRESSURES

This section summarizes the drivers of this restructuring from the perspective of municipal governments, based on key informant interviews (for more information, see Appendix C).

Key informants from municipal governments, water utilities and professional associations identified the following **key drivers of water governance restructuring** in Ontario:

- Increased fiscal pressure and responsibility for municipalities;[7]
- The Energy Competition Act and changes to the Public Utilities Act;
- Municipal amalgamation; and,
- New legislation following the Walkerton Inquiry.[8]

In terms of legislative change, the piece of legislation with the most obvious and dramatic effect was the **Energy Competition Act**. It resulted in the near elimination of the Public Utility Commission (PUC) model of water service delivery in Ontario.[9] Changes to the Public Utilities Act also affected the PUC model, making it easier to dissolve commissions, making dissolution permanent, and changing board representation from elected membership to council-appointed membership. The enforced separation of electricity from other utilities under the Energy Competition Act also led to increased costs for water utilities, eliminating the cost savings achieved by sharing personnel and equipment in a multi-utility PUC model.

For municipalities that were not directly affected by the legislated incorporation of energy in Ontario, legislation introduced following the Walkerton Inquiry was most frequently cited as a driver of the reconfiguration of operations. However, the current absence of established regulations to support the 2002 Sustainable Water and Sewer Systems Act (SWSSA) has been a cause of stagnation in some municipalities. Survey respondents indicated that although there are certain measures they would like to pursue, without knowing what regulations will be established in support of SWSSA, reorganization is risky. To avoid having to reorganize twice, some municipalities have been waiting for the regulations for more than four years. The opposite is also true. Many municipalities have been or were already pursuing SWSSA-defined requirements, for example, for full cost recovery.[10] Workshop participants argued that municipalities have different capac-

ities and incentives to operate and innovate under such flexible conditions or within an unclear regulatory environment.

The Safe Drinking Water Act (SDWA) likewise yielded additional costs for utilities due to more stringent requirements for training and certification of operators, reporting, testing, and drinking water quality standards. In response, some utilities are reigning in their activities and focusing on newly developed priorities (Box 4, R1). Walkerton has put yet another spin on the fiscal restraint issue. New legislation involving more inspection and regulation has heightened awareness and pointed to the need for infrastructural improvement, placing a greater burden on existing grants (Box 4, R2). With respect to how governance priorities have changed across utilities, many survey respondents cited new provincial legislation as having the largest impact. The legislation was credited with raising costs and shifting priorities. For example, it was not until 2004 that Utilities Kingston considered itself to be progressing beyond simply keeping pace with the changing regulatory environment (Utilities Kingston, 2004: 4).

Box 4: Post Walkerton Legislation – Survey Responses

R1: "We're actually setting priorities, whereas previously we tried to do everything. However, the well has run dry, and we're down to the bones with respect to staffing; therefore, senior management is stating categorically that priorities have to be set, and those not on the list may not and likely will not get done."

R2: "There are less grants and programs available, because there are many more municipalities having to upgrade their outdated water systems and the same amount of monies available."

1.2 Trends and Concerns: Effects of Restructuring

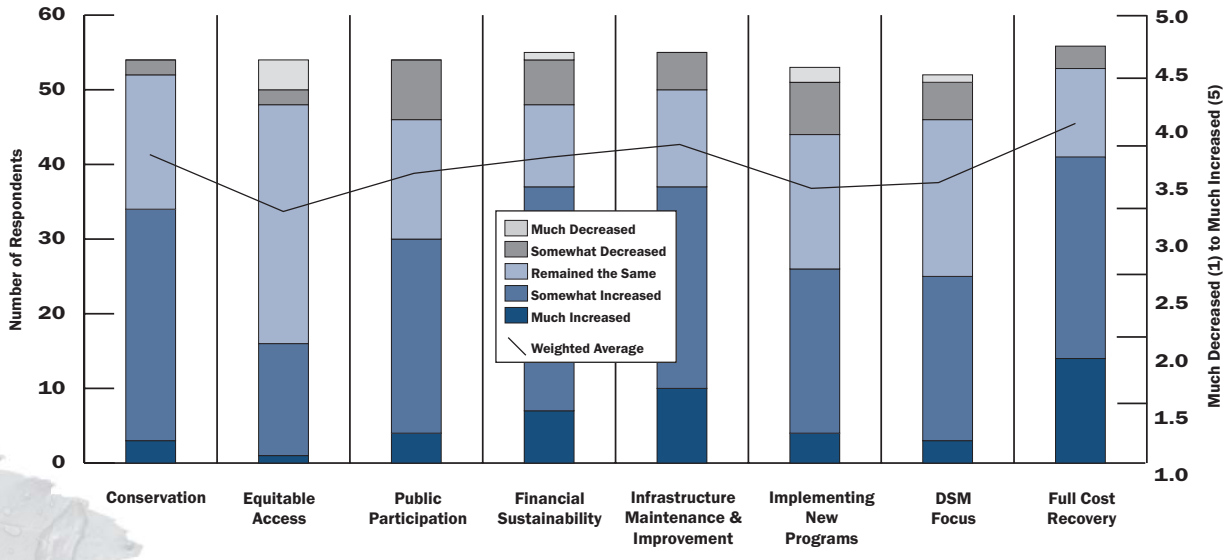
1.2.1 Utility priorities

The province-wide survey asked respondents about the **implications of restructuring for various aspects of water utility management** (Figure 2). In particular, respondents were asked whether specific aspects of water utility management were considered higher or lower in priority following restructuring.

The responses are tabulated in Figure 2, and summarized as follows:

- ***Greatest increase in priority level:*** Full cost recovery (73%);
- ***Significantly increased:*** Financial sustainability (67%); infrastructure maintenance and improvements[11] (67%);
- ***Least increase in priority level:*** DSM (48%); and Equitable access (30%), with most respondents finding no change in priority level.

Figure 2: Restructuring: Effects on the Priorities of Water Supply Management



Survey respondents were also asked how restructuring had affected the priority of a set of governance issues. The majority of respondents indicated that all governance issues listed had increased in priority. Also, in keeping with the results of Figure 2, the greatest perceived increase in priority level was for full cost recovery, with 76% of respondents marking it as somewhat or much more of a priority. Environmental sustainability showed the smallest perceived increase in priority level, with 44% of respondents marking it as somewhat or much more of a priority.[12]

1.2.2 Municipality-utility relationship

Results from the interviews pointed to a trend toward governance models that allow utilities to distance themselves from the influence of municipal politics and local governments. In general, this indicates increasing interest in business models for water supply that are more arm's length from municipal governments.

The reasons for this trend fall into two categories, one political and the other organizational. Politically, municipal councils have been seen to complicate rate harmonization, use the water rate to subsidize the mill rate, take too long to approve contracts, or exhibit ward-based political interests that do not benefit the utility as a whole. Relating to conservation and DSM, utility managers have found municipal councils unwilling to raise prices or impose outdoor water use by-laws.

Organizationally, interview respondents were concerned with the relationship between water utilities and the municipal departments from which they purchase services — mainly those related to human resources, purchasing, and finance. Under a corporate structure, or even a board, it is thought that the water utility could either have its own internal service departments or contract out these services, enabling them to get the best value for money. Respondents argued that these services are insufficiently flexible to meet the unique and changing needs of water utilities.[14]

With respect to the organizational issues identified above, municipal corporate staff members make the point that collective use of services provided by the municipality makes services more cost-effective for the municipality as a whole. Municipalities must provide certain services in-house. Requiring all departments to employ such services creates economies of scope, as seen in the example of printing services (Box 5).

Box 5: Printing Services – Toronto

The City of Toronto must operate printing services to meet the rapid turn-around time required by city clerks. The demand for printing is such that the service must be on stand-by, resulting in inactive periods. Other departments could probably acquire printing services more cheaply by contracting them from outside the municipality, but this would leave the city's printing service idle. Although some departments would save money, the costs for the municipality as a whole would be higher [Interview #42].

In Ontario, the impetus to neutralize the effects of local politics on municipal water supply management has come from a variety of public and private actors, including municipal utility management and, most recently, from the provincial government in the form of the Water Strategy Expert Panel's Watertight Report. Without a formal response from the Ministry of Public Infrastructure Renewal (MPIR) — the provincial ministry that commissioned the report — the report's status as a guide for restructuring is unclear.[15] Irrespective of uptake, the report's theme of favouring arm's length business models for water supply reflects concerns articulated by utility managers in some municipalities.

Ontario is not unique in its drive to separate water services from municipal politics. The American Water Works Association (AWWA) lists the "politicization of water" as one of the 10 primary trends faced by water utilities. According to the Association's journal, addressing the issue requires that "[g]overnance models ... be structured and designed to overcome political problems," which involves "[c]lear separation of management and board responsibilities coupled with strong ethics programs [to] help minimize politicization of capital program expenditures" (Means, Ospina, & Patrick, 2005, p. 65).

Water supply, however, is not a service for which a municipality would necessarily pursue arm's length governance. In the City of Toronto's literature on governance reviews, for example, a service is considered for Alternative Service Delivery (ASD) review if it is not used to implement public policy and generates significant revenue for the munici-

pality or if the City's role in the delivery of the service should be altered (Chief Administrative Officer, 2002, Appendix 5a).

Evidently, in many jurisdictions, debates continue about the City's role in water services and, although water revenues are meant to be ring fenced for water-related activities, in practice, there are grey areas about what is defined as "water related."

1.2.3 Unions and environmental groups

The workplace for water utilities has been subject to important transitions over the last two decades. (Olstein, 2005). These alterations have both affected and been a product of restructuring. Key groups that have been affected include unions and municipal politicians (discussed above). Below, the concerns of unions are explored in detail. The roles of external actors (especially environmental groups, and consultants or experts) are also included, although to a lesser extent.

Unions and environmental groups have had important impacts on some restructuring initiatives. In 2002, a Municipal Services Board (MSB) proposal for Toronto Water was abandoned, as was a second operations and maintenance outsourcing contract for water and wastewater in Hamilton in 2004. At the workshop, groups focused on environmental and social justice issues credited unions with putting the breaks on the privatization movement in water supply. The pertinence of their concerns to this study is outlined in Box 6.

Union representatives have expressed a variety of concerns with respect to arm's length restructuring, which can have inequitable benefits or costs for workers. Those of particular relevance to the questions addressed here are detailed below:

- ***Job security:*** If restructuring leads to more automation or contracting out, concerns about job security arise. With metering, for example, when a utility adopts automated meters, it can result in job loss.[16]

- ***Loss of expertise:*** Early retirement from the water sector has been encouraged — albeit indirectly — through amalgamation, new certification and testing requirements, and cross-training, which can lead to both higher salaries and job intensification. This has meant a loss of institutional memory. As such, workshop participants noted the increased importance of documenting innovation and best practices. Examples given included InfraGuide and the Ontario Centre for Municipal Best Practices.

- ***Mobility:*** Workshop participants noted that amalgamation had the dual effect of increasing job mobility outside or between organizations, and of reducing intra-organizational mobility due to organizational "flattening" (i.e. the reduction of the number of middle management positions). They found more opportunities for job mobility outside of organizations and fewer opportunities within.

- ***Liability and responsibility:*** Results from both the case research and the workshop indicated that with organizational flattening some of liability and responsibility once carried by mid-level management is moved downward to unionized employees. Likewise new legislation places more liability on those working directly with the service. In this context, workshop participants advocated more communication between labour and management.
- ***Role of municipal governments:*** The role of municipal governments in municipal water supply has been a key concern for groups resistant to restructuring efforts that involve the adoption of arm's length business models. Groups arguing against restructuring in Toronto (2002) and Hamilton (2004) cited con-

Box 6: Considering the Concerns of Unions and Environmental Groups

Engaging with unions and environmental groups regarding particular governance and business models is important for this study in several ways:

- These groups have had significant influence on water utility restructuring. As such, their concerns reflect secondary variables in the study of the interaction between governance and sustainable water management.
- They tend to promote certain forms of governance and business models for water supply, usually direct municipal management, which have particular influences upon efficiency programming.
- Among their concerns is the influence of particular governance models on sustainable water supply management.

cerns that accountability and transparency would be sacrificed; that arm's length models result in a loss of public influence and control over water supply; and, by consequence, that such models threaten environmental protection and water conservation.

1.3 THE CONSERVATION CONNECTION

With respect to water conservation and efficiency, the interactions within and among governance organizations and scales of governance are important. For example, water efficiency staff members regularly work with counterparts within the utility and from other municipal departments. Water efficiency staff have lobbied provincial and federal governments for regulatory improvements, indicating the need to work at provincial and federal levels as well. Working with other actors raises challenges. Municipal governments can present political challenges to water efficiency initiatives, sometimes resulting in improvements and sometimes in delays or rejection. The challenges associated with working with various divisions of the utility on water efficiency stem from certain contradictory incentives to managing demand.

Understanding how governance relationships are changing helps determine how drivers and constraints for conservation programming are shifting as well. For example, the results above indicate that restructuring favours full cost recovery, infrastructure improvements and financial sustainability. This indicates improved mandates for water efficiency, but not necessarily for water conservation. With respect to water supply and demand management methods, this would imply a preference for structural operational methods that improve supply-side efficiencies (e.g. leak detection) over those that focus on reducing demand-side consumption (e.g. home retrofits). It also implies a preference for economic measures that regulate demand-side consumption (e.g. pricing) over those that improve supply-side efficiencies (e.g. charging utilities for water taking) (see Table 1).

2. LINKING GOVERNANCE AND SUSTAINABLE WATER MANAGEMENT

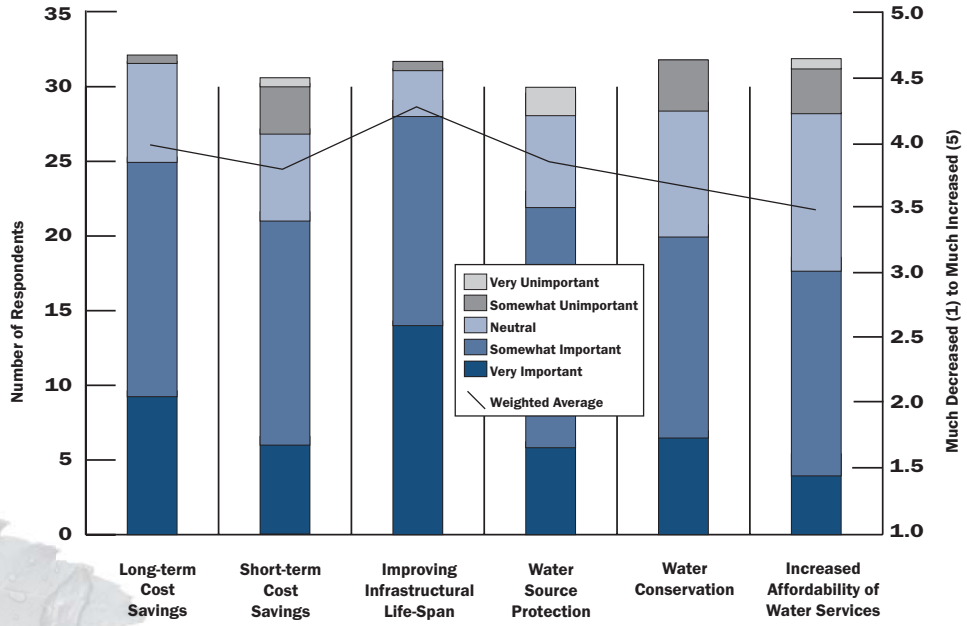
Different levels of government are well placed to fill different roles relating to water efficiency. Noting jurisdictional fragmentation challenges in Canada, workshop participants suggested a funding role for the federal government, regulatory and funding roles for provincial governments, and the roles of implementation and innovation for municipal governments.

2.1 Utility Governance and Efficiency Programming

2.1.1 Motivations for Efficiency Programs

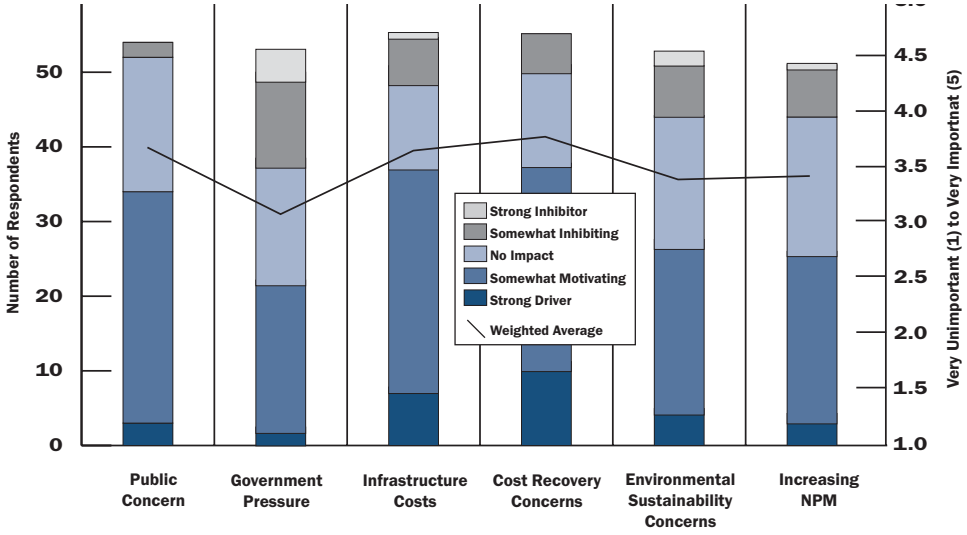
Water efficiency and demand management practices address a broad range of challenges faced by water suppliers. Techniques for improving water efficiency can be applied to realize environmental goals such as improved source protection, reductions in wastewater outflows, and reductions in treatment requirements. These also spill over in to economic goals of water utilities such as cost reduction for water and wastewater treatment, and the delay of infrastructure expansion. In fact, delaying the need to expand infrastructural capacity to meet increasing demand was the most important reason cited for program implementation in Ontario,[17] as well as across Canada (Waller, 1998). Responses to the province-wide survey of experts suggest that increasing the life span of existing infrastructure and long-term cost savings are primary reasons for utility managers to implement DSM programs (Figure 3).

Figure 3: Implementing DSM: How Important Are the Following Goals?



The limitations of infrastructural

Figure 4: Uptake of Conservation Measures: To What Degree Are These Drivers or Inhibitors?



capacity must not be equated to problems associated with aging infrastructure. The latter drives cost recovery and supply-side efficiencies rather than demand-side efficiency. Limitations to infrastructural capacity, on the other hand, are akin to supply short-falls that encourage utilities to curb demand. They present a type of scarcity that is physical, economic and temporary; utilities curb demand because of supply limitations stemming from infrastructure, rather than a philosophy of conservation. Efficiency and conservation programs are frequently viewed as limited responses to problems that will eventually require a solution involving increased supply. Pipeline debates have arisen in the last 10 to 15 years in regions of the Greater Golden Horseshoe that do not have direct access to Lake Ontario.[18]

The survey also explored factors influencing the **uptake of conservation measures**. In general, the options for drivers and inhibitors of conservation techniques presented in the survey yielded only neutral or positive responses regarding the uptake of conservation. Most notable among the drivers were infrastructure costs, cost recovery objectives and public concern. In terms of inhibitors, survey respondents commented on a building industry focused on high-water-use luxury homes; a lack of public awareness; and governmental pressure, noting that this could be both a driver and an inhibitor (Figure 4).

Overall, the survey responses suggest that, in terms of implementing water efficiency programs, **economic incentives are more important than conservation goals**. This is perhaps unsurprising as it reflects the mandate of water utilities, which are more or less uniquely responsible for water efficiency and conservation (see 2.2). This may reflect consumer perceptions. In Toronto in 1990, city councillors decided to refer to "water efficiency" rather than "water conservation" because they felt the latter would lack public buy-in. In his report on Economic Instruments (EI) for water efficiency, Renzetti argues that "what doesn't work" includes "conservation for conservation's sake," i.e. prices must reflect actual costs and not be raised simply to induce conservation (Renzetti & Marbek Resource Consultants, 2005, p. xii). At the workshop, participants indicated that, while water conservation had the negative connotation of sacrifice, water efficiency could inadvertently lead to more water use overall.

2.1.2 Conflicting mandates

Utilities can face internal challenges with respect to DSM (Box 7). Successful DSM initiatives in the energy sector have been subject to negative feedback cycles. Greater conservation can lead to over capacity in utilities; price-drops, and incentives to sell the overcapacity on the part of the utility and to use more energy on the part of the consumer (Hirst, Cavanagh, & Miller, 1996). Such relationships are known as "rebound effects" (Loughran & Kulick, 2004). A related concern stems from lost revenues due to reductions in energy use. According to Gellings (1996: 288), DSM "has been branded [by utility executives] as involving costly direct incentives to reduce precious sales or as a surrogate for social programmes" (i.e. not good business practice). In the long term,

however, reducing demand is known to delay and reduce future infrastructural investments. In the energy sector, such savings on infrastructure have been found to far outweigh the costs of DSM (Gellings, 1996, p. 286).

In the water sector, especially given the increasing focus on self-financing, full cost recovery water supply divisions and utilities, certain contradictions emerge in terms of DSM. Most striking among these is the push to reduce demand on the part of DSM and the need to sell water to meet costs and generate income for infrastructure improvements in an industry with high amounts of sunk costs.[19]

Box 7: Internal Challenges to DSM

Toronto: The water efficiency program was designed to be "revenue neutral," i.e. prices would increase with decreasing demand [Interview #35]. Still, water efficiency staff are sometimes challenged that they are doing "too good a job" [Interview #41].

Kingston: Supply-side efficiency programs in the form of leak detection are actively pursued compared to DSM initiatives. Leaking pipes are lost revenue, whereas excess demand is not [Interview #17].

Durham: A WEP has been developed, and although other efficiency initiatives are ongoing, it is being delayed due to fears that it will lead to revenue loss. External experts are to be brought in to argue a long-term cost benefit case [Interview #15].

While DSM has been critiqued for not "stepping outside the box" of existing consumptive and institutional practices (Brooks, de Loë, Patrick, & Rose, 2004, p. 15), its conventional nature may in fact prove beneficial with respect to the uptake and propagation of water efficiency and conservation programs. That is DSM's more orthodox aspects regarding economic efficiency and the rationalization of user consumption patterns find commonality with the contemporary political economic climate, which promotes business-like management for public services.

2.2 POLITICAL/ECONOMIC ISSUES: MUNICIPAL GOVERNMENTS AND UTILITIES

2.2.1 Ring fencing: Fiscal restraints and political decisions about efficiency

Municipalities in Ontario have limited means of revenue generation. Further, they have little effective control of the revenue channels available to them. Of the available revenue sources — property tax, municipal grants and loans, and user fees — municipalities can claim exclusive control over user fees alone (Kitchen, 1996). In Ontario over the period from 1980 to 1993, cuts to provincial transfer funding resulted in municipalities shifting their property tax revenues to educational funding. With reduced access to provincial funding, the property tax was spread too thinly (Tindal & Tindal, 2004). The Association of Municipalities of Ontario argues that the realignment of provincial-municipal responsibilities in Ontario throughout the 1990s has left Ontario's municipalities at the short end of a $3 billion fiscal imbalance with the provincial government (AMO, 2005).

The strain on municipal budgets and constraints on how they can spend the money they do have can affect water supply utilities even when they are self-financing. Municipalities can transfer funds from municipal bodies with separate revenue streams into municipal coffers through several financial instruments at their disposal. The three most common of such instruments include: operating transfers, payments in lieu of taxes, and franchise fees (Stumm, 1997).

In addition, water-related municipal activities are eligible for funding from the water rate. Under the current budgetary strain, the temptation to construe activities as water related can be significant [Inter-

Box 8: Drawing From the Water Rate – Toronto

The Department of Parks and Recreation in Toronto is not billed for its water use. For the Water Unit, this is a $2 million annual subsidy, which for some goes towards golfers [Interview #1] and for others helps keep public swimming pools accessible to all residents [Interview #42].

The Deep Lake Water Cooling project is a P3 with the City's portion funded through the water rate. It is an important energy efficiency initiative for the City, for which it had few sources of funding [Interview #36]. But it is not a water initiative.

Box 9: Ring Fencing Water Revenues: Wide and Narrow Views of the Water Rate

Depending on how wide or narrow a view of pricing objectives, of water efficiency and conservation we adopt, the activities eligible for funding from ring-fenced water revenues expands or contracts.

- Pricing objectives: Under SWSSA, full cost recovery includes: "source protection costs, operating costs, financing costs, renewal and replacement costs and improvement costs associated with collecting, treating or discharging waste water." Defining what is necessary for source protection will vary across municipalities depending on a number of factors (see also section 3.3).
- Water efficiency: One workshop participant made a connection between ring fencing revenues and water conservation, noting that what municipalities can legitimately fund through the water rate is influenced by how broadly we define the mandate for conservation. A "soft path" approach would mean that a broad range of conservation activities could be funded through the water rate.

views #36 and 39]. This issue is not straightforward, as the Toronto case demonstrates (Box 8). Moreover, much depends on how we define the objectives of water pricing and the breadth of our approach to water efficiency and conservation (Box 9).[20]

2.2.2 Efficiency programs: Hindering, mediating, promoting

Typically, the efficiency initiatives that prove most controversial for municipal governments are metering, price increases, and outdoor water use by-laws (Box 11). Hamilton's experience with its universal metering and price incentive program is demonstrative of the mediating influence that councils can have on utility policy and of the iterative process of working with councils (Box 10).

Box 10: Negotiating Metering – Hamilton

Hamilton has among the highest per capita domestic water demands in urban Ontario. In 2000, 30% of Hamilton's homes were not metered. Today, that figure is 0.2% (City of Hamilton, 2007).

City Council helped shape the universal metering program. In 1999, utility staff approached Council with a policy to "encourage conservation by treating everyone equally." Their proposal involved tripling the flat rate charges for those who refused water meter installation and implementing a two-year repayment plan for meter and installation costs ($260 per home).

On April 26, 2001, Council accepted the program, but reduced the penalty to double the flat-rate charge and increased the payback period to five years (Hughes, 2001a, 2001b).

Councils can also help promote **an environmental agenda**. Personnel involved in Metro Toronto's first Water Efficiency Plan (WEP) in 1990 attributed the initiative to an environmentally progressive regional council [Interview #38]. In Kingston, concerned municipal councillors feel that progress on environmental initiatives with respect to utilities is dependent on the environmental leanings of the Chief Administrative Officer (CAO)[21] who sits on the board of Utilities Kingston [Interview #22]. Finally, utility staff in Peterborough credited their good financial situation to a forward-thinking mayor who raised water rates by 20% in the mid-1980s [Interview #29].

In summary, while councils can hinder unpopular utility policies, they can also promote environmental programming and can play an important role in mediating utility policy to soften the burden for vulnerable consumers. Even technical decisions may have implications for governance, and have the potential to become political decisions to some degree. Metering provides a good example. Whether or not to install meters, how to read the meters, and what type of meter to use all have political and social implications. Reconciling these potentially progressive or stagnating influences of council over water supply is important to ensure a council's consumer protection role.

Box 11: Outdoor Water Use By-laws – Peel and Toronto

Peel does not have an outdoor water use by-law. Instead, the Region runs a weekly voluntary ban called Water Wise Wednesdays. Watering restrictions are controversial in Peel for two reasons: (1) a public perception that because they live next to Lake Ontario, there is no need to conserve; and, (2) the Region sells water to York Region. As one respondent stated, "Council was quite adamant that ... water restrictions would never be imposed on a Peel resident while we sell water to York" [Interview # 28].

Toronto does not have such a by-law either. The issue has not been brought before Council in recent years, because it is considered politically unpalatable to restrict water use through regulation [Interview #38]. The recent willingness of Council to raise water rates indicates that the ability to pay is considered a better method of managing demand than regulation. Although a by-law was included in Toronto's 2002 WEP as a short-listed measure, the Plan stated that it would be restricted to emergency situations (Veritec Consulting, 2002, p. 13).

2.3 LEGISLATIVE AND REGULATORY MATTERS: PROVINCIAL AND FEDERAL ROLES

Institutional and legislative impediments to water conservation were also identified in the study. These findings are supported by a recent Conference Board of Canada report, which found that "water managers do not always have the required policy clarity, mandates for action or information resources to determine the optimal method of delivering water services into the future." Among the recommendations to address these issues, they included "intergovernmental policy coordination" (Hoover, Howatson, Churchill, & Roberts, 2007).

This recommendation was supported by our survey results, with respondents highly favouring **a greater regulatory role for municipal and provincial or federal governments:**

- ***Greater legislative authority:*** 65% of respondents indicated that municipalities should have greater legislative authority than they currently do.
- ***By-laws and DSM:*** Municipal by-laws were deemed considerably or very important for achieving DSM goals by 75% of municipal water manager respondents.
- ***By-laws and sustainability:*** 75% of all respondents saw municipal by-laws as considerably or very much able to improve the sustainability of municipal water supply.
- ***Provincial/Federal regulation:*** 67% of all respondents indicated that governmental regulation would improve sustainability considerably or very much.

Key informants also indicated that provincial legislative change was in many instances necessary for water conservation measures to be implemented. In Ontario, for example, lobbying the provincial government for changes to the plumbing code began in the early 1970s with the Region of Waterloo. Municipal lobbying efforts met with some success when the government amended the provincial plumbing code in 1996 to require efficient water fixtures in all new construction. However, several challenges remain. These include insufficient regulation of fixtures that claim to meet the standards, and the fact that inefficient fixtures continue to be sold in retail outlets. In the United States, the sale of 17-litre toilets is banned. Water efficiency staff members at various utilities in Canada have pursued several avenues to address these problems locally, co-operatively across municipalities, and internationally (Box 12).

Some key informants argued that provincial barriers were so significant that greater powers should be given to municipal governments. For example, the Region of Waterloo has argued for "new municipal powers" to pursue source water protection (MacDonald & Hodgins, 2003, p. 8). In 1990, the former Metro Toronto Water Efficiency Committee (WEC) recommended lobbying the Ontario government, Environment Canada, and the Canadian Standards Association (CSA) for regulatory change. The committee members lobbied the provincial government to amend the plumbing code to require efficient fixtures in all new developments. They lobbied Environment Canada to require water use labeling on fixtures at the point of sale; and they lobbied the CSA for new product efficiency standards (Commissioner of Works, 1990a, 1990b). Metro Toronto's WEC also recom-

Box 12: Addressing Regulatory Insufficiencies – Local and Inter-municipal Approaches

Peel Region's water efficiency strategies include a toilet replacement program for new construction. Although the provincial plumbing code stipulates that all new construction must install 6-litre toilets, many toilets that qualify do not flush at 6 litres or require multiple flushes. This has been a "big problem" due to the large amount of new construction in Peel. In 2003, a group of municipalities (12 Canadian and 5 American), in conjunction with Veritec Consulting, and including the Regions of Peel, Durham, Halton, Waterloo and the City of Toronto, undertook a toilet testing program and developed an approved list of those actually meeting the 6-litre requirement. The program in Peel gives builders the difference in price between the cheapest acceptable toilet (as determined by the by-law) and a toilet tested by the group of municipalities and found to function well. Peel Regional Council dislikes the initiative, viewing it as a subsidy to builders. And Peel's water efficiency group has found it "hard to get the ears of provincial government" [Interview #28].

Peel continues to work with the Region of Durham on this issue, and other municipalities have also remained active. The group started a water efficiency committee under the CWWA to discuss their experience, to further water efficiency in Ontario, to conduct research projects, and to liaise with American counterparts on water efficiency, among other activities. As of January 2006, the toilet testing initiative had stimulated 15 co-operative research projects across North America.

mended that they, in conjunction with the Ministry of Environment (MoE), hold public hearings and conduct studies to establish standards for water efficient devices (Commissioner of Works, 1990b).

Evidently, different levels of government are well placed to fill different roles relating to water efficiency. Noting jurisdictional fragmentation challenges in Canada, workshop participants suggested a funding role for the federal government, regulatory and funding roles for provincial governments, and the roles of implementation and innovation for municipal governments. They noted that, in Ontario, regulatory changes should be based on what municipalities are already doing in the absence of regulations. The provincial government, they argued, is well placed to advance existing initiatives through regulation, policy and funding.

Moreover, the matrix of water supply and demand management techniques presented in Table 1 indicates that, for certain techniques, the direct involvement of different levels of government is required. Most supply-side measures that are economic or social-political, for example, fall within the capacity of provincial government. On the other hand, many structural-operational demand-side measures that can be implemented by utilities will only function to their potential if supported by government regulatory measures (e.g. efficient retrofits and accompanying standards and regulations) or new legislation.

3. THE CASE OF WATER CONSERVATION: IMPLEMENTATION, TECHNIQUES AND DEBATES

The implementation and performance of techniques is related to governance. For example, public education is difficult to justify when utilities are asked to operate like a business and whether or not metering results in better system knowledge or demand reduction depends on various corresponding policy and technical decisions.

3.1 IMPRESSIONS OF VARIOUS APPROACHES

The survey of experts also asked utility managers to what degree different DSM techniques had been implemented in their municipalities; to what degree they thought the techniques should be implemented; and the degree of ease or difficulty of implementation. The survey responses, shown in Figure 5, indicate that the degree to which a measure has been implemented coincides with the degree to which respondents feel it should be implemented, with the latter slightly exceeding the former. Metering and pricing measures were most frequently adopted and considered among the most straightforward to implement. Municipal by-laws and measures to reduce system losses were identified as the next most adopted measures, with about 10% less support. Operation & Maintenance (O&M) measures to reduce consumption and plumbing retrofits were both implemented less often than the other technical measures and were considered the most difficult to implement. Retrofit programs faired the worst in all three categories of responses. All retrofit programs are not alike, however. On the ground, some programs have been very successful, while others have been less effective (Box 13).

Box 13: Retrofit Programs in Waterloo

In Waterloo, a commercial dishwasher spray valve replacement program has realized significant water savings. The project was estimated to cost a maximum of $50,000 for a savings that "could total 31,290 cubic metres per year" or "the total water needs of 144 households" (WEAC, 2005).

The Region's retrofit kit give-away program began in 1984 and appeared at first to be very popular. The kits were in such demand that the Regional Advisory Committee on Water Conservation sought a budget increase to purchase more kits. But in 1986, they found that 40% of aqua savers had been left uninstalled (RACWC, 1986).

While the survey does not reveal the "truth" about retrofit programs, it encourages questions about what the challenges to retrofitting might be. The first and most obvious is the human element in the proper function of such measures. The results also suggest that utility managers see greater benefit in addressing system losses than reducing household consumption. First, technical measures are seen as more effective when they do not require the co-operation of individual water users. Second, user consumption is seen as more appropriately addressed through incentives such as by-laws and pricing signals.

Another explanation emerges from partial correlation tests performed on the survey data. Tests were performed for the relationships between preferred demand management programs and organizational focus, as well as preferred demand management programs and goals for implementing demand management. The full results of the correlation tests are presented in the research note on the project Web site.[22] These data show retrofit programs to be correlated with an organizational focus on environmental

sustainability (p<0.05) and affordable water services as a goal for implementing DSM (p<0.05). Both sustainability and user affordability are public policy issues that utilities may adopt, but are not strictly or primarily within their mandates as purveyors of safe water for municipalities and as those responsible for the associated infrastructure. In Ontario, it is utilities that are charged with managing efficiency programs without sufficient government support in terms of regulations (section 2.3).

The data also show **public education and public participation programs** have the greatest gap between the level of adoption and the level respondents thought that they should be adopted. For both public education and participation, the difference was 28%. Despite this gap, neither is considered particularly difficult to implement. In fact, public education programs were considered the least difficult to implement of all program categories listed. In terms of correlations,[23] public education is linked to a range of organizational foci, which include: environmental sustainability (p<0.05), full cost recovery (p<0.5), and furthering Private Sector Participation (PSP) (p<0.05).

With respect to **challenges in the implementation of public education** programs, the following issues emerged from the workshop discussions:

- *Lack of a clear mandate for education:* It is unclear who has a mandate for education programs and what the message is. Many groups have funding from different levels of government.
- *Plethora of stakeholder groups:* There is both a broad range of sources of information and significant audience diversity (e.g. cultural, geographical). For this reason, participants suggested that we may need different ways of communicating messages to different groups.
- *Different ideas about conservation:* There are many private groups with different ideas about conservation.

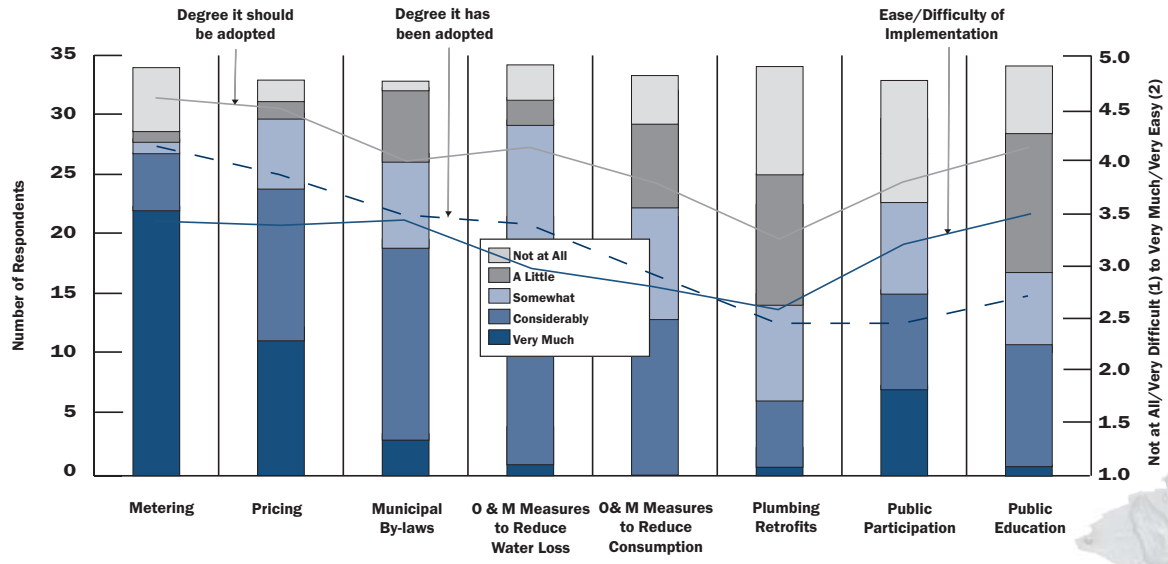
The following two issues were also identified through the interview research:

- *Business-like management:* The nature of "effectiveness" has changed because utilities are often asked to operate as businesses. As such, programs that operate at a loss such as public education are difficult to justify.
- *Measuring success:* It is unclear how to measure the success of education programs. Lower meter readings were suggested as indicators, but were also considered inadequate.

3.2 METERING: GOALS AND CHALLENGES

Metering can serve a variety of purposes and need not be linked to regulating demand. Many interview respondents stated that the need to measure water use and production to gather useful planning and management data was a more important reason for metering than water demand reduction. As the discussion above

Figure 5: Uptake of DSM in Your Municipality



on Hamilton's metering program indicates, metering is a program that appeals to utilities for a variety of purposes that need not include demand reduction (see Box 10). Utilities Kingston provides another example. They have successfully completed a universal residential metering program. However, with ample infrastructural capacity, the utility is not pursuing DSM initiatives in conjunction with metering [Interview #17].

In Peterborough, by contrast, there is little residential metering and the Peterborough PUC charges a flat rate based on home characteristics such as the number of baths, square metres of space, etc.[24] In terms of water efficiency or demand reduction, the PUC does not consider metering cost effective. The PUC conducts a metering study approximately every 10 years to assess the cost and benefits of residential metering. The estimated costs, examined again in 2005, were $9 million for "full implementation" (Stiver, 2004, pp. 4-5). This is seen as a poor investment compared to retrofitting programs. Utility personnel in other municipalities often agreed that metering was not necessarily a cost-effective way to reduce consumption (noting that even where the predicted 20% reduction in demand did occur, rebound effects were an issue). Metering was instead valued as a necessary measure for collecting good, reliable system data, including how well DSM programs perform.

Meter installation alone does not guarantee demand reduction, data gathering, conveying price signals to consumers, or improving performance.

- ***Estimated meter readings:*** In Toronto, water meter reading is done in person. Respondents noted that it was not uncommon for meter readings to be estimated based on prior consumption due to difficulties accessing or reading the meters. Respondents noted that this was particularly problematic where residents and/or companies had invested in water efficiency devices and had not seen a change in their water bills [Interview #37 and #41].[25]

- ***Meter accuracy:*** Workshop participants highlighted difficulties in collecting data from mechanical water meters. They stated that the meters are less accurate and read lower than actual water use levels: "You could be chasing water losses, but really be chasing ghosts." A study conducted on Hamilton's water metering program, for example, found that an "aggressive" preventative meter maintenance program could result in up to $2 million in increased revenues for the utility (City of Hamilton, 2002, p. 16).

- ***Automated metering challenges:*** In Hamilton, individuals working with automated meter reading noted that when the meters were read remotely, the utility lost contact with customers. When meters were read in person, abnormalities in consumption patterns could be noted. The meter reader could then either address possible leaks or discuss water efficiency with the consumer [Interview #26]. At the workshop, this was also identified as an issue with respect to water theft. Participants stated that they need staff to notify customers about leaks, so that customers are able to manage water use themselves.

3.3 PRICING: EQUITY, FULL COST ACCOUNTING AND DSM

Metering and pricing are closely linked. Effective water pricing depends on the presence of meters to measure consumption and enable pricing systems other than flat-rate pricing. Metering and pricing initiatives can also be used to **promote economic and social equity**. The debate in Hamilton over metering and pricing is indicative of the potential impacts of combining the two. In Hamilton, most of the remaining unmetered homes that would be targeted though the universal metering initiative (Box 10) were located in the low-income areas of downtown Hamilton. Councillors from these wards argued that the universal metering plan would place an unfair burden on seniors with fixed incomes.[26] The plan did include financial incentives to encourage meter installation. Other councillors, however, identified another social justice issue: that under a flat-rate system, low-income earners were probably paying more than they should (Hughes, 2001a). Under a flat-rate system based on residential characteristics (i.e. number of baths, square metres of space, etc.), pensioners tend to subsidize middle and upper middle class families.

Although some municipalities have instituted subsidy programs for low-income consumers (Box 14), there was general agreement among interviewees that people should pay the full cost of their water consumption and that rates should not account for the ability to pay. They stated that

any subsidies should be the responsibility of government through welfare programs, and not the responsibility of utilities. This was also supported in the workshop and the survey: while 86% of survey respondents agreed that users should be charged the full cost of water services, 27% expressed agreement that rates should be tailored to a user group's ability to pay (Figure 6).

This **raises the issue of full cost accounting**, or which activities should be included in the water rate and which should be funded through taxes. At the workshop, participants also included water rate assistance for institutional users (e.g. hospitals and schools) and the costs of firefighting (including the costs of higher capacity infrastructure) within the list of services that should be funded through tax revenues. The list of activities that they thought should be considered in full costs was expansive. Beyond the expected activities, workshop participants included ecological integrity, R&D, and a regulatory component. In terms of ecological integrity, they highlighted water source protection, ecological damage and restoration, and ensuring that polluters pay for degrading water quality. The R&D component referred to the need to address scientific deficits, e.g. knowledge about groundwater and surface water, their interaction, and groundwater renewability.

Workshop participants concluded that pricing does not have a significant impact on DSM, because water prices are too low. Here, the DSM experience in the energy sector has two important lessons to offer:

- First is the **need for regulation**. Hirst et al. contend that the only way to create new incentives for DSM under utility deregulation is to institute regulations such that the cost of the externalities from energy production and distribution are covered by the utility (Hirst et al., 1996). This is predicted to drive the price of energy up enough to make DSM financially attractive once again.

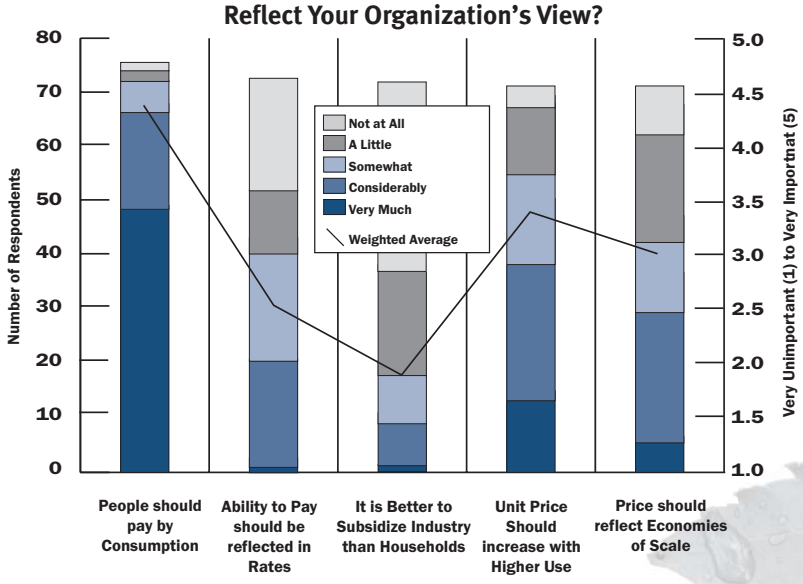
Box 14: Subsidy Programs–Hamilton and Kingston

Hamilton's "Utility Arrears Assistance Program," started in 2002, draws $500,000 from water rates to subsidize low-income user water bills. It became a water-to-energy subsidy program, however, with 93% of funds directed at energy bills (City of Hamilton, 2004). The evolution of the subsidy program indicates the challenge of ensuring adequate utility services for low-income users, the need for flexibility, and council's greater control over the revenues of municipal departments (water) versus arm's length bodies (energy). [Interview #50].

In November 2005, Kingston City Council started a subsidy fund for low-income water users at the Kingston Economic Development Corporation. Council started the fund with $5000, anticipating contributions from other local bodies and levels of government. Council sees its role as "compassionate," ensuring adequate service to low-income users without affecting the utility's income stream or drawing on the property tax [Interview #22].

- Second, in relation to **consumer uptake of DSM**, Eyre argues that one should examine price in terms of how it modifies other barriers to energy efficiency, rather than as a barrier to efficiency itself (Eyre, 1998). In the water sector, for example, inefficient household appliances are barriers to water efficiency. Low prices for water discourage consumers from paying a premium for water efficient appliances. This problem, however, can also be resolved through regulation, limiting the sale of appliances to those meeting an acceptable water efficiency standard.

Figure 6: Water Pricing: How Much Do the Following Statements Reflect Your Organization's View?



4. FUTURE RESEARCH

This report has summarized key issues related to water efficiency and governance of municipal water supply in Ontario. The key finding is that restructuring municipal governance can have an important impact on the degree and type of water conservation initiatives implemented by a utility.

To structure these findings, a set of hypotheses is presented below; these will be tested in the second and pan-Canadian phase of the research project.[27]

(1) Municipal governance models affect the degree and type of water conservation initiatives implemented by a utility. Restructuring of governance models can therefore alter a utility's approach to water conservation by modifying the incentives and roles of different actors.

- For example, when restructuring involves arm's length governance models it alters the ability of governments and the public to influence water supply policy. The reduced influence of a municipal council can alter the focus of efficiency programs. Utilities, for example, favour pricing and metering over retrofit devices, while councils find retrofit programs more politically acceptable to implement than the others.

(2) Achieving a broader range of water conservation initiatives is beyond the mandates of municipalities. There are regulatory and policy roles with respect to water efficiency and conservation in municipal supply that can only be taken on by higher levels of government.

- For example, the strongest drivers for municipal water supply utilities to adopt water conservation initiatives are infrastructure life extension and long-term cost savings. Conservation and equity are weak drivers in comparison. Both conservation and equity require supportive regulation by higher scales of government.

(3) Some water efficiency initiatives may be disconnected from broader concerns of sustainability.

- In the survey, utility managers strongly favoured metering and pricing, and ranked retrofit devices lowest. While retrofitting is associated with broader sustainability goals (e.g. overall reduction in water use), metering and pricing are more closely associated with system knowledge, cost recovery and economic equity.

(4) Better understanding of the mandates and challenges of various scales of governance and of utilities and the issues raised by distinct methods of managing supply and demand will enable improved planning for water efficiency and conservation.

- The classification of measures in Table 1 highlights that different techniques require action or support from different organizations and groups. However, the practical capacity to act (at the utility level) and the political, financial or institutional capacity to act (facilitated by various levels of government) may not coincide.

- Identifying the level of governance associated with different techniques in Table 1 helps clarify these relationships. For example, economic measures on the supply-

side are directed at conservation and place additional cost burdens on utilities. Economic measures on the demand-side are directed at efficiency or conservation and can be selected on a cost-benefit basis. The latter would have wider appeal, whereas the former may be necessary for meeting wider environmental goals.

(5) How we define efficiency can have a number of implications for governance.

- Ring fencing: Activities that depend on funding through water rates can expand or contract depending on how broadly the mandate for conservation is defined. A broader "soft path" approach would involve more activities than an approach focussed strictly on efficiency.
- Roles in decision making: The more broadly efficiency is defined, the greater the implications for matters of public policy, requiring the involvement of governments and public interests groups in decision making.

(6) Mutually supportive roles for utility management and government are necessary to achieve water efficiency and conservation for sustainability.

- Noting the challenges associated with jurisdictional fragmentation in Canada, workshop participants suggested a funding role for the federal government, regulatory and funding roles for provincial governments, and the roles of implementation and innovation for municipal governments.

APPENDIX A – SUPPLY AND DEMAND MANAGEMENT: MATRIX OF TECHNIQUES

The matrix presented in Table 1 classifies the array of available water efficiency and conservation techniques. On the horizontal axis of the matrix, techniques are classified according to whether or not they address the supply- or demand-side of water management.

On the vertical axis, approaches are further classified according to Tate's tripartite classification of DSM techniques (which is equally applicable to supply-side management). The grouping includes: economic, socio-political, and structural-operational (as described in the introduction). The matrix also indicates the bodies, groups or actors that have the capacity, either alone or with others, to implement the measures. For each technique, the capacity holder(s) are specified in the line immediately beneath the technique.

TABLE 1: WATER SUPPLY AND DEMAND MANAGEMENT – MATRIX OF TECHNIQUES AND CAPACITIES

	Supply-Side Management	Demand-Side Management
Economic	Charging for water taking	Pricing (various methods)
	Provincial government	Provincial & municipal governments, utilities
	Charging for ecosystem services	Ring fencing so all users pay
	Provincial government	Provincial & municipal governments, utilities
	Charging for source water protection	Water efficiency audits
	Provincial government	Municipal government, utilities
		Peak period pricing
		Provincial & municipal governments, utilities
		Capacity buy-back programs
		Municipal government, utilities
		Incentives for consumer programs
		Municipal government, utilities
Socio-political	Education in engineering programs	Public education programs
	Provincial government	Provincial & municipal governments, utilities
	Worker training	Advertising campaigns
	Provincial government, utilities	Municipal government, utilities
	Regulations for water efficiency	Building codes
	Provincial government	Provincial government
	Regulations for source water protection	Municipal by-laws for water use
	Provincial government	Municipal government
		Standards & regulations for water using devices
		Federal & provincial governments
Structural/Operational	System leak detection and repair	Water efficient retrofit devices
	Utilities	Utilities, consumers
	Metering	Private leak detection
	Utilities	Utilities, consumers
		Metering
		Municipal government, utilities
		Water recycling/grey water use
		Provincial government, utilities

APPENDIX B – CONCEPTS DEFINED

B1 – EFFICIENCY

EFFICIENCY – TECHNICAL DEFINITIONS

In a technical sense, efficiency refers to the ratio of outputs to inputs in a system (e.g. a ratio of work done to energy supplied). Water efficiency can refer to the ratio of water consuming tasks achieved to the water used, the water produced per unit cost, or the ratio expressing water system losses.

AN EFFICIENT WATER UTILITY

Highlighting key themes for most utilities, one respondent defined efficiency in water utilities as "focused governance and dedicated revenues" [Interview #29]. The survey data indicate that "efficiency" is a catch-all concept for a variety of water supply policies. In terms of improving efficiency, respondents were interested in source protection, full cost recovery, and infrastructural life extension. Interest in water loss reduction and water conservation followed closely. The only proposed measure that did not receive greater than 70% support was cost reduction, valued considerably or primarily by 50% of respondents (Figure 7). [28]

B2 – WATER GOVERNANCE CONCEPTS

GOVERNANCE

Governance is the process through which decisions are taken within or among organizations. It includes: who is involved, assignment of responsibility, the setting of priorities, and rendering accountability.

GOVERNANCE MODEL

In practice, governance is codified through an associated governance model, which includes "the agreements, procedures, conventions or policies that define who gets power, how decisions are taken and how accountability is rendered" (J. Graham, Amos, Plumptre, 2003, p. 1). Governance reflects processes through which decisions are made and a governance model is a formula for achieving the desired principles of governance in decision making (Bakker, 2003).

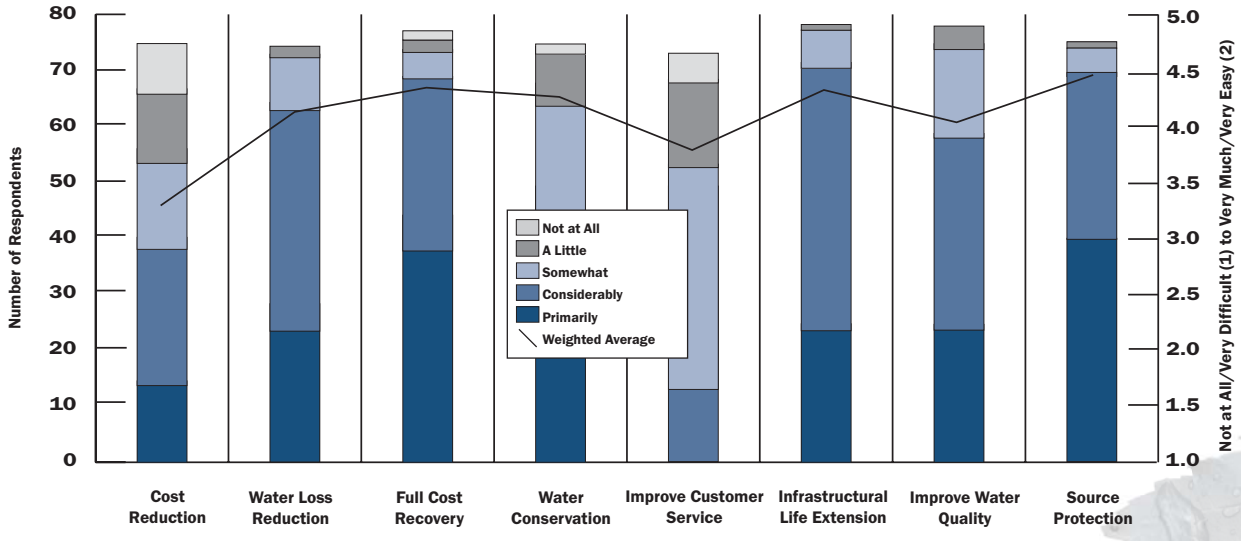
BUSINESS MODEL

A primary feature of municipal water operations in relation to governance is the associated business model. Business models define arrangements for getting things done once decisions have been made. More specifically, a business model delineates features such as ownership, organizational structure, and the risks and responsibilities for the management of the organization and its improvement (Bakker, 2003). Business models in Ontario include: municipal departments, contracts with external operators, municipal corporations, and PUCs, among others.

RESTRUCTURING

Restructuring involves changes in governance and

Figure 7: Improving Efficiency: To What Degree Would Your Organization Promote the Following Techniques?



business models for water supply. Changes in governance include provincial mandates such as amalgamation and new legislation, as well as mechanisms for achieving accountability, liability and transparency. Changes in business models include organizational changes such as asset ownership, the legal framework and operational responsibilities.

B3 - INFRASTRUCTURE

We assume a broad definition of infrastructure that integrates the analysis of both "hard" and "soft" technologies. For the case of water conservation, these include technologies associated with separated storm and sewer drainage, retrofit programs and water recycling. These technologies are usually implemented in conjunction with "softer" techniques that help regulate the use and lifespan of infrastructure. This includes, for example, pricing mechanisms, and water use restrictions. This broad definition of infrastructure is in line with research recently conducted by Infrastructure Canada (Infrastructure Canada, 2004b).

APPENDIX C – DATA

C1 – INTERVIEWS

Over a period of nine months between July 2005 and April 2006, 54 people participated in 50 interviews. Table 2 below provides the list of interviews.

The anonymity of interview participants is preserved according to UBC ethics requirements.

TABLE 2: LIST OF INTERVIEW RESPONDENTS

Interview #1	Consultant	Interview #26	Union
Interview #2	Researcher	Interview #27	Regional Staff
Interview #3	Researcher	Interview #28	Regional Staff
Interview #4	Researcher	Interview #29	Utility Staff
Interview #5	NGO	Interview #30	NGO/Consultancy
Interview #6	National Association	Interview #31	Utility Board Member
Interview #7	NGO	Interview #32	Municipal Council
Interview #8	NGO	Interview #33	Conservation Authority
Interview #9	Professional Association	Interview #34	Municipal Staff
Interview #10	Government Think Tank	Interview #35	Consultant/Former Utility Staff
Interview #11	Provincial Association	Interview #36	Municipal Council
Interview #12	Provincial Board	Interview #37	Municipal Staff
Interview #13	Provincial Corporation (2 persons)	Interview #38	Municipal Staff
Interview #14	Consultant	Interview #39	Municipal Staff (2 persons)
Interview #15	Regional Staff	Interview #40	Municipal Staff
Interview #16	NGO	Interview #41	Municipal Staff (3 persons)
Interview #17	Utility Staff	Interview #42	Municipal Staff
Interview #18	Utility Staff	Interview #43	Regional Staff
Interview #19	Union	Interview #44	Regional Council
Interview #20	Conservation Authority	Interview #45	Regional Staff
Interview #21	Municipal Staff	Interview #46	Regional Staff
Interview #22	Municipal Council	Interview #47	Regional Staff
Interview #23	Municipal Staff	Interview #48	Consultant
Interview #24	Utility Staff	Interview #49	Regional Staff
Interview #25	Consultant/Former Utility Staff	Interview #50	Municipal Council

C2 – ONTARIO EXPERT SURVEY

The Ontario survey of water experts consisted of two parts. The first part was general and to be completed by all respondents. The second part was specific to those representing municipal water utilities. One survey was distributed for each relevant water organization identified and each organization received only one survey. We mailed out 340 surveys and received 82 responses, 41 of which were from municipal water suppliers. For the general portion of the survey, for a confidence level of 95%, our confidence interval is 9.5%. For the second part of the survey, for a confidence level of 95%, our confidence interval is estimated at 14%.[29] The breakdown of respondents according to affiliation and size of municipality is shown in Table 3 below. The survey is a tool for further investigation. Its results generate new questions and refocus existing ones. As such, the survey results were used to generate

hypotheses, which were explored with interviewees in Phase 1, and will be further tested in Phase 2.

TABLE 3: BREAKDOWN OF SURVEY RESPONDENTS

Respondent According to Group Affiliation		Municipal Provider Respondents According to Municipal Population Size	
Provincial Ministry	2	Less than 2000	1
Conservation Authority	14	2000-5000	6
NGO	10	5000-50,000	21
Municipal Provider	41	50,000-500,000	9
Other	13	Greater than 500,000	4
Unidentified	2		
Total	82	Total	41

C3 – WORKSHOP

The "Water Governance in Transition: Utility Restructuring and Demand Management in Ontario" workshop was held April 13, 2007 at the Peter Wall Institute, UBC. The workshop addressed issues that arose from the Ontario pilot phase of the project. A second workshop related to the Canada-wide phase of the project will be held in June 2008.

The workshop report is available on the project Web site at: www.watergovernance.ca/Institute2/municipal/publications.htm

The workshop included 38 participants with extensive experience related to Canada's municipal water supply sector or a related sector. The breakdown of participants is shown in Table 4 below. A list of the workshop participants is presented in Table 5.

Prior to the workshop, an earlier draft of this policy report was circulated among the participants. The draft version was used as the basis for workshop discussions.

The one-day workshop comprised two half-day plenary sessions. The first plenary focused on water efficiency and the second on restructuring water supply. Both consisted of four parts. First, the sessions were opened with a presentation on the plenary theme. Second, the participants were divided into six breakout groups each dedicated to discussing a specific sub-topic and answering a set of related questions. The group membership, topics and questions were pre-assigned. The breakout groups were given one hour to discuss and prepare answers to the questions. Through this exercise, we drew on the expertise of participants to explore specific topics that emerged through the research in the pilot phase. Third, each of the breakout groups presented the results of their discussions to the larger group. In the fourth part, participants engaged in an open discussion.

More information is available on the workshop Web site: www.watergovernance.ca/Workshop1.

TABLE 4: BREAKDOWN OF WORKSHOP PARTICIPANTS

	Ontario	British Columbia	Nova Scotia	Federal/ National
Municipal Government	3			
Municipal Water Supply	4	3		
Academic/Research	2	9	1	
Prov/Fed Government	3			1
Professional Association	4	1		1
Union	2			
Conservation Authority	2			
Public Interest Group	1			1
Total	21	13	1	3

TABLE 5: LIST OF WORKSHOP PARTICIPANTS

Nancy Autton	Urban Governance, City of Toronto
Paul Ayotte	Mayor, City of Peterborough
Karen Bakker	Department of Geography, UBC
Carol Beal	Infrastructure Canada
Sharon Bennett	Nickel District Conservation Authority, Sudbury
Oliver Brandes	Polis Project, University of Victoria
Alice Cohen	Resource Management and Environmental Studies, UBC
Nicola Crawhall	Nicola Crawhall & Associates
Graham Daborn	Arthur Irving Academy for the Environment
Mohammed Dore	Department of Economics, Climate Change Lab, Brock University
Doug Doyle	City of Vancouver
Diane Dupont	Department of Economics, Brock University
T. Duncan Ellison	Canadian Water and Wastewater Association
Neil Freeman	Ontario Power Authority
Ray Fung	Water Sustainability Committee, BCWWA
Kathryn Furlong	Department of Geography, UBC
Shelly Gordon	Canadian Union of Public Employees
Dick Hibma	Conservation Ontario
Susan Howatt	Council of Canadians
Jen Karmona	Department of Forestry, UBC
Jim Keech	Utilities Kingston
Rosemary Kelleher-MacLennan	Past Chair, Ontario Municipal Water Association
Stephanie Lepsoe	Resource Management and Environmental Studies, UBC
Gord Miller	Environmental Commissioner of Ontario
Sarah Miller	Canadian Environmental Law Association
Madjid Mohseni	Chemical and Biological Engineering, UBC
Linda Nowlan	Program on Water Governance, UBC
Gus Oliviera	Canadian Union of Public Employees
Ric Robertshaw	Public Works, Region of Peel
Brian Rosborough	Association of Municipalities of Ontario
Hans Schreier	Institute for Resources, Environment and Sustainability, UBC
Olga Schwartzkopf	Greater Vancouver Regional District
Ken Seiling	Regional Municipality of Waterloo
Kelly Shields	Ministry of Public Infrastructure Renewal
Wayne Stiver	Water Utility Services, Peterborough Utilities Services
Harry Swain	Canadian Institute for Climate Studies/Management Consultant
Stan Woods	Regional Utility Planning, Greater Vancouver Regional District

CITED WORKS

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ENDNOTES

[1] The workshop report is available on the project Web site at: www.watergovernance.ca/Institute2/municipal/publications.htm

[2] Efficiency refers to achieving the best results for a given level of work. In water supply, this can involve a variety of practices and goals. See Appendix B–1 for a discussion of the term. The concept of demand-side management is explained in the introduction.

[3] The links between infrastructural innovation and governance reform have not been widely studied in Canada, but for exceptions see Brandes & Ferguson (2004); Renzetti, et al. (2005: 54).

[4] See Appendix B, section B2 for definitions of governance and several related concepts, including governance models, business models, and restructuring.

[5] Demand-side management regulates the demand for water rather than simply meeting it with new supply.

[6] Other strategies that have been put forward to address financial and infrastructural challenges in the delivery of water supply include "sustainable asset management" (Pollution Probe, 2001) and the "water soft path" (Brooks, 2005; Brandes & Brookes, 2005).

[7] This has been an issue driving changes to municipal water supply governance across Canada. Aspects of political-economic restructuring across Canada's provinces that have been particularly important, include: provincial-to-municipal devolution of fiscal responsibilities for public service provision (Graham, Phillips, & Maslove, 1998); a shift in infrastructure ownership from higher levels of government to municipalities between 1961 and 2002 (Harchaoui, Tarkhani, & Warren, 2003); and increasing use of the private sector to support the provision of public services (Bradford, 2003).

[8] The Walkerton water quality tragedy and the results of the subsequent Walkerton Inquiry provided an impetus for the revision of drinking water legislation, monitoring and enforcement in several provinces, but especially in Ontario.

[9] Between 1990 and 2005, the number of PUCs in the province declined from 124 to 8.

[10] SWSSA also stipulates that regulations will be passed regarding allowable sources of revenue for full cost recovery and maximum amounts by which water and wastewater utilities may increase their charges.

[11] Infrastructural maintenance, life extension and improvement emerge as key foci for utility management throughout the report. This speaks to the "infrastructure deficit" found in many parts of Canada. The Federation of Canadian Municipalities (FCM) defines infrastructure deficit as "the cost to build, maintain and repair essential infrastructure." Published estimates of the deficit's magnitude in Canada vary widely (Infrastructure Canada, 2004a). The Canadian Water and Wastewater Association (1997) estimates a required investment of $88.4 billion in water and wastewater infrastructure between 1997 and 2012. Adding to infrastructure pressures, Canadian municipalities exhibit some of the highest rates of municipal water consumption [as well as the lowest prices for water] in the world (Boyd, 2003; Renzetti, 1999).

[12] The full results for this question can be found on the project Web site at: http://www.watergovernance.ca/Institute2/municipal/survey.htm click on "Figure 6."

[13] This problem is less prominent today than in the 1990s and earlier.

[14] In terms of human resources, for example, there are distinct needs for workers with particular skills in water supply that may not be readily available locally. Utilities use distinct types of training programs including apprenticeships and, following the Safe Drinking Water Act (2002), the work done by human resources increased due to new, more stringent and extensive requirements for training, certification and testing [Interviews #21 & #40].

[15] In October 2006, the CBC published an article stating that the document had been "flushed." However, it referred only to recommendations for amalgamating small systems (CBC, 2007). Enabling rather than adopting is perhaps the most likely strategy. The provincial government has enacted legislation to make it possible for municipalities to adopt municipal corporations as described in the report for water supply delivery. The Municipal Services Corporations Regulation was enacted under the Municipal Act and the City Services Corporations Regulation under the City of Toronto Act in December 2006. These extend the services that can be provided through municipal corporations, and include water and wastewater.

[16] Other concerns in terms of governance arise with respect to automated meters. These are discussed in section 3.2.

[17] Moreover, several of the municipalities studied are sited as "Places to Grow" (i.e. municipalities and regions that are to absorb important amounts of the population growth of the Greater Golden Horseshoe) (MPIR, 2005).

[18] Under the new Great Lakes Basin Sustainable Water Resources Agreement, municipalities must demonstrate water efficiency programs prior to the approval of additional or new water takings. Also, water taken from one lake must be returned to the same lake. This has complicated possibilities for building pipelines to municipalities seeking additional sources of supply. In addition, Ontario's Permit to Take Water Legislation requires that the Director considering the application consider whether water conservation is being implemented (O. Reg 387/04).

[19] The tendency in this scenario would be to favour structural-operational supply-side management methods (Table 1).

[20] For more on the water soft path mentioned in Box 9, see Brookes 2005; and, Brandes & Brookes, 2005.

[21] Chief Administrative Officer – In Canadian municipalities, this person is appointed by a council and is in charge of administrative functions for the municipality. The CAO is also disposed to make policy recommendations to the council, but does not essentially hold a political office.

[22] http://www.watergovernance.ca/Institute2/municipal/survey.htm, click on "research note."

[23] See endnote 22.

[24] Residential customers can opt for meters in some circumstances. Typically the ICI sector is metered. Billing is monthly (KPMG, 2000: 14).

[25] In light of this and other issues, Toronto Water staff sought funding for telematic meters that would allow automated reading. In 2007, Council approved a pilot project to install 10,000 telematic meters in unmetered Toronto residences. Following the pilot's assessment "full conversion of flat rate accounts into meters with automated reading will be considered" (Pannachetti, 2007: 12).

[26] Wards 3, 4, 5 and 8.

[27] For more information, see: www.watergovernance.ca/Institute2/municipal/

[28] The next lowest was Improving Customer Service at 73%.

[29] These confidence intervals are estimates because rather than a random sample from a large population, we have attempted to survey as much as possible of a relatively limited population (see De Vaus, 2002).

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