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C.D. Howe Institute COMMENTARY

THE WATER SERIES

A Bridge Over Troubled Waters:

Alternative Financing and Delivery of Water and
Wastewater Services

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In this issue...

Municipal water and wastewater utilities are not serving Canadians well, and lack the resources to address the challenges ahead. What are the options?

THE STUDY IN BRIEF

THE AUTHOR OF THIS ISSUE

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Recent years have seen fierce disagreements over whether Canadian municipalities should preserve their monopoly over the provision of water and sewage services. Debates in Victoria, Winnipeg, and other communities have pitted those arguing for improved access to private capital, expertise, and efficiencies against those arguing that water services should remain outside of the market.

This *Commentary* argues that the status quo, in which most systems are municipally owned and operated, is not viable. Many of the systems that treat and distribute drinking water perform poorly, many of those that collect and treat sewage are substandard, and many of both systems need more capital investment.

This *Commentary* examines the role of markets in water and sewage services. Canadian municipalities have little experience with the private financing and operating of water and sewage services. Yet many municipally owned and operated utilities have insufficient capacity to meet their challenges without private-sector expertise and financing.

To encourage municipalities to seek competitive offers for water and sewage construction and operation, upper levels of governments should:

- reduce grants for water and sewage infrastructure;
- legislate full-cost pricing of drinking water and sewage treatment;
- publish information on utility performance; and
- enforce laws governing public health and the environment.

To get the most out of their partnerships with private service providers, municipalities should use competitive procurement processes and vigorously enforce performance-based contracts. Public-private partnerships, if approached in that way, are a good solution to a growing and potentially very serious problem.

ABOUT THE INSTITUTE

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Municipal water and wastewater utilities – the majority of which are publicly financed, publicly owned, and publicly operated – are not serving Canadians well. Many of the systems that treat and distribute drinking water perform poorly, and many of those that collect and treat wastewater are substandard. These problems are likely to worsen as infrastructure ages. More stringent regulations, which have been proposed by the federal government, will pose further difficulties for municipal utilities.

In what follows, I will show that municipalities often lack the resources to correct current failings and address future challenges. They lack the professional capacity to plan infrastructure improvements, and the capital to finance them. Increasingly, they lack the skilled labour to operate infrastructure. Worse still, they lack the political will to overcome their deficiencies. Few municipalities are willing to set water and wastewater rates that are high enough to pay for sustainable systems. And few feel real pressure to improve their performance – especially that of their wastewater treatment systems – since conflicts of interest prevent public regulators from vigorously enforcing environmental laws and regulations against public utilities.

I will argue that private water and wastewater services providers are, on the other hand, potentially well positioned to help municipalities address the challenges they face. Many have access to large pools of capital. Many have been in the business for decades and have developed extraordinary operating expertise. Engaged through competitive contracting and governed by performance-based contracts, private providers have incentives to find efficiencies and perform well. Competition can

also improve publicly run operations even if services are not eventually privatized.

Alone, private operations are not a panacea. Private service providers – if installed without competition or constrained by limited water revenues or by the limited aspirations of their municipal partners – do not always realize their potential. Only if financing and enforcement are reformed will private operations provide the full benefits that they are capable of delivering.

Municipal Utilities: Poor Performance and Insufficient Capacity to Improve

Municipal water and wastewater utilities are not serving Canadians well. Across the country, hundreds of facilities, most of which are owned and operated by municipalities, are threatening both public health and the environment.

Poorly Performing Drinking-Water Systems

Municipal drinking-water utilities frequently fail to comply with operating or reporting requirements. In Ontario, for example, during the 2008/09 fiscal year, more than half of the 700 municipal drinking-water systems violated provincial requirements. Inspectors identified several common problems, including improper operation of equipment, insufficient documentation of procedures, and inadequate maintenance of chlorine residuals in distribution systems. That year, 198 systems also exceeded the limits for total coliforms and *E. coli* bacteria in treated water, and 47 systems exceeded the limits for chemical contaminants (Chief Drinking Water Inspector 2010). See Box 1 and the Appendix for a detailed discussion of utility failings.

Substandard Wastewater Systems

Wastewater systems are in even worse shape than drinking-water systems. They are among the

I would like to thank Olena Loskutova for her assistance in researching utility performance, Benjamin Dachis for his expert editing and advice, and C.D. Howe Institute staff and external reviewers for their valuable feedback on drafts of this *Commentary*. The author routinely advises government agencies, businesses, and others on water and wastewater management issues.

Box 1: Performance Problems in Canadian Water Utilities

Across the country, boil-water or do-not-consume advisories are common. More than 1,500 were in effect in November 2010 (Water Chronicles 2010). While advisories most often concern very small systems, such as those serving trailer parks or campgrounds, large cities are not immune. A million Vancouver residents had to boil their water for 12 days in 2006. In the worst cases, inadequate treatment at municipal facilities makes people sick or even kills them. In 2000, in Walkerton, Ontario, *E. coli* and *Campylobacter* bacteria in municipally supplied drinking water killed seven people and made 2,300 sick. The following year, *Cryptosporidium* contaminated the drinking water in North Battleford, Saskatchewan, causing 6,000 to 8,000 people to fall ill.

Another indication of the state of Canada's drinking-water systems is the amount of treated water that is lost from broken or leaking distribution pipes. Although Environment Canada's estimate (2010b) that municipal water losses average 13 percent nationally is not alarming, other estimates do give cause for concern. The National Research Council suggests that typical losses are 20-30 percent and, sometimes, especially in older systems, as high as 50 percent (Hunaidi 2000). Such losses may be both environmentally harmful and economically inefficient.

country's largest sources of pollution, dumping more than 150 billion litres of raw sewage – and approximately 1.35 trillion litres of only partially treated sewage – into waterways every year (Government of Canada 2010b and Environment Canada 2010a). The former environment minister, Jim Prentice (2009), acknowledged the need to curb sewage pollution, saying, “perhaps the most important way in which we can help improve the water quality of Canada's rivers and lakes is to work with the provinces and municipalities to address wastewater.”

The Canadian Council of Ministers of the Environment (CCME) has identified 949 wastewater facilities (of the more than 3,700 systems across the country) that need to be upgraded to provide “secondary” treatment, which is the minimum acceptable level of treatment in the United States. Of these, CCME has determined that 399 pose high risks to the environment (Government of Canada 2010b).

The limited information that is available on the performance of sewage-treatment plants suggests there is frequent noncompliance with provincial laws and regulations. Ontario's compliance reports for 2008 showed that 102 municipal wastewater

facilities exceeded permitted limits (Ontario Ministry of the Environment undated).

Looking Ahead: Anticipating Operating and Financial Challenges

Water and wastewater systems, which are already performing poorly, will face further challenges as infrastructure ages, as population growth spurs demand, as climate change stresses water supply and infrastructure, as the costs of electricity and other inputs rise, and as the Internet makes it harder to hide utility failings.

In the late 1970s, after a construction boom in the previous decades, many municipalities began to neglect their infrastructure, thus setting off a vicious cycle of deferred maintenance, deterioration, and a growing backlog of repairs. In the 1990s, downloading by provincial governments increased municipal responsibilities without proportionate increases in revenues. Politicians often preferred to spend limited municipal capital on more visible services with greater political payoffs, resulting in further deferrals of investment and further deterioration of infrastructure. Although investment in new water-supply stock increased in

the 2000s, wastewater investment continued to lag. As a result, by 2007, wastewater-treatment facilities had, on average, reached 63 percent of their useful life nationally, and 60 percent in Ontario (Gagnon et al., 2008).

As they grapple with aging infrastructure, utilities can anticipate having to meet more stringent standards. In March 2010, the federal government introduced draft regulations for wastewater system effluent. The regulations, if adopted as proposed, will require a minimum of secondary treatment for all of the 949 substandard systems identified by the CCME. The worst 399 systems will have to comply by 2020; another 550 will be given more time. In Ontario, the Environmental Commissioner (2010) has called for still more rigorous standards, which would increase both the complexity and the costs of operations, posing further difficulties for utilities that are already struggling.

Inadequate Expertise

Many municipal utilities are ill-equipped to deal with this host of new challenges. They lack the necessary expertise at all levels – planning, management, and operations. Many utilities do not have the professional skills required to oversee increasingly complicated and technically

sophisticated operations.¹ The ability of utilities to deal with more routine challenges may be compromised by a shortage of qualified operating staff. Since the Walkerton tragedy, municipalities across Canada have striven to train utility employees better and to certify them. Despite considerable progress, problems persist. A recent labour-market study revealed that more than half of the municipalities surveyed had trouble attracting and retaining qualified operators. Indeed, many said this was the biggest challenge they deal with in their water and wastewater facilities. The shortage of skilled labour is expected to become greater with an aging workforce and upcoming waves of retirement, leaving smaller communities especially vulnerable (ECO Canada 2010).

Limited Financial Capacity

Municipal utilities lack the managerial and financial skills – and incentives – to oversee efficiently the large capital improvements that many will require. Water and wastewater projects are noted for cost overruns and construction delays.² Nor do many municipal utilities have the financial capacity to meet the challenges they face because water usage revenues do not cover operating and capital costs. In 2007, municipal water revenues were equal to just 70 percent of

1 The Canadian Water and Wastewater Association (2010, ii) complained that the proposed federal wastewater regulations are so complex that even its members from large and sophisticated utilities have difficulty understanding them. It warned, “it is difficult to imagine that small utilities with fewer resources available to them will be able to comprehend and implement activities to bring them into compliance.” Infrastructure Canada (2004, 9) bemoaned the inadequacy of data-management capabilities, saying that many municipalities “lack the expertise and the information needed to monitor infrastructure, and to assess the need for new or upgraded water infrastructure. Without a system of data collection and monitoring, it is almost impossible to make an informed decision on whether to repair, expand, or upgrade infrastructure.” The Environmental Commissioner of Ontario (2010, 89) sounded a similar note when lamenting the failure of wastewater utilities to optimize their systems to improve performance and avoid the need to expand: “Many facilities (particularly smaller ones) lack the specialized staff, expertise and sensor equipment required to run an optimization program.”

2 The cost of the new sewage-treatment plant in St. John’s, Newfoundland, soared from its initial budget of \$93 million to \$144 million. Calgary’s Pine Creek Wastewater Treatment Centre likewise saw costs skyrocket, with initial estimates variously reported as between \$220 and \$270 million, and a final price tag of between \$430 million and \$450 million. So, too, with the cost of upgrades to Winnipeg’s West End Water Pollution Control Centre, which increased from \$26 million to \$47 million. Such projects, the mayor explained, have simply proved beyond the city’s abilities to deal with (White 2009).

Bent Flyvbjerg et al. (2002), who examined construction cost overruns in 258 transportation infrastructure projects, found that costs were initially underestimated in almost 90 percent of the projects and that actual costs were on average 28 percent higher than estimated costs. The authors maintained that other types of projects are at least as, if not more, prone to cost underestimation. They noted that the problem has not diminished over time: “No learning seems to take place.” They concluded that such systematically misleading estimates “cannot be explained by error and is best explained by strategic misrepresentation, that is, lying.” Those promoting such projects, they suggested, have strong incentives and weak disincentives to underestimate the costs.

recorded expenditures and a far smaller portion of the full costs of service provision, which would include the cost of building adequate infrastructure and the environmental costs of water and wastewater operations (Renzetti 2009). The widespread underpricing of these services has inflated demand, thereby prompting unnecessary expansion of infrastructure, creating unnecessary environmental impacts, and unnecessarily raising operating costs. It has also left utilities with insufficient capital to invest in legitimate infrastructure.

Not much information is available about current capital expenditures and projected capital needs. Statistics Canada (2009) found that \$885 million had been spent to add, expand, or upgrade drinking-water plants in 2007.³ Ontario's data are more comprehensive. That year, Ontario municipalities reported \$975 million in capital expenditures on waterworks systems. The combined capital expenditures for waterworks systems, sanitary sewer systems, and storm-water systems in Ontario amounted to \$2.1 billion in 2007 and \$2.2 billion the following year (Ontario Ministry of Municipal Affairs and Housing 2007; 2008).

Many people believe that capital needs dwarf current capital expenditures.⁴ Estimates of projected needs vary considerably and are unreliable for three reasons. First, they rely on insufficient data. Many municipalities lack a complete inventory of their underground

infrastructure or have not fully assessed its capacity, condition, or performance. Second, they often rely on data obtained from surveys of those who have an incentive to overstate their capital needs in order to attract more provincial and federal grant money. And third, they generally assume that the current pricing policies will continue. In the absence of prices that cover the full costs of providing water and wastewater services, it is impossible to know the true demand for such services or the amount of infrastructure required to meet it (Kitchen 2003).

Despite these uncertainties, it appears that many tens of billions in capital investments will be needed across the country to meet even the existing standards. The need could grow even larger as utilities face new regulations. For example, it will likely cost municipalities between \$6 billion and \$13 billion to meet the proposed federal wastewater treatment regulations, and billions more to curb overflows from combined sewers.⁵

Ontario has made its own estimate of capital requirements. The province calculated that municipalities would need \$34 billion between 2005 and 2019 for their water and wastewater systems, including \$25 billion for capital renewal and \$9 billion to meet projected growth. Comparing this required investment to current investment rates, the province identified an investment gap of \$1.2 billion a year, or \$18 billion between 2005 and 2019. “[W]ithout

3 The agency did not collect information on water distribution systems.

4 In 1996, the National Round Table on the Environment and the Economy (1996) calculated that between \$79 billion and \$90 billion in capital would be needed over the following 20 years – between \$38 billion and \$49 billion to maintain existing stock and services, and \$41 billion to meet new capital demands. It noted that this was a conservative estimate that fell more than \$10 billion below high-end projections. In 1998, the Canadian Water and Wastewater Association (1998) very tentatively projected that municipalities would need to invest \$90.4 billion: \$27.5 billion in water, \$61.4 billion in wastewater, and \$1.5 billion in metering – over the following 15 years. In 2007, the Federation of Canadian Municipalities reached a similar conclusion, estimating that municipalities needed \$87.6 billion for water and wastewater infrastructure – \$31 billion to upgrade existing infrastructure and an additional \$56.6 billion for new infrastructure (Mirza 2007). The Canadian Water Network (2005) reported that it would cost \$39 billion to maintain existing water and wastewater stocks and services, and up to \$90 billion over a 10-year period to replace and upgrade infrastructure. Economist Harry Kitchen (2003, 11) summarized the more alarming conclusions of a 1999 study conducted by Guy Felio for the National Research Council: “Replacement costs for water were expected to total \$56 billion over the fifteen year period from 1997 to 2012 with new investment ranging from \$6.1 billion to \$11.5 billion. For wastewater, replacement costs were estimated to be \$86 billion from 1997 to 2012 and new investment was expected to range from \$7.5 billion to \$10.7 billion.”

5 Federal officials estimate the proposed regulations will cost wastewater system owners and operators \$5.9 billion, discounted to 2010 dollars (Government of Canada 2010b). The Canadian Water and Wastewater Association (2010) calls these costs “seriously underestimated,” noting that the Canadian Council of Ministers of the Environment previously estimated \$13 billion for capital costs alone. According to the Federation of Canadian Municipalities (undated), the regulations will cost at least \$13 billion.

significant changes to the system,” it warned, “sustainability will be an issue in over 100 municipalities” (Ontario Ministry of Public Infrastructure Renewal undated, 4).

Unsustainable Reliance on Infrastructure Grants

Many municipalities will have trouble finding the capital needed to maintain and upgrade their infrastructure. Many will doubtless continue to look to upper levels of government for assistance. But grant programs cannot possibly fund all municipal water, transportation, recreation, and other infrastructure needs. The capital required dwarfs the \$8.8 billion in the Building Canada Fund and the \$12 billion in Canada’s Economic Action Plan. Furthermore, several of the current funding programs will expire in 2011 and 2014. Concern about the large deficits facing the federal and provincial governments make unlikely the renewal of current programs at current scales.

The Environmental Commissioner of Ontario (2010, 85) recently called grants for wastewater systems unsustainable, explaining, “It is very difficult for municipalities to responsibly plan, finance, manage and conserve their wastewater assets, given the temptation of rare, unpredictable, but often large grants.” Depending on the circumstances, grants can encourage too little investment in infrastructure or too much. On the one hand, the possibility of getting “free” money tempts municipalities to delay making necessary investments, and in fact, those that neglect their infrastructure are often rewarded. On the other hand, once grants do materialize, they allow a municipality to invest in unnecessary capacity. Consumers, relieved of bearing the full costs of the water they use, overconsume; municipalities,

likewise relieved of incentives for efficiency, overinvest. Using other people’s money, municipalities build more infrastructure than they need and more than they can afford to operate and maintain. Ontario’s Expert Panel on Water and Wastewater Strategy (2005) pointed this out noting the “sad reality” that “overly generous grants actually caused many of the problems in Ontario’s water sector today.” In the previous decade, 44 percent of capacity had exceeded current needs. More than \$25 billion had been spent prematurely or “to meet no real needs whatsoever.” The panel concluded that this indicated “a serious misallocation of public money” (Expert Panel 2005, 50, 54).

In addition to perverting investment decisions, grants reduce accountability by creating uncertainty about who is responsible for water and wastewater infrastructure, or the lack thereof. They also interfere with the accountability that is part of independent environmental and health regulation. Conflicts of interest may paralyze governments that both finance and regulate water and wastewater systems. The department that regulates performance may be reluctant to enforce tough standards if it knows that doing so will oblige the department that oversees municipal grants to support new infrastructure.

Such reluctance may help explain the federal government’s actions to protect municipal polluters in British Columbia. In 2007, it stayed charges laid under the *Fisheries Act* by citizens concerned about wastewater pollution from the Lions Gate sewage plant; the following year, it likewise stayed charges laid against the Iona sewage plant (Georgia Strait Alliance 2007, 2008).⁶ Provincial governments have been equally unwilling to hold municipal utilities accountable for damage done to public health or the environment. At the inquiry into the Walkerton

⁶ Government prosecutors may likewise be reluctant to press for punitive fines against public utilities that violate health or environmental standards. The large fines imposed on private-sector polluters – such as the \$3 million assessed against Syncrude for the deaths of 1,606 ducks in Northern Alberta, or the \$187,500 fine (including a victim surcharge) assessed against US Steel for one minute of smoke pollution from a blast furnace in Hamilton, Ontario – contrast sharply with the modest fines levied against under-performing utilities. In Ontario, the two municipal drinking water systems fined in 2008-2009 paid just \$10,000 and \$32,000, respectively. This differential treatment may be reasonable, since public utilities – having no profits from which to pay fines, and no shareholders to suffer the economic consequences of poor performance – will simply pass their fines on to ratepayers or taxpayers.

water tragedy, witnesses from Ontario's environment ministry stressed their uniquely cooperative relationship with municipal water utilities and acknowledged the ministry's concerns about the financial implications of enforcement (Energy Probe Research Foundation 2001).

Grants from higher levels of government also impede private-sector involvement in the financing and operation of water and wastewater systems. Free in appearance, though not in reality, public money trumps more costly private money. Municipalities prefer grants, whose costs are borne by provincial or federal taxpayers, to investments of private capital, which must be repaid by local ratepayers. For all of the above reasons, the winding down of grant programs – although sure to prompt vigorous complaints from municipalities – will ultimately strengthen utilities.

Private-Sector Solutions to Public-Sector Problems

Innovative and efficient responses to the challenges facing Canada's water and wastewater utilities will have to involve new sources of financing and expertise, along with new incentives for better performance. The best solutions will often include greater private-sector involvement in both the financing and the operations of utilities.

Alternative Methods of Financing Projects

Investors that put money into water and wastewater infrastructure and services do so because they see investments in utilities as stable, predictable revenue generators. Water utilities in particular, which provide an essential service and have few competitors,⁷ tend to be shielded from economic fluctuations.

Interest in infrastructure investing has grown considerably in both Europe and North America in recent years. More than 200 infrastructure funds have been established, almost half of them in North America (Papa et al. 2009). Among the would-be investors are pension funds, which value the good fit between their long-term payment obligations and long-term infrastructure investments – especially when revenues from the latter are linked to inflation. In the US, a number of state teachers' funds and other public funds are targeting between 1 percent and 5 percent of the market value of their portfolios toward infrastructure (Public Works Financing 2009). Canadian pension funds, which had \$800 billion in invested assets in 2006, are likewise looking at infrastructure investments. As of 2006, at least two large pension funds aimed to allocate as much as 10 percent of their assets to infrastructure (Burleton 2006). Life insurance companies may also become important sources of funding.

Funds dedicated to water investments – though not exclusively to municipal infrastructure – are becoming more common: for example, 2007 saw the Toronto launch of Criterion Water Infrastructure Fund, which invests in companies providing water supply, environmental services, and water technology. Toronto is also home to several water-oriented venture-capital firms, including XPV Capital Corporation, which invests in emerging water companies. Industry insiders speak of an exuberance in the industry. The editor of the infrastructure-renewal magazine *ReNew Canada* has described the water and wastewater sector as being “about to explode onto the marketplace” (Shenker 2009).

Water companies themselves have capital to invest. For example, Epcor – which, though owned by the City of Edmonton, provides water and wastewater services to more than a dozen

7 Water and wastewater systems, being capital-intensive network systems, tend to be thought of as natural monopolies. Since it is generally uneconomic to install rival networks, in North America, competition (where it exists) tends to be *for* the market rather than *in* the market. Even in England and Wales, where the economic regulator of water services has encouraged competition through cross-border supplies, inset appointments, and common carriage, competition remains limited. Under cross-border supplies, consumers who are willing to pay the costs of connection purchase water from regulated suppliers that do not normally service their area. Under inset appointments, new licensees are appointed to service greenfield sites and large consumers in areas already covered by regulated companies; the new licensees may use the existing companies' treatment facilities. Common carriage allows a provider to use a competitor's network to supply water to a customer.

other communities in Alberta and British Columbia⁸ – is looking to invest the proceeds from the sale of its energy-generating assets. It expects to have almost \$2 billion available for investments in water, wastewater, and transmission infrastructure (Gysel 2010).

Currently, in Canada, the capital market's appetite outstrips investment opportunities (Papa et al. 2010). As a result, pension funds and other firms are investing abroad rather than at home. The Canada Pension Plan Investment Board and Ontario Teachers' Pension Plan have invested in water utilities in the UK and Chile. Epcor has purchased water and wastewater utilities in Arizona and New Mexico. Oakville-based Algonquin Power owns 19 water-distribution and wastewater utilities in the US. The top holdings of Criterion Water Infrastructure Fund are in Brazil, the US, France, the UK, and Switzerland.

Fund managers have, however, invested in some Canadian water utilities. For example, CAI Capital Management and the BC Investment Management Corporation are the principal owners of Vancouver-based Corix Utilities, which owns and operates several small systems in Canada, including the new sewer system in Langford, BC. Such opportunities remain rare because investor-owned systems are the exception.⁹ Nonetheless, private money can and, arguably, should be invested in publicly owned utilities more often.

The Benefits of Private Financing: Access to Funding, Risk Transfer, and Efficiency

Municipal utilities can benefit from private equity and debt in several ways. Most obviously, they will gain access to funding that has until now been far too limited to meet their infrastructure needs. Not only has grant funding been insufficient, but the

financial crisis made conventional debt less available at attractive terms. Alternative sources of funding are therefore needed more than ever. Private funding for water and wastewater infrastructure promises the associated benefit of reducing the number of projects competing for limited public funds, in essence freeing up funds for other purposes.

Private funding is also key to transferring financial risks from the ratepayer and taxpayer to the private sector – this is one of the most common arguments for greater private-sector involvement (Iacobacci 2010; Burleton 2006). It is generally thought that parties should bear the risks over which they have the most control. A consortium that designs, finances, and builds a facility will have considerable control over the pace, cost, and quality of construction. It should therefore bear the risks of the facility's being delivered late or above budget or failing to perform as promised. If the facility does not work, the consortium, rather than the taxpayer or ratepayer, should be financially responsible. The benefits of transferring risks are widely seen as substantial, and they are given significant weight in the value-for-money calculations used to compare traditional procurement with alternative financing. To be sure, the benefits are not free since those bearing the risks will be compensated. Even so, the benefits of offsetting these risks are valuable enough to justify paying higher financing or transactions costs.¹⁰

Another advantage of private funding is that it will be used more efficiently than public funding. Municipal utilities – and consumers – will therefore get more for less. Public-private partnerships (P3s) involving the private design, finance, and construction of public water and wastewater infrastructure create powerful

8 There are far more if the 51 communities and 10 counties surrounding Edmonton are counted separately.

9 BC has approximately 178 privately owned water utilities. More than half are very small, serving fewer than 50 customers. The largest, owned by Epcor, serves White Rock's population of 20,000.

10 The challenges of effectively transferring risks should not be overlooked. Even under alternative financing arrangements, a municipality may be left holding considerable risk. Critics of greater private involvement point out that a municipality cannot fully insulate itself. "It is the City's responsibility to ensure that sewage is collected and treated and in the end a private consortium or contractor can always walk away, but the City cannot," warns one union representative (Canadian Union of Public Employees 2011). A municipality's residual liability points to the importance of its negotiating binding contracts with clear penalties, backstopped by letters of credit, performance bonds, or other guarantees.

incentives for responsible, lowest-cost, and timely construction. Private water companies, on their own or in a consortium with other investors, risk their own money with no promise of relief from taxpayers. This motivates them to exercise due diligence, both commercial and technical, and to invest prudently. Commercial discipline will help filter out projects that are not viable, such as those that are premature or oversized or involve inappropriate technologies.

If the private partners finance a project and are not paid until its completion, they will have strong incentives to manage construction effectively and complete it on time. Delays in construction schedules or technological problems that push back delivery dates will increase their debt-servicing costs. Private finance is thus an important efficiency driver (Iacobacci 2010).

Experience in other sectors confirms the efficiencies of private financing. The Conference Board of Canada examined the projects undertaken since 2004 under the auspices of provincial P3 agencies. Of the 19 completed projects (none of which were municipal water or wastewater projects), 17 were delivered early or on time, and two were delivered up to two months late. The projects often brought considerable efficiency gains for taxpayers. Savings per project ranged from less than 1 percent to more than 61 percent, or from a few million dollars to more than \$750 million (Iacobacci 2010).¹¹

So, too, with experience in the UK. The UK Comptroller and Auditor General (2003) examined 37 projects – including hospitals, prisons, and roads, but not water, which has been privately provided since 1989 – that had been procured under that country's Private Finance Initiative (PFI). Focusing on construction cost, timing, and quality, they compared the PFI results with historical experience of public-sector contracts. They found that only 22 percent of the PFI projects had exceeded budgeted costs,

compared to 73 percent of the earlier public-sector projects. Furthermore, only 24 percent of the PFI projects were delivered late, compared to 70 percent of the public-sector projects. They concluded that “there is strong evidence that the PFI approach is bringing significant benefits to central government in terms of delivering built assets on time and for the price expected by the public sector.” Other PFI studies found average savings of between 17 and 20 percent compared to publicly procured infrastructure (Allen 2001).

Involving the private sector not only in design, finance, and construction but also in operations further increases efficiencies and decreases financial risks to the public sector. If the same party designs, finances, constructs, and operates a facility, it will have incentives to minimize costs over the entire life of its contract. In designing the facility, it will take into account not only construction costs, but also long-term costs associated with operations, maintenance, management, and asset replacement. It will strike an efficient balance between initial investment and long-term expenditures (Hart 2003). The bundling of construction and operations can also provide a kind of insurance for long-term performance. In conventional procurement, a builder's obligations end with the construction warranty, but when construction and operations are bundled into a single contract, responsibility extends to the end of the contract.

Concerns about Private Financing

Two common concerns temper the considerable advantages of private financing. The first is that some investments in municipal water and wastewater infrastructure are too small to be of interest to large investors, such as pension plans. Although investors interested in smaller projects appear to be emerging, the transaction costs associated with P3s may be too great for smaller

11 The Canadian Union of Public Employees, which vigorously opposes P3s and the threats they may pose to union jobs, lucrative benefit packages, and job-security guarantees, calls the Conference Board study “astoundingly biased and superficial.” It charges, “The assumptions used in these VfM [value for money] reports, particularly in terms of discount rates and risk transfers, are highly questionable.” Furthermore, it complains, the study “ignores or dismisses major auditor general criticisms issued recently in several provinces” (Sanger 2010).

projects. It is time-consuming and expensive to determine whether a P3 provides value for money, to negotiate a complex contract, and to manage that contract. PPP Canada, a federal Crown corporation established to support the development of P3s, suggests a \$50 million floor on the total project cost for P3s of all types. Larger projects, it says, can generate greater efficiency gains to offset the fixed costs of P3 development and procurement. Similarly, Partnerships BC and Infrastructure Ontario recommend projects that cost at least \$50 million as targets for alternative financing and procurement. Others put the minimum threshold for a P3 project at between \$40 million and \$100 million (Iacobacci 2010). Still others suggest that projects of less than \$250 million may be too small (Burleton 2006).

This limitation is not, however, fatal. Some water and wastewater projects on the horizon will cost hundreds of millions of dollars, an amount that puts them well above even the highest efficiency floor. Victoria plans to spend more than \$700 million on its new sewage system, and Winnipeg plans to spend more than \$660 million on upgrades to its existing system. A new drinking-water system may cost Saint John, New Brunswick, almost \$260 million. But even smaller projects may be suitable for private financing. As discussed below, several privately financed projects have cost under \$25 million. Smaller projects may be financed by water companies themselves, without a need for institutional investors. Provincial or federal P3 agencies may reduce transaction costs – and lower the efficiency floor – by developing model procurement documents and otherwise guiding municipalities through the process. Furthermore, if there is indeed a higher efficiency floor, smaller projects can be bundled together to meet P3 requirements. The bundling of specific projects could be done in conjunction with, or independently of, the consolidation of smaller utilities, as recommended by both Alberta's Water for Life strategy and Ontario's Expert Panel on Water and Wastewater Strategy.

The other common concern about private financing is that it is more expensive than public financing since governments can generally borrow

at lower rates than the private sector. However, governments' borrowing costs are deceptive. Rates are lower because governments, which are unlikely to go bankrupt, are good credit risks. But that is true only because governments are backstopped by taxpayers. When projects are financed publicly, taxpayers ultimately bear the risks of cost overruns or scheduling delays. In contrast, when projects are financed privately, the private sector bears such risks. The higher costs of private financing thus serve as protection against unforeseen future costs on taxpayers (Kitchen 2007). One economist compares this to paying for a warranty:

In a well-structured P3, the private sector takes on the risks for an appropriate reward, similar to an extended warranty on a car. In traditional procurement, these same total risks and costs are no less; they are merely borne by taxpayers, and effectively concealed under a government guarantee." (Burleton 2006.)

Public borrowing has another hidden cost, as well. A government cannot borrow unlimited amounts at low interest rates. Increased indebtedness may adversely affect a government's credit rating, increasing its borrowing costs. Borrowing at lower rates today may therefore mean borrowing at higher rates tomorrow.

But even in the absence of such considerations, when public financing costs are unambiguously lower, private financing need not make a project more expensive. As discussed above, private financing creates incentives to reduce construction and operating costs. These performance incentives may ultimately be more important than the relative costs of borrowing. For all of these reasons, private financing may, in the long run, be less expensive than public financing (Bettignies and Ross 2004).

Canadian Experience with Private Financing

Although Canada does not yet have extensive experience with private investment in municipal water or wastewater utilities, the few experiments that have taken place have been promising. In the late 1990s, Moncton, unable to acquire provincial or federal funding for a new water-filtration plant,

sought private financing. It held a competitive bidding process that initially saw expressions of interest from nine consortia. The successful consortium, which consisted of USF Canada (now Veolia Water Canada) and the Hardman Group, designed, financed, and built the plant. The capital cost of the plant was \$23 million – almost \$10 million less than the city had planned to spend. Those savings came in part from a 40 percent reduction in the size of the building, which was made possible by the winning consortium's choice of a particular kind of filtration. The city was also able to offload design and construction risks. The consortium agreed to design and build the plant within 500 days, to be responsible for cost overruns, and to forgo payment until the plant was fully commissioned. On completion of the project, the consortium sold the facility to Moncton. The city did not put up any money for the purchase, however, because the consortium agreed to lease the facility from the city for 20 years and to pay for the entire lease up front. The city makes monthly capital repayments.¹²

Veolia now operates the plant. Thanks to the size of the plant and its operational features and patented technologies, operating and maintenance costs are lower than they would have been at the public plant initially proposed.¹³ An independent review of Canadian P3s reported Moncton's experience to be a "success" (Vining and Boardman 2008).

Private financing has also benefited Taber, Alberta, which entered into a design-build-finance-operate agreement with Epcor. The firm and its partners constructed a new wastewater treatment plant for a fixed price on a guaranteed

schedule. They reduced construction costs by converting a decommissioned tank from the previous system into a primary clarifier. The capital cost of approximately \$15 million compared favourably to initial engineering estimates of \$28 million. Epcor will run Taber's water and wastewater systems for 20 years (Lifton 2010).¹⁴

Other municipalities are currently looking at private financing for a portion of their water infrastructure. In June 2010, the City of Saint John, New Brunswick, decided to apply to PPP Canada for funding for a new drinking-water filtration plant. At present the city does not filter its water – rather it screens, chlorinates, and fluoridates it. However, it has had a number of drinking-water problems, including eight boil-water advisories in the last three years and elevated levels of carcinogenic byproducts of chlorination. The anticipated costs of a filtration plant have almost tripled since 2009, inspiring councillors to consider private funding options.

In January 2011, Sudbury's city council voted to undertake a new biosolids management project through a P3. The city, which has been disposing of its foul smelling sewage sludge in a tailings pond owned by Vale, the mining company, must find another disposal method by the end of 2012 when its agreement with Vale expires. It has applied to PPP Canada for assistance, and it plans to hold a competition among four pre-qualified consortia for the design, building, financing, operating, and maintaining (DBFOM) of a sludge-processing plant. The city attributes its choice of a DBFOM model to its own limited access to capital (the plant is expected to cost between \$30 million and \$40 million), its inability to meet tight construction deadlines,

12 Unless otherwise noted, information on water companies and their clients, performance, and investments was obtained from their web sites or from correspondence between them and the author.

13 Veolia reports annual operating and maintenance savings of 12 percent, totalling \$2 million. City officials have been very pleased with the relationship. "In the last 10 years," said Ensor Nicholson, Moncton's director of water systems, "you couldn't find one spot on our record" (Foster 2010).

14 Another example of a water company bringing savings through an innovative design can be found in Okotoks, Alberta. Okotoks and Epcor have a 20-year agreement covering the design, construction, operation, and maintenance of the community's water and wastewater utilities. Epcor completed an \$11.2 million upgrade to the wastewater treatment plant in 2006. The plant's design saved the town \$13.5 million over initial estimates. Among other things, it took advantage of existing facilities and buildings, thereby reducing land requirements and bringing project costs down (Canadian Council for Public-Private Partnerships 2006).

and its wish to transfer risks, especially the risk that the facility will not be completed on time, to the private sector. The city's consultant estimates the value of risk avoidance to be \$10 million over the 20-year contract. The city also believes that a DBFOM model will maximize its access to private-sector innovation and expertise and provide a single point of accountability (City of Greater Sudbury 2011; Whitehouse 2011).

Private Operation of Public Utilities

Moncton and Taber provide a model for other municipalities to emulate. In addition to financing water and wastewater systems, the private sector can and should manage, operate, and maintain them. Many municipal utilities will benefit from private water companies' experience and expertise.¹⁵ The large firms also invest considerable sums in research and development (R&D). Suez Environnement has an R&D budget of US\$95 million for water research. Veolia Water's R&D budget is even larger, at \$150 million a year. These research capabilities have produced patented technologies and other sophisticated tools to meet municipal water challenges around the world.

Canadian Experience with Private Operations

The breadth of experience and knowledge offered by many private firms; the in-depth understanding of water systems; the specialized

planning, technological, and operational skills; and the ability to access a larger network of talent and other resources when local skills do not suffice are especially valuable to smaller municipalities. Such considerations played an important role in the decision by Brockton, Ontario (the municipality that includes the town of Walkerton) to contract out the operation and maintenance of its water and wastewater systems. For several years after the Walkerton tragedy, Brockton used the services of the Ontario Clean Water Agency (OCWA), the Crown Agency that operates more than five hundred municipal water and wastewater systems. In 2006, after a competitive process that attracted four proposals, Brockton selected Veolia Water Canada as its operator. With operations and maintenance costs 60 percent below those of OCWA, the municipality expects to save \$1.5 million over the five-year contract – savings that it will be able to invest in the system (Saunders 2009).

However, large, international firms are by no means the only – or even the best – qualified water-services providers. Small, specialized firms may provide specific operator training and support programs to certain communities, such as First Nations.¹⁶ Their location and assets may give them quick access to remote communities.¹⁷ They may also assist municipalities with specific tasks, such as data collection and the production of annual reports, or provide oversight rather than hands-on operations.

One factor limiting Ontario's experience with private water and wastewater service providers is

15 Several of the large water and wastewater companies – Veolia, United Water, American Water, Epcor – have been in the business for well over a century. They employ thousands and serve tens of millions in North America. American Water provides approximately 16 million people in 1,600 communities with water and wastewater services. Veolia Water North America provides services to more than 14 million people in approximately 650 communities. United Water serves 7 million in almost 250 communities. The large multinationals have extraordinarily broad networks to draw upon. Worldwide, Veolia Water has 83,000 employees. It supplies 95 million people with drinking water and 68 million people with wastewater services. Suez Environnement, the parent of United Water, has 62,000 employees worldwide. It provides drinking water to 68 million people and wastewater services to 44 million.

16 In 2005, after *E. coli* contaminated the water in Kashechewan, in northern Ontario, prompting the airlift from the reserve of more than 1,100 residents, the federal government called in Northern Waterworks, a firm that then operated 11 water and wastewater facilities in northern Ontario. The firm's technician flew into the community and repaired the malfunctioning chlorination system in less than six hours (Brennan 2005). The firm now operates the system, along with 44 other facilities.

17 For instance, with an office in Red Lake, in northwestern Ontario, and a fleet of three aircraft, Northern Waterworks can quickly reach troubled facilities in remote northern locations.

the existence of a public competitor, OCWA. This Crown Agency is widely viewed as having an unfair competitive advantage, especially over new entrants and smaller competitors. Its history of subsidies, its close relationship with the province, its extensive infrastructure, and its market share, which was gained, not through merit, but through government fiat, led a representative of United Water to call it “the most serious impediment to the creation of a competitive environment in Ontario” (Paisley and Brubaker 2001).¹⁸ Other water-services providers have likewise expressed frustration over the difficulties of competing with OCWA on an uneven playing field.

Incentives for Efficient Operations through Competitive Contracting

Municipal operations can benefit, not just from the expertise of private firms, but also from the innovations, efficiencies, and resulting cost savings that competitive contracting brings. Given the monopolistic nature of most water and wastewater systems, competition is generally *for* the market rather than *in* the market. It is the former – competition between firms for operating and maintenance contracts – rather than the latter – competition between firms for individual customers – that motivates bidders to reduce costs. Although price is rarely the sole determining factor, a bidder will be more attractive if it can bring its price below its competitors. Provided the request for proposals specifies performance and outputs rather than particular methods and technologies, each bidder has incentives to find efficiencies, be it through staff reductions, reductions in energy use, economies of scale, the elimination of waste and duplication, creative re-use of existing infrastructure, computerized monitoring and control, new technologies, or detailed asset-management planning.

After the bidding process has been completed, contracts can continue to promote efficiencies.

Milwaukee’s wastewater contract with Veolia encourages the firm to reduce energy use by making the firm liable for 25 percent of monthly energy costs. The contract likewise encourages the firm to propose capital projects (which the sewerage district will fund) by splitting cost savings from such projects evenly between the district and the firm.

To ensure that operating savings do not necessitate greater capital expenditures in the future, long-term agreements can assign to the service provider the responsibility for both operations and capital improvements. Such an agreement might have avoided a controversy for Hamilton, Ontario, which contracted out water and wastewater operations to Philip Utilities Management Corporation (PUMC) in 1995. Critics alleged that PUMC’s reductions in operating costs increased the city’s capital costs. The operator, critics charged, overpumped water during off-peak hours, when power rates were lower, thereby raising the pressure in pipes and causing some to rupture (McGuiness, 1999.) The city and the operator denied the allegations, blaming ruptures on the age of the pipes. Operations reverted to the city in 2005.

Caveats

There has been little formal Canadian study of efficiencies resulting from engaging private water and wastewater operators. As experience with private operations remains limited, so too does evidence of efficiency gains or losses. Most case studies have been conducted by industry advocates or critics representing labour. Claims of operating savings often come from the industry or municipalities but are not accompanied by enough information to make independent verification possible. Furthermore, before-and-after comparisons are complicated by changes that may accompany the contracting out of operations. The private operator may have been brought in to solve an

18 OCWA lost almost \$60 million – albeit in steadily decreasing amounts – on its utility operations between 2000 and 2009. Although OCWA’s mandate is to provide services on a cost-recovery basis, corporate policy enables it to reduce its prices in order to win contracts. Some of its contracts do not recover all direct costs, let alone overhead (Office of the Auditor General of Ontario 2009, 2010).

expensive problem, or it may be operating different equipment or operating to a different performance standard. In such cases, the public-cost portion of the comparison may be projected rather than actual.¹⁹

Evidence of Cost Savings from Private Operation

While they should be viewed with those caveats in mind, a number of before-and-after comparisons do suggest that substantial savings are possible. Operating savings in Moncton and Brockton are mentioned above. Canmore, Alberta, has likewise benefited from the efficiencies of a private operator. In 2000, Canmore signed a 10-year utility-management agreement with Epcor for water and wastewater, and in 2010 they renewed the contract. Because Canmore received a fixed price for the first five years of the contract, which guaranteed there would be no cost increases due to growth-related infrastructure, the rapidly growing town saved more than \$1 million over this period.²⁰

Experience in the US confirms that private operations are often more efficient than public operations. There, the contracting out of water and wastewater services has achieved operating cost savings of between 10 and 50 percent

(Brubaker 2002; Burleton 2006). That said, the evidence suggests that savings arise more from competition than from the fact that the operations are private (Ouyahia 2006). Germà Bel and Mildred Warner (2008) reviewed all of the econometric studies published between 1976 and 2006 comparing the costs of public and private water services. Eleven of the studies examined experience in the US. Three of them concluded that private production is less costly, three concluded that public production is less costly, and five found no significant cost difference between private and public provision. While Bel and Warner found that private ownership did not guarantee cost savings, they also found that competition for contracts did reduce costs. “The popular literature typically confuses privatization with competition,” they noted, adding that too often competition is either not present or erodes over time.²¹

Bel and Warner also examined three studies comparing public and private utilities in England and Wales. One found higher inefficiencies in private firms; one found very small technical changes and productivity improvements after privatization; and one found that the strict price-cap regulation that accompanied privatization induced efficiency improvements. Economic regulation can indeed create incentives for

19 Comparisons of the efficiency of different facilities, public and private, are made difficult by both the considerable differences among them and the paucity of data on whether facilities are publicly or privately operated. Statistics Canada collects information on the costs of providing drinking water across Canada. It notes that costs reflect differences in the source, availability, and quality of raw water, the treatment technology, plant size, and other factors; it does not assess the influence of public or private provision on costs. For 2007, Statistics Canada (2009) reported large variations in labour costs – the largest component of operating and maintenance costs – between provinces. The labour costs per thousand cubic metres of treated surface water ranged from \$28.20 in British Columbia to \$120.40 in Saskatchewan. The labour costs per thousand cubic metres of treated groundwater ranged from \$27.80 in Newfoundland and Labrador to \$390.50 in Saskatchewan. Such variations between provinces whose services are primarily provided publicly suggest the importance of many other factors.

The Ontario Ministry of Municipal Affairs and Housing attempts to benchmark the efficiency and effectiveness of drinking water, storm water, and wastewater systems through its Municipal Performance Measurement Program. Like Statistics Canada, however, it does not collect information as to whether systems are publicly or privately operated.

20 The town saved another \$3 million on drinking-water treatment as a result of Epcor’s decision to install an innovative UV disinfection system instead of constructing, as the town had proposed, a new reservoir that would have allowed drinking water longer contact time with chlorine (de Soto 2010). Sooke, BC, has also enjoyed considerable savings. Epcor designed, built, and now operates Sooke’s new wastewater system. Operating costs are said to be 60 percent below original estimates (Canadian Council for Public-Private Partnerships 2006).

21 In the absence of competition, a municipality cannot be certain that it has got the best deal. Such was the case in Hamilton, Ontario, which sole-sourced its water and wastewater operations to PUMC in order to aid the local company and encourage economic development. Although the agreement brought moderate savings and investment and permitted the city to offload labour-relations problems, it did not solve the performance problems plaguing the city’s systems (Brubaker 2002).

efficiencies in the absence of competition. Canadian regulators could learn much from Ofwat, the economic regulator in England and Wales, which has developed considerable expertise in incentive regulation, benchmarking (or “yardstick competition”), and methods of promoting genuine competition in the water industry (Brubaker 2002).

Other analysts have likewise found the international literature on efficiencies achieved through private management to be unclear. Roberto Martinez Espiñeira et al. (2009) reviewed four studies showing public management to be more efficient, six studies showing private management to be more efficient, and six showing no significant differences in efficiency. Much depended on geographic or socioeconomic factors, on the reasons municipal governments had chosen to engage private operators (those seeking to solve technical difficulties would expect to pay higher prices), and on the rigour of the regulatory framework governing water services.

Accountability Mechanisms

To ensure that a private operator’s quest for efficiencies and cost savings does not come at the expense of performance, municipalities must insist on binding contracts that spell out performance standards and penalize noncompliance. As long as the performance metrics are clearly defined and easily measured and monitored, performance-based contracts give municipalities a simple, straightforward enforcement mechanism. The assurance that the municipality can hold the private operator accountable for poor performance has been a key driver of several water and wastewater partnerships.

For instance, the desire to improve regulatory compliance and reduce municipal liability for operational deficiencies was an important factor in Canmore’s decision to pursue a P3. The town had been fined \$15,000 for its own operator’s failure to test and report on chlorine residuals in drinking water. It had also had trouble retaining qualified staff to operate its new wastewater treatment plant. It was keen to enter into a contract with

clear performance measures and quantified penalties for poor performance. Lac La Biche County, Alberta, also emphasized its desire to shift regulatory compliance risks and liability to the private sector as a major reason for choosing Maple Reinders and Corix to design, build, and operate a new wastewater treatment facility (Kolenosky 2010).

Performance-based contracts with financial penalties for poor performance create incentives to perform well. Such contracts are increasingly common. Less common are those that include bonuses for better-than-required performance – such as Milwaukee’s wastewater contract, which provides for annual payments (beyond the base service fee) of US\$200,000 if Veolia avoids bypasses from its separate and combined sewer systems, US\$60,000 if the firm reduces biological oxygen demand (BOD) in the combined effluents from two treatment plants to an annual average of less than nine milligrams per litre, and US\$60,000 if the firm reduces total suspended solids (TSS) in the combined effluents to an annual average of less than eight milligrams per litre. Conversely, the firm must pay damages if it performs below expectations. For example, it must pay US\$100,000 for every milligram of BOD or TSS in the combined effluents that, on average, exceeds 13 milligrams per litre. These provisions in the contract align the interests of the private operator with those of the public: the operator benefits financially when the public enjoys a cleaner environment, and the operator suffers when the environment deteriorates.

Performance-based contracts can take other forms, as well. In Indianapolis (under a contract expected to end this year), 25 percent of Veolia’s fees are paid only if the firm meets specified performance measures, not only for drinking-water quality, but also for operations and maintenance, capital planning, and customer service. The 37 components of the incentive plan, many of which are above industry standards, put almost \$10 million at risk for the firm annually.

For maximum accountability, municipalities should seek long-term concessions that assign to the private partner responsibility not only for

operations and maintenance but also for capital improvements. Doing so avoids disputes about how to characterize expenditures, eliminates incentives to reduce operating costs at the expense of capital costs, and, most important, reduces the operator's ability to blame poor performance on the municipality's failure to invest in infrastructure.²² If something goes wrong, the operator must look to itself to correct the problem.

One risk associated with long-term contracts is that a contract will have to be renegotiated. As contracts lengthen, it becomes more and more difficult to foresee future developments. Regulatory, economic, and political landscapes may change. Even short-term agreements may be based on incomplete information and may present unwelcome surprises. As a result, either water-services providers or governments may try to revisit the terms of a contract. Although renegotiations have been most common in developing countries, North America has not been immune.²³ Accountability and efficiency require that agreements not be easily renegotiated by either service providers or governments. Renegotiation, which is generally less transparent and less competitive than the initial bidding process, can undermine the legitimacy of the contract. Moreover, opportunities for contractor-led renegotiation may attract bidders that excel at renegotiation rather than at efficient service provision; they may encourage competitors to low-ball their bids in the expectation that they will recover their costs at a later date. Furthermore, the threat of government-led renegotiation may discourage investment or increase the cost of capital. Such problems point to the importance of

including complete and reliable information about the state of the infrastructure in the bidding processes, negotiating a clear and binding contract that includes provisions for adapting to regulatory and other changes, and having an independent regulator that balances the needs of the public effectively and fairly with those of the services provider (Gómez-Ibáñez et al. 2004; Guasch et al. 2005; Engel et al. 2009). Where both parties agree that revisiting the terms of a contract will be beneficial, renegotiation should be transparent and conducted under the auspices of an independent body.

Greater accountability can also stem from improved environmental and health regulation because, with private operations, upper levels of government are more likely to enforce strict standards. In a private operation, the operator is separated from the regulator, and thus the conflicts of interest that may impede enforcement are reduced. This helps to de-politicize regulation, thereby freeing up regulators to regulate. Reducing conflicts of interest was one of the justifications for privatizing the water and wastewater systems in England and Wales in 1989. The gamekeeper, it was said, had to be separated from the poacher. One regulator described the separation of operations and regulation as the "most significant gain" of the British privatization of water utilities (Brubaker 2002, 132). In the decade following privatization, prosecutions for environmental offences went from being extremely rare to numbering in the hundreds, despite greatly improved environmental compliance.²⁴

22 In two of North America's least successful experiments with private operations – those in Hamilton and Atlanta – the operators blamed their poor performance on factors beyond their control, such as aging infrastructure and inadequate capital investment.

23 The highest-profile attempt to renegotiate a US contract occurred in Atlanta, where United Water complained that it had spent US\$10 million on unremunerated tasks and blamed the city for providing inaccurate information during the bidding process. After the city rejected United Water's request to raise its annual rate by US\$4 million, both parties agreed to terminate the contract.

24 The conflicts of interest that occur when governments both operate and regulate utilities argue against the partial privatization that is increasingly popular in Europe (Bel and Fageda 2010). Many municipalities are creating mixed public-private firms that are jointly owned by local governments and large water-service companies. Such municipalities seek managerial flexibility, economies of scale, and private-sector expertise while avoiding the transaction costs of P3s and retaining a degree of control over management. However, retaining control in order to implement political objectives can compromise efficiency. Furthermore, mixed ownership can blur the lines of accountability. An enforceable, performance-based contract with a purely private firm, provides a more efficient and effective means of maintaining control.

The separation of operator and regulator has, according to limited anecdotal evidence, enhanced enforcement in North America. Following the contracting out of water and wastewater operations in Hamilton, the Ontario environment ministry cracked down on poor performance that dated back more than a decade. It laid 22 charges in a year and a half and issued fines in excess of \$217,000. The ministry certainly appeared to hold the private operator to higher standards than it had held its public predecessor (Brubaker 2002).²⁵ In testimony to the Walkerton Inquiry, then environment minister, Norm Sterling, confirmed that the province could enforce regulations more effectively against private operators than against public operators, since there would be less political infighting and less of the interference from municipal politicians that now hinders the regulation of public utilities (Energy Probe Research Foundation 2001). The US Environmental Protection Agency is likewise believed to enforce rules more vigorously against private utilities (Henderson 2010).

Transparency also serves to increase accountability. If a contract and all performance data are publicly available, environmental groups, unions, and concerned citizens can hold a poorly performing operator accountable. Other accountability mechanisms exist in the market itself. An operator that performs poorly risks harm to its reputation, lost business opportunities, reduced share prices, and the threat of bankruptcy.

The Extent of Private Involvement in Canadian Water and Wastewater Operations

The private operation of municipal water and wastewater systems, although still very limited, is

steadily increasing. Its extent can only be estimated. No publicly accessible database of private operations is maintained.²⁶ The figures vary widely in published reports, in part because some reports count the number of municipalities served, others count the number of systems operated, and still others count the number of facilities operated. A private firm may operate one system for several communities. For example, the CU Water Pipeline, owned by Canadian Utilities, delivers treated water to eight communities along one Alberta highway. American Water operates and maintains the Lake Huron and Elgin Area Water Supply Systems, which serve 14 communities, including London, in southwestern Ontario. Or a private firm may operate only one of a municipality's several facilities. Veolia, for example, operates just the biosolids facility at Toronto's main wastewater treatment plant.

In 1998, Ontario's now defunct Office of Privatization reported that about 26 water or wastewater facilities in the province were operated by private contractors. In 2001, the Walkerton Inquiry determined that the number had grown to 42 systems. Four years ago, one service provider estimated that between 50 and 75 systems in Ontario were privately operated (Brubaker 2008). Today, the number of Ontario communities served exceeds 75. In the western provinces, private operators serve another two dozen communities – and far more, if the 51 small communities and 10 counties surrounding Edmonton are counted separately. These figures do not reflect the provision of private oversight services for publicly operated systems. Nor do they include the privately owned or operated systems serving small residential developments, trailer parks, schools, or other facilities.

25 This experience is consistent with that of other utilities in Ontario. Former regulator Mervin Daub compared the Ontario Energy Board's regulation of the public electricity monopoly and the private regional gas monopolies, concluding that the former was subject to more political interference whereas the latter was subject to more focused and regular control (Brubaker 2002).

26 Ontario's Ministry of Municipal Affairs and Housing (2000 – 2008) tracks the amounts municipalities spend on contracted services but does not specify the nature of these services. In 2008, municipalities reported spending \$544 million on contracted services for their waterworks and sewer systems. At 16 percent of total expenditures, this was consistent with averages over the previous eight years. These figures, however, have not generally reflected private operating and maintenance contracts. Far greater sums have been spent on contracts with OCWA.

Despite recent growth, private water and wastewater operations remain modest in number and size. Private operators have gained a secure foothold only in smaller communities. In larger communities they tend to play a limited role – if any – mainly because they encounter fierce political opposition. Opposition typically comes from public-employee unions that perceive threats to their membership, since enhanced efficiency following contracting out may mean fewer jobs. To minimize opposition, municipalities often require their private partners to maintain wage and benefit levels and to reduce staff only through attrition or voluntary early retirement, thereby protecting individual workers.²⁷

Public opposition derailed Vancouver's plans for a privately designed, built, and operated water filtration plant in 2001. It likewise contributed to Winnipeg's more recent decision to scale back its plans for private involvement in wastewater treatment. In 2009, the city council voted to establish an arm's-length, city-owned water, wastewater, and solid-waste utility corporation. The plan included bringing in a private "strategic partner" to help plan, design, construct, manage, and possibly finance upgrades to two wastewater treatment plants, and, potentially, to subsequently operate them. Initially, the city considered sharing ownership of a subsidiary of its proposed utility with the strategic partner. Opposition forced the city to reconsider. In May 2010, it chose Veolia to help conduct the wastewater upgrades. Instead of jointly owning the utility or financing the upgrades, the firm will help design the upgrades, supervise construction, and provide advice on operations for 30 years. Fewer than 15 Veolia staff are expected to work on the project at any one time.

The Victoria region, too, has faced vigorous opposition to a P3 for its new wastewater system.

British Columbia required the Capital Regional District to consider a P3 in order to be eligible for partial provincial funding. After considering its options, the region has proposed a "hybrid." Although plans continue to evolve, the main wastewater treatment plant will likely be operated publicly.²⁸ The private sector may be called upon to finance and operate a biosolids-processing facility and a resource-recovery facility.

Recommendations for Facilitating Private Involvement

Public opposition to private involvement in water and wastewater, although common, is by no means inevitable. Enhancing the public understanding of current performance problems and the extent of the improvements in performance that could be gained through P3s may help minimize opposition. In Ontario, the Environmental Commissioner (2010, 86) has complained that "the public is left in the dark on the performance of municipal waste-water facilities." Governments that wish to create an environment conducive to private participation need to publicize utility failings. Full transparency is essential to creating a demand for new sources of funding and more expert operations.

Upper-level governments can take a number of other steps to facilitate private involvement. They can provide resources to help municipalities navigate an unfamiliar – and often daunting – process. Many municipalities have too little technical, financial, and legal capacity to assess the merits of a P3 and negotiate a contract. PPP Canada and its provincial counterparts can supply the expertise that municipalities lack. These organizations can help municipalities seeking private involvement by providing them with

27 Not all unions oppose private involvement. Those representing construction workers believe that private capital may facilitate construction that would not otherwise occur. The Residential and Civil Construction Alliance of Ontario (2007), whose members include several unions, has endorsed P3s as a means of overcoming the infrastructure funding deficit (Kitchen 2007). The Laborers' International Union of North America supports private investment because infrastructure (albeit not that related to water or wastewater) has presented investment opportunities for its pension fund.

28 The region appears to be keeping open a range of private options. In a January 2011 "market sounding" exercise, private concessionaires and contractors were questioned about their interest in operating the main treatment plant for between three and 20 years.

model requests for expressions of interest and requests for proposals, along with information to guide municipalities through the bidding process. They can distribute model contracts that create incentives for adept and efficient performance and include effective monitoring and enforcement mechanisms. Working through these agencies will often provide comfort to potential bidders, since the process will be more predictable and reduce the risk of a deal falling apart at the last minute.

Reforms to the financing of utilities to ensure their long-term sustainability, whether operated publicly or privately, can also facilitate private involvement. Since infrastructure grants decrease the attractions of alternative financing, reducing such grants could strengthen municipalities' incentives to seek private financing for infrastructure improvements. Upper-level governments should also encourage pricing reforms. The underpricing of water and wastewater services, in addition to promoting waste and undermining the integrity of municipal infrastructure, discourages private participation. Prices must be high enough to pay back private investments and to sustain operations and maintenance.²⁹ Full-cost pricing will therefore help make possible private involvement. Although recent changes to public-sector accounting standards – especially those requiring municipalities to inventory, value, and depreciate their capital assets – have helped pave the way for pricing reforms, most municipalities remain reluctant to charge full prices. Provincial governments will likely have to legislate this reform and establish independent economic regulators to enforce it.

Public education will be crucial to achieving acceptance of financing reforms. If the higher prices accompany private-sector involvement, criticism will likely be especially harsh – a reason for governments to reform pricing regimes before embarking on partnerships. Consumers must

understand the roles that both full prices and private financing and operations play in ensuring the efficient and effective operations of their water and wastewater systems. They will doubtless see the costs; they must also be able to see clear benefits, be they the lower taxes or lower public debt resulting from the phasing out of grants, the greater value-for-money obtained from private financing and operations, or the better protection of public health and the environment provided by expert operators.

If federal and provincial regulators were to penalize nonperforming utilities, they would strengthen the incentive for municipalities to seek private assistance to improve performance. The lax enforcement of laws and regulations governing public health and the environment makes the status quo quite comfortable for poor performers. Stricter enforcement would spur demand for the expert operation and management of existing infrastructure and the development of new infrastructure.

Lastly, in Ontario, the provincial government can encourage the growth of the private water and wastewater services sector by disbanding its public competitor, OCWA. That would create opportunities for private firms to compete, on a level field, for the business of the Crown Agency's 180 clients.

On its own, private involvement is not a panacea. Private performance is not flawless, and some contracts fail to deliver the promised results. But governments – municipal, provincial, and federal – can do much to create conditions under which partnerships can thrive. The keys to realizing the promise of private financing and operations are competitive procurement, properly structured agreements, vigorously enforced contracts and laws, pricing that supports adequate infrastructure, and a fully informed public.

29 When the high cost of water services creates concerns about equity or public health, it is preferable to subsidize needy users themselves (through direct payments, tax measures, or other means) than to subsidize their water use through low prices. Direct subsidies maintain incentives to conserve – incentives that are lost when the price of water is artificially lowered.

Appendix: Municipal-Utility Performance

There is little standard or comprehensive information on the performance of municipal utilities. The content, quality, currency, and availability of information varies from province to province. To understand the state of drinking water and wastewater systems across the country, it is necessary to piece together disparate reports on water-quality tests, boil-water advisories, leakage, effluent content, overflows, and facility inspections. Although crucial pieces of the puzzle remain missing, a picture emerges of a sector that threatens both public health and the environment.³⁰

Poorly Performing Drinking-Water Systems

Statistics Canada (2009) reports that, in 2007, 4 percent of the drinking-water plants surveyed³¹ exceeded federal guidelines for total coliforms – an indicator of the possible presence of disease causing bacteria. Furthermore, 20 percent of the conventional and direct filtration plants surveyed exceeded guidelines for turbidity; that is, cloudiness that can interfere with disinfection.

Provincial data, however, show that poor performance is more common than suggested by Statistics Canada. The most recent report of Ontario's Chief Drinking Water Inspector (2010), covering the period from April 2008 through March 2009, revealed infrequent but widespread failure of water-quality tests. One-hundred-ninety-eight municipal systems exceeded microbiological parameters at least once during the reporting year, and 47 systems exceeded chemical parameters. In all, 452 municipal systems reported 1,769 "adverse water quality incidents."³² Facility inspections uncovered routine violations of provincial regulations; in fact, fewer than half of the 700 systems inspected met all

provincial requirements. Inspectors identified a number of problems at 356 noncompliant systems, including improper operation of equipment, insufficient documentation of procedures, and inadequate maintenance of chlorine residuals in distribution systems (Chief Drinking Water Inspector 2010).

Water utilities perform poorly in other provinces, as well. Approximately 54 of Alberta's regulated drinking-water facilities do not meet current design standards. In 2009, 46 facilities failed to comply with operational requirements, and 33 had water-quality problems (Alberta Environment 2010). Health authorities in British Columbia have given high hazard ratings to 398 systems (British Columbia 2009). In Saskatchewan, too, inspections have exposed operating and maintenance problems. In September 2009, 141 waterworks did not maintain adequate chlorine residuals in their distribution systems, 65 did not keep adequate records, 16 were dirty or disorderly, 16 had reservoirs in poor repair, and 9 did not meet minimum treatment requirements. Furthermore, one-third of the province's permitted waterworks failed to submit the required health and toxicity samples (Saskatchewan 2009).

Boil-Water Advisories

Boil-water advisories (shown in Table 1) provide another indication of the breadth of drinking water contamination across Canada. The Water Chronicles website tracks do-not-consume and boil-water advisories nation-wide. In November 2010, it listed 1,513 advisories in effect at the time. In 2008, an investigative report published in the *Canadian Medical Association Journal* called attention to a total of 1,859 advisories in effect across Canada (Eggertson 2008). Neither compilation revealed how many advisories concerned water provided by municipal utilities

30 Since none of the comprehensive assessments of utility performance state whether the operators are public or private, the following discussion of municipal utility performance does not attempt to distinguish between the performance of publicly and privately operated facilities.

31 In 2008, Statistics Canada surveyed 2,200 plants serving communities of 300 or more people and received 1,232 responses.

32 The Inspector was not alarmed by these results. On the contrary, he stressed, "We are proud of the levels of protection we have achieved in Ontario." The Minister of Environment has likewise assured the public that utility performance is excellent.

Table 1: Boil-Water and Do-Not-Consume Advisories in Canadian Water Systems

Jurisdiction	Boil-Water Advisories	Boil-Water and Do-Not-Consume Advisories
	In Effect in March 2008	In Effect in November 2010
Alberta	13	12
British Columbia	530	327 ^a
Manitoba	59	95
New Brunswick	2	11
Newfoundland and Labrador	228	268
Nova Scotia	67	74
Ontario	679	79 ^b
Prince Edward Island	0	1
Quebec	61	308
Saskatchewan	126	337
Yukon	0	0
Northwest Territories	1	1
Nunavut	0	0
First Nations	93	Not tracked separately
Total	1,859	1,513

Sources: Eggerton 2008 (for 2008 data); Water Chronicles 2010 (for 2010 data).

Notes:

a. By another count, compiled from information provided by five BC Health Authorities, there were approximately 628 boil-water advisories in place in BC in May 2010 (Loskutova, 2010).

b. As of October 2008. Ontario no longer updates its provincial site.

and how many concerned water provided in trailer parks, campgrounds, or other facilities. Although very small systems are particularly vulnerable to advisories, even large cities are not immune. In 2006, high levels of turbidity forced a million Vancouver residents to boil their water for 12 days.

Water-Borne Illnesses

The frequency of water-borne illnesses across the country likewise suggests there are widespread problems with drinking water. Because it is

difficult to determine the cause of any one illness, and because only a small fraction are reported to the health authorities, it is impossible to gauge precisely the number of illnesses caused by drinking water. By extrapolating from US data, scientists at Environment Canada, Health Canada, and two universities have suggested that 90 Canadians may die each year, and another 90,000 may become ill, from drinking contaminated water (Edge et al., 2001). Some experts dispute these widely cited figures.³³ However, no one disputes that waterborne

33 Edge et al. (2001) based the possibility of 90 deaths and 90,000 illnesses on estimates, from the Centers for Disease Control, that in the United States 900 deaths and up to 900,000 illnesses may occur annually as a result of waterborne infections. Disease rates in the two countries may or may not be comparable.

illnesses are common and that some have resulted from inadequate water treatment at municipal facilities. The best-known outbreak occurred in 2000 in Walkerton, Ontario, where *E. coli* and *Campylobacter* bacteria in municipally supplied drinking water made 2,300 people sick and killed seven.³⁴ The following year, *Cryptosporidium* in the drinking water in North Battleford, Saskatchewan, caused 6,000 to 8,000 people to become ill.

Leakage

Another indication of the state of drinking water utilities is the amount of water that is lost through leaking or broken distribution pipes. Environment Canada (2010b) estimates that, nationally, almost 13 percent of municipal water is lost; the losses are highest in Quebec, at over 19 percent.³⁵ The National Research Council suggests that the losses are typically 20-30 percent and sometimes, especially in older systems, as high as 50 percent (Hunaidi 2000).

Estimates of leakage in Ontario also vary widely. Environment Canada's estimate of 12 percent is considerably lower than several others. According to the Residential and Civil Construction Alliance of Ontario (2009), 25 percent of all processed water leaks into the ground after leaving treatment plants. One market analysis maintains that 40 percent of purified water is lost through breaks in water mains (Jones and Henderson, 2010).³⁶ If the lowest of the above estimates is correct, the energy

costs alone of treating and pumping the water lost in Ontario amount to \$15 million a year – almost 5 percent of provincial waterworks systems' expenditures on materials (Maas 2010; Ontario Ministry of Municipal Affairs and Housing 2008). The costs of water-main breaks, including basement flooding and disruptions to traffic, power supplies, and subway service, are more difficult to assess.³⁷

Substandard Wastewater Systems

Across Canada, wastewater systems are in even worse shape than drinking-water systems. Wastewater systems are one of the country's largest sources of pollution (Government of Canada 2010b). In 2008, more than 85 percent of all reported discharges of water pollution came from municipal wastewater treatment plants³⁸ (Ecojustice 2010, using data from Canada's National Pollutant Release Inventory). Every year, wastewater facilities dump more than 150 billion litres of raw sewage and approximately 1.35 trillion litres of only partially treated sewage into waterways (Environment Canada 2010a).

When municipal wastewater is improperly treated, it can threaten human health, the environment, and economic activity, including tourism and fishing. Bacteria, viruses, and protozoa in sewage can contaminate drinking water, make beaches unswimmable, and necessitate the closing of shell-fisheries. Ammonia,

34 Outbreaks of water-borne illnesses can be extraordinarily expensive. A study commissioned by the Walkerton Inquiry estimated the economic impact of the tragedy – the tangible costs – to be \$64.5 million (Livernois 2002a). A related report estimated the human costs of the tragedy, i.e., the statistical value of the lives lost and the illnesses suffered, to be an additional \$90.8 million (Livernois 2002b). The Canadian Water Network estimates that health problems related to water pollution cost the Canadian health-care system \$300 million annually; it does not estimate what percentage of these costs are related to municipal drinking water (Government of Canada 2010a).

35 According to another Environment Canada document (2004), approximately 20 percent of municipal water is lost or unaccounted for.

36 Underground infrastructure in many older cities is in especially poor condition. The average age of Toronto's water mains is 55 years, about 17 percent are between 80 and 100 years old, and about 7 percent are more than a century old. The system is increasingly vulnerable to corrosion, cracks, and collapse. On average, the city has 1,500 water main breaks a year (City of Toronto 2010).

37 The Residential and Civil Construction Alliance of Ontario (2009) estimates that leakage costs Ontarians \$700 million annually, and closer to \$1 billion if environmental costs are included.

38 Pollution Watch (undated) compiled information from Environment Canada's National Pollutant Release Inventory. In 2006, Toronto's Ashbridges Bay Sewage Treatment Plant headed the list of water polluters in Canada. The plant released more than 13 million kilograms of pollutants into Lake Ontario that year. Its biggest releases were nitrates, ammonia, and phosphorus; it also released zinc, copper, lead, cadmium, arsenic, and mercury. Calgary's Bonnybrook Wastewater Treatment Plant was next, followed by Ottawa's Robert O. Pickard Environmental Centre.

Table 2: Number of Canadian Wastewater Facilities Requiring Upgrades to Meet Proposed Federal Wastewater Standards.

Jurisdiction	Low Risk	Medium Risk	High Risk	Total
Alberta	6	40	2	48
British Columbia	0	5	8	13
Manitoba	0	81	0	81
New Brunswick	13	44	0	57
Newfoundland and Labrador	0	1	185	186
Nova Scotia	9	37	16	62
Ontario	102	4	3	109
Prince Edward Island	17	7	0	24
Quebec	0	154	33	187
Saskatchewan	0	29	1	30
Yukon	0	1	1	2
Federal	0	0	150	150
Total	147	403	399	949

Source: Government of Canada (2010b), using data collected in 2006 by the Canadian Council of Ministers of the Environment's Economics and Funding Task Group.

chlorine, and other toxins can poison fish, and nutrients such as phosphorus can promote the growth of algae and deplete oxygen in the water, further harming fish. Sediment can destroy fish habitat. Harmful effects can be observed 10 or 20 – sometimes, even 100 – kilometres downstream from where wastewater has been discharged (Environmental Commissioner of Ontario 2010).

The Canadian Council of Ministers of the Environment (CCME) has identified 949 wastewater facilities (shown in Table 2) that need to be upgraded to provide “secondary” treatment, which is the minimum acceptable level of treatment in the United States (Government of Canada 2010b).³⁹ Of these, CCME has determined that 399 pose high risks to the environment. A

number of coastal systems do not treat their sewage at all before discharging it into the ocean. Victoria, for example, merely screens large solids from its sewage before discharging it into the Strait of Juan de Fuca. Other systems provide only minimal, or “primary,” treatment. Even wastewater systems that do provide secondary treatment may pollute local waters through spills, bypasses of treatment facilities, and overflows from combined sewers during storms, when facilities cannot accommodate the increased flows from sewers that carry both sanitary sewage and storm water. Sarnia Mayor Mike Bradley did not exaggerate when he said, “We are still treating the Great Lakes like a toilet bowl” (QMI 2010).

³⁹ The 949 facilities are largely municipally owned and operated, but they also include 150 federal facilities.

Information on the performance of wastewater treatment plants – the content of their effluent, and their compliance with provincial regulations – is spotty, at best. The limited information available suggests that noncompliance is frequent. In Saskatchewan, for example, 203 wastewater plants inspected in 2009 did not comply with provincial requirements (SaskH2O 2010). Ontario’s compliance reports for 2008, which are the most recent available, show that 102 municipal wastewater facilities exceeded permitted limits for *E. coli*,

suspended solids, biochemical oxygen demand, ammonia, phosphorus, pH, or other substances. Some of the province’s biggest cities – Toronto, Ottawa, Hamilton, and London – failed to comply with their certificates of approval or permits. A number of municipalities were chronic offenders. The City of Brockville’s water-pollution-control plant exceeded permitted limits for biochemical-oxygen demand, indicating excessive organic matter in the effluent, in all but two months of 2008 (Ontario Ministry of the Environment undated).

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