

How to use price as a tool to improve water service provider financial performance and community water use efficiency



# Worth Every Penny:

## A Primer on Conservation-Oriented Water Pricing

Oliver M. Brandes, Steven Renzetti and Kirk Stinchcombe

University of Victoria

MAY 2010



POLIS Project  
on  
Ecological Governance  
University of Victoria

## AUTHORS:

Oliver M Brandes (University of Victoria), Steven Renzetti (Brock University), Kirk Stinchcombe (Econnic)

## PROJECT TITLE:

Worth Every Penny: A Primer on Conservation-Oriented Water Pricing

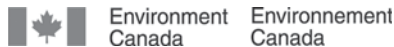
ISBN 978-1-55058-417-2

## Acknowledgements:

To ensure *Worth Every Penny: A Primer on Conservation-Oriented Water Pricing* is as relevant and useful as possible to municipal leaders, staff and water policy makers, an exhaustive practitioner and expert review process was employed. Water managers, economists and various recognized water experts provided detailed review and input during development of the publication. In particular, we would like to thank Eric Bonham, David Brooks, Joshua Craig, Al Dietemann, Mike Donnelly, Diane Dupont, Duncan Ellison, James Etienne, Daphne Ferguson, John Finnie, Ray Fung, Wayne Galliher, Elizabeth Hendriks, Edward Henley, Deborah Humphrey, Nelson Jatel, Debby Leonard, Carol Maas, Kathy McAlpine-Sims, Jon O'Riordan, Ralph Pentland, Glen Pleasance, Susanne Porter-Bopp, Leela Ramachandran, Kevin Reilly, Talitha Soldera, Ted van der Gulik, Barbara Veale and Mike Zbarsky for detailed comments on drafts of this document. All errors and omissions are the responsibility of the authors alone.

Thanks also go to Liz Lefrançois from Environment Canada, Zita Bothelo from the British Columbia Ministry of Environment, Duncan Ellison of the Canadian Water and Wastewater Association and the Canadian Water Network for assistance and support with outreach and distribution. A special thank you goes to Liam Edwards and Glen Brown at the British Columbia Ministry of Community and Rural Development for catalyzing this research and providing initial support for this project. Brad Hornick is the creative spark providing layout and design. Tracey Hooper edited and got us ready for publication. We would also like to thank everyone at the University of Victoria's POLIS Project for ongoing support and encouragement, especially Elizabeth Hendriks for her coordination, perspectives and input throughout the project, and Ann Zurbrigg for administrative support.

We would like to thank the Walter & Duncan Gordon Foundation, the University of Victoria and the Eco-Research Chair for their ongoing core support of the Water Sustainability Project at POLIS.

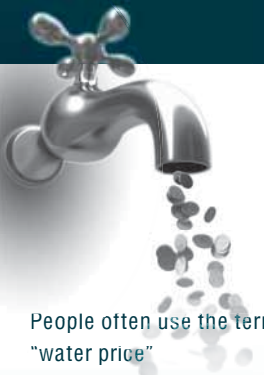


## KEY MESSAGES

- ▶ **Conservation-oriented pricing** makes solid sense from both financial and environmental perspectives.
  - On average, Canadian utilities are currently not recovering enough money from their customers to cover the costs of the services they provide.
  - At the same time, Canadians are among the biggest users of water on the planet, which could result in significant regionalized environmental impacts.
- ▶ **Potential negative consequences** of conservation-oriented pricing on communities can be mitigated. For example, mechanisms to stabilize revenue can be implemented, and volume-based pricing does not have to mean harmful impacts on low income families.
- ▶ **One of the greatest benefits** of conservation-oriented pricing is that it allows individuals much greater control over their water costs. Depending on how it is implemented, those who choose to conserve may actually see a decline in the amount that they pay.
- ▶ **It's a question of fairness.** Why should prolific water users pay the same amount as those who do their best to conserve?
- ▶ **Remember that the objective of conservation-oriented pricing** is to cover the full costs of providing water services and no more. Someone ultimately has to pay these costs. It just makes sense to do so directly through the water bill.
- ▶ **Revenue generated** by conservation-oriented pricing can be reinvested in the water supply system to repair aging infrastructure, develop and enhance conservation programs and protect water sources. Ultimately, this is an investment in the future of communities.
- ▶ **Improved pricing** provides a strong incentive to innovate.
- ▶ **Many other places** are successfully doing it.

## A 10-STEP PLAN FOR DEVELOPING A CONSERVATION-ORIENTED PRICING SYSTEM:

1. Have a plan.
2. Get buy in and authority from senior management and elected officials.
3. Get metered and start charging by volume.
4. Get the water bill right.
5. Improve accounting of water use in the community.
6. Account for expenditure and understand costs.
7. Consider starting with a seasonal surcharge.
8. Make it a part of a complete program.
9. Recruit the aid of senior government.
10. Take the long-term view.



# ABOUT THE PRIMER

*This primer provides an overview of conservation-oriented water pricing. It explains how it works, what the benefits are, and how water utilities can implement and transition to this system over time. The primer also offers advice on how to address some implementation challenges, including how to avoid negative effects on low-income families and how to maintain revenue stability for water utilities.*

Engaging in the process of water pricing reform is a difficult and complex task. It requires not only sophisticated economic knowledge but also the involvement of a range of key players beyond just water managers, including municipal or regional senior staff and financial officers, local politicians and senior government. To successfully move pricing towards a conservation-oriented pricing system requires all of these decision makers to be engaged and supportive.

This primer focuses on promoting conservation-oriented water pricing as a key tool in the water manager's toolkit. It is written specifically to assist those seeking to lead change, particularly those who may not have an extensive background in finance or economics. More technical concepts—such as *marginal cost* and *price elasticity*—are explained in “tech boxes” throughout the document. To demonstrate what is possible and happening on the ground today, a number of case studies from around North America are also provided.

People often use the term “water price” interchangeably to mean different things. The range of meanings includes selling and pricing water itself (the substance, for example in bottles or other containers) and selling and pricing water rights (the legal right to use, divert, or control water). In this document, when we refer to water price, we mean selling and pricing treated water services—the price associated with the provision of physical infrastructure and services required to treat and deliver water to homes, businesses and institutions.

We certainly recognize that water is much more than just a commodity and that it has significant ecological, spiritual and other values. We also recognize that pricing is but one of many possible tools that can be used to achieve greater water use efficiency, conservation and stewardship. For us, pricing is most certainly not an end in itself but rather an instrument that can help society achieve its goal of water sustainability.

Although the principal focus of the primer relates to the use of water service pricing as a tool to promote water use efficiency and conservation in households, much of the discussion has general applicability to the commercial and institutional sectors as well. Agricultural and industrial water pricing, in contrast, have many different issues and considerations. They require separate attention and are beyond the purview of this primer.

Our hope is that this primer will assist in entrenching a community-wide commitment to water conservation, financial stability and innovation. We believe that a successful, comprehensive water conservation program starts by understanding how to use price as a signal to both manage water demand and sustain water infrastructure for the future. The best water conservation programs will use a variety of techniques and approaches, of which pricing is only one component. Additional resources and some tools to start down the path and help develop a comprehensive, integrated and long-term approach to sustainable water management are listed at the end of the document.

## TABLE OF CONTENTS

Section 1: Pricing Water Services - Sustaining Infrastructure	01
Section 2: The Case for Improving Water Pricing in Canada	05
Section 3: Setting Up a Conservation-Oriented Pricing System	13
Section 4: Addressing the Challenges to Conservation-Oriented Pricing	23
Section 5: From Concept to Action - a Step-By-Step Plan to Reform Your Pricing Regime	31

## TECH BOXES

Tech Box 1: Water, Wastewater, or Both?	03
Tech Box 2: The Numbers Say It All...	07
Tech Box 3: The Price Elasticity of Demand for Water	12
Tech Box 4: Marginal Cost vs. Average Cost Pricing	17
Tech Box 5: Types of Rates	19
Tech Box 6: The Great Rate Debate: Uniform vs. Inclining Block	21

## FIGURES

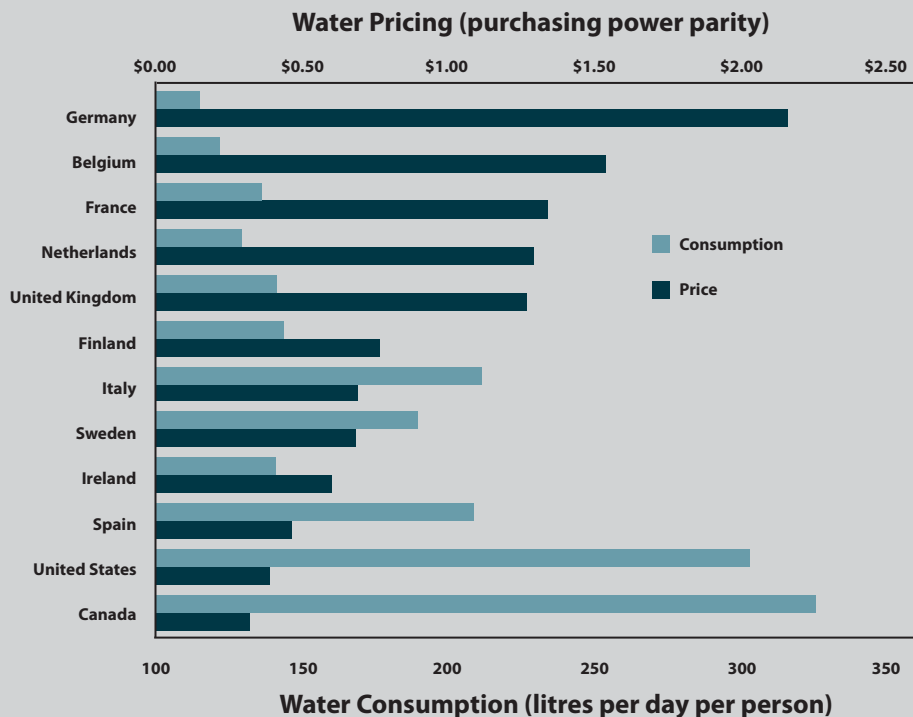
Figure 1: International Comparison of Municipal Water Prices and Consumption	iv
Figure 2: Percent of Canadian Single Dwelling Residential Customers That Are Metered	06
Figure 3: Comparison of Unit Prices of Water Services and Waste-water Services to Households, Including Taxes	08
Figure 4: Revenues and Expenditures of Canadian Water Agencies: 1988 to 2007	11
Figure 5: Types of Water Rates Illustrated	20

## CASE STUDIES

Case Study 1: Halifax Water, Nova Scotia	04
Case Study 2: Seattle Public Utilities, Washington	15
Case Study 3: San Antonio Water System, Texas	26
Case Study 4: City of Guelph, Ontario	30
Case Study 5: Vancouver Island Communities	35

# Figure 1:

## INTERNATIONAL COMPARISON OF MUNICIPAL WATER PRICES AND CONSUMPTION



**Source:** Council of Canadian Academies. (2009). *The Sustainable Management of Groundwater in Canada: Report of the Expert Panel on Groundwater*. Ottawa, ON. p 115.

## SECTION I:

### PRICING WATER SERVICES - SUSTAINING INFRASTRUCTURE

*Inevitably, society has to pay for the infrastructure and services that store, treat and distribute water to our homes and businesses.<sup>1</sup> Yet, Canadians typically pay only a portion of these costs through regular water bills. The remaining costs must be postponed, leading to deteriorating infrastructure. Alternatively, they must be subsidized from other sources, including infrastructure grants from provincial and federal governments or municipal government general revenue (usually generated from property taxes). This keeps the retail price of water artificially low.*

In addition to water being relatively cheap, Canada's water consumption is high compared to other countries. In fact, Canadians are among the biggest water users in the world.<sup>2</sup> Figure 1 compares municipal water service prices and consumption among various Western European and North American countries—and Canada comes out firmly last in both respects. The message is clear: *Canadians pay relatively little for their water, and their consumption is comparably high.*

When it comes to water conservation planning, pricing reform is a bit like the proverbial “elephant in the room” in the boardrooms and council chambers of

1. Expansion of infrastructure in almost all municipalities is paid for by development charges levied on the developer and paid for by the home owner as part of the price of the new home. However, future maintenance of this infrastructure is usually intended to be paid for through water bills.

2. It is important to note the challenges associated with international comparisons due to different data gathering approaches and varying levels of comparability and changes across data sets both between countries (and even between provinces in Canada) and across time. Nonetheless, we use this comparison to illustrate a point: even taking potential data deficiencies into account, Canadians use a significant amount of water compared to other places, with pricing being one of the elements that accounts for this difference.

**Conservation-Oriented Water Pricing** is a rate structure adopted by a water service provider where the costs of providing services are recovered, individual customers are metered and pay for the volume of water they use, and the price signal is sufficient to affect individual decisions and encourage conservation and efficiency.

Canadian water service providers and municipalities.<sup>3</sup> Too often the potential to use price as a signal to curtail water over-use and a way to improve long-term financial performance is simply overlooked.

## CONSERVATION-ORIENTED PRICING: CHANGING CHOICES THROUGH THE WATER BILL

Fundamentally, the price charged for water services should:

1. provide enough revenue to water utilities and suppliers to cover the full costs of providing the service, including maintaining and replacing infrastructure;
2. signal the actual cost of supplying water and provide a financial incentive for customers to use it more efficiently;
3. promote innovation by encouraging inventors, engineers and scientists to develop water-saving devices, practices and technologies.

The basic concept of conservation-oriented pricing is that we should set community water rates sufficiently high to reflect the full costs of providing services, and to affect individuals' choices about how they use water. This includes behavioural choices about the quantity they consume and their purchase selections when they buy water-using technologies and services. The majority of people and organizations will change their behaviour because they recognize that conserving will lead to financial savings. In short, by setting a more appropriate price, people will change the value they place on water and modify their actions accordingly.

The water service provider is interested in achieving these greater efficiencies because it will mean better use of scarce operational capital, deferred future expansion costs and reduced environmental impacts.

A number of preconditions must exist to implement such a progressive pricing system:

1. individually metered water connections;
2. volumetric charging (where users are charged for the amount of water they use); and
3. a water rate that is sufficiently high to affect a user's decision making.

3. In this document we use the term "water service provider" generically to refer to all types of organizations, regardless of their institutional form: legislated water utilities, municipal water departments, corporatized public entities, public works divisions, etc.

## TECH BOX 1: WATER, WASTEWATER, OR BOTH?

We might be tempted to think that volumetric charging applies only to water coming out of the tap. But when both water and wastewater services are being provided, volumetric charging can also be used to price wastewater. This can be done even when the sewer is not metered (as is almost always the case). Typically, this involves setting a volume-based wastewater charge based on a *discharge factor*—essentially an assumption about how much of the water that comes into a home or business is subsequently discharged to the sewer (i.e., the percent of water that goes down toilets and drains as opposed to water that goes onto lawns or cars or into swimming pools).

Provided that pricing information is clearly communicated, having a volume-based wastewater charge can magnify the effect of conservation-based pricing, simply because customers will realize that they will save on both their water and wastewater bills if they use less. That is, they will realize that the combined price that they pay for their water and wastewater services increases as they consume more.

Halifax Water in Nova Scotia, explored in Case Study 1, is an example of a water service provider that has had success with moving to volumetric wastewater charges, and is all the more interesting because they also include costs of stormwater infrastructure in their bill.

## IS CONSERVATION-ORIENTED PRICING THE ELEPHANT IN THE BOARDROOM?



# Case Study 1:

## HALIFAX WATER, NOVA SCOTIA

**H**alifax Water provides utility services to more than 79,000 metered connections and a population of approximately 350,000 in the Halifax Regional Municipality. Halifax Water is an autonomous and self-financed utility. It also has a history of demonstrating Canadian leadership in other areas related to water demand management, most notably in pressure and leakage management.<sup>i</sup>

In 2007, utility services were merged, making Halifax Water the first regulated water, wastewater and stormwater utility in Canada. This created a unique opportunity to provide integrated, cost-effective and environmentally sound services across the full urban water cycle.

Halifax Water's billing structure consists of a fixed charge and three separate variable components, all of which are based on the customer's water consumption volume:

- a water consumption charge that reflects the cost of pumping and treating water and maintaining the distribution system;
- a wastewater and stormwater management charge that reflects the cost of operating both the stormwater and sanitary sewer systems; and
- an "environmental protection charge" that reflects infrastructure, operating and capital upgrade costs associated with the wastewater collection and treatment system.

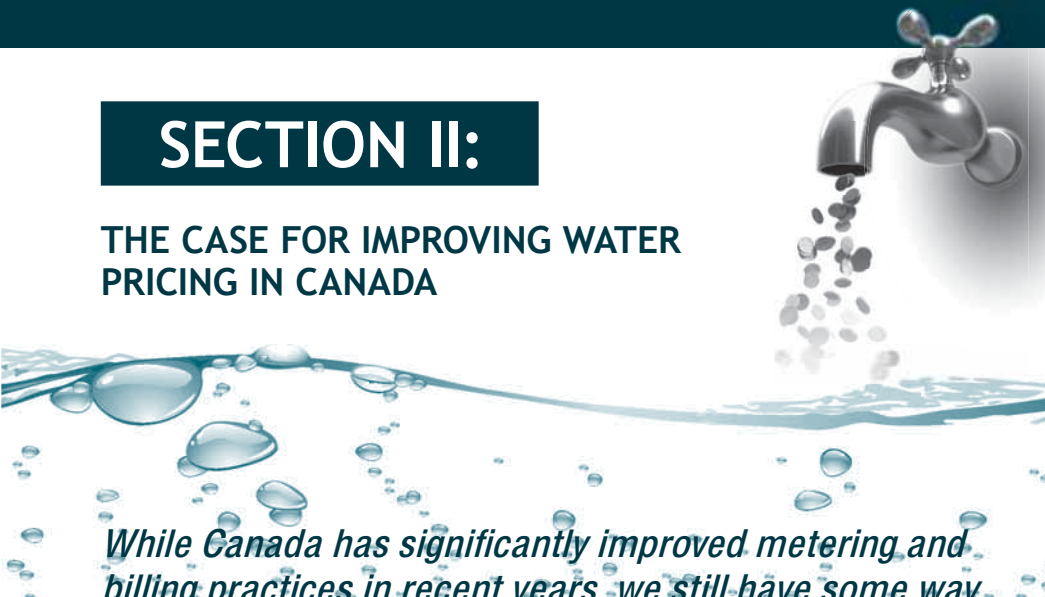
While the total cost for a typical residential water bill is not particularly high in Halifax, even by Canadian standards, the organization's approach is still interesting for a couple of reasons. First, Halifax Water is tasked with integrated management of all aspects of the urban water cycle, including stormwater, and is working towards full cost accounting and recovery across all components. Second, by having separate volumetric billing components for water, wastewater and stormwater, they provide direct information to customers about the costs of managing each of these sub-systems, and thereby indirectly inform customers about the environmental linkages between them.

Halifax Water has committed to continuously improving their approach to cost recovery as part of their integrated urban water management mandate.

For more information, see [www.halifax.ca/hrwc/RatesAndFees.html](http://www.halifax.ca/hrwc/RatesAndFees.html)

## SECTION II:

### THE CASE FOR IMPROVING WATER PRICING IN CANADA



*While Canada has significantly improved metering and billing practices in recent years, we still have some way to go to meet the basic requirements of a conservation-oriented pricing system.*

#### 1. Metering

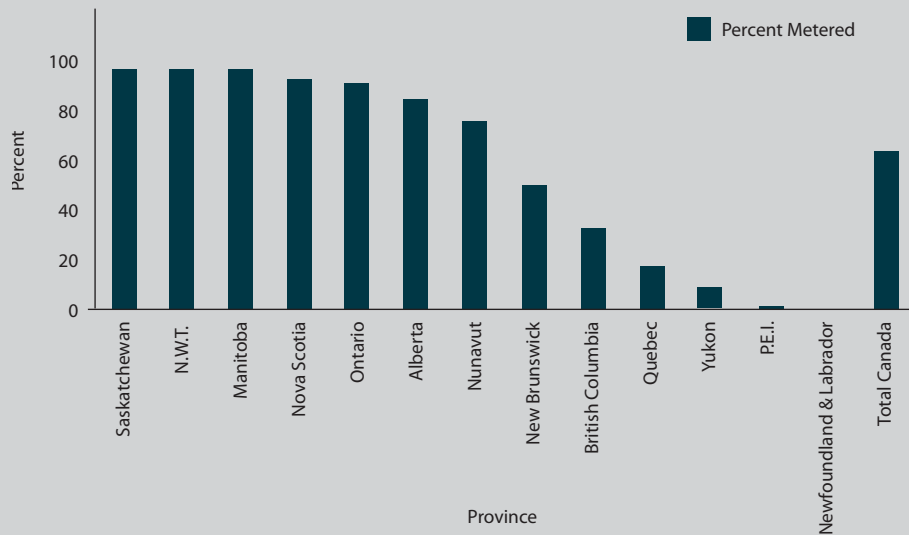
As of 2006 (the most recent year for which data are available), only 63.1% of customers living in single-family dwellings in Canada were metered.<sup>ii</sup> In other words, over one-third of Canadian homes still do not have a water meter. This is puzzling when you consider that universal metering is commonplace and expected in other utility sectors, such as electricity or natural gas. In these sectors, we would be very surprised indeed if usage were not metered.

The extent of metering is also highly variable from province to province (see Figure 2). In British Columbia, only 32.6% of residential customers are metered. In Quebec, only 16.5% of residential customers are metered. In Newfoundland, only a fraction of one percent of residential customers have a meter.<sup>iii</sup>

Some municipalities continue to resist meter installation, typically citing costs to homeowners or the belief that demand management goals can be met by other means, such as education. But based on the adage that "what gets measured gets managed," it is difficult to expect that Canadians will seriously embrace urban water sustainability objectives without adopting metering as a basic planning tool. As demonstrated by leading practices from around the world, metering is a foundational element of any comprehensive pricing program, not to mention crucial to any efforts to seriously address unaccounted for water, including system leakage.

# Figure 2:

## PERCENT OF CANADIAN SINGLE DWELLING RESIDENTIAL CUSTOMERS THAT ARE METERED



Responding Population = 27 927 531; based on single-family residential dwellings<sup>4</sup>

**Source:** Based on data from Environment Canada. (2009). *Municipal Water and Wastewater Survey: Municipal Water Use 2006 Summary Tables*. Ottawa, ON.

Two-thirds of Organisation for Economic Co-operation and Development (OECD) member countries already meter more than 90% of single-family houses.<sup>iv</sup> Without meeting this basic requirement, it is impossible to charge based on the volume consumed and is difficult to manage community consumption.

## 2. Volumetric Charging

About one-quarter of customers living in single-family dwellings in Canada still receive a flat rate water bill. This means that they are charged a pre-set monthly fee that provides for a virtually unlimited amount of water. Like an all-you-can-eat buffet, flat rate billing is a problem because it creates an incentive to over-consume

4. Because these data are based on stand-alone houses, these rates likely overstate meter coverage in Canada. Many people live in apartment buildings that have a single master meter rather than individual unit meters. These types of customers are not captured in the statistics.

5. Note: updated (2006) data on the rate of metering were available at the time of writing, but only 2004 data were available on water pricing. Also, the number of residential customers facing non-volumetric charging is higher (29.9%) if you include customers who are not billed separately for water but instead pay for water services through their local taxes based on property condition or some other assessment.

(see Tech Box 2). Almost a quarter (23.4%) of Canadian homes were still on this kind of system as of 2004.<sup>v</sup> The good news is that the numbers for businesses are much better, and the number of residential customers on flat rates has also been steadily declining in recent decades. But we do still have some way to go.<sup>5</sup>

The remaining three-quarters of Canadians do face volumetric-based charging, so are billed for the volume of water they use. However, even when the structure is right, the per unit rate they pay may not be high enough to significantly affect their behaviour.

## 3. Sufficiently High Water Rates

What exactly defines a “sufficiently high” price for water? The question is certainly open to debate and often depends on context.

One way to assess whether Canadian water rates are “high enough” is to compare both our prices and our water consumption to other developed countries. As shown in Figure 1, above, Canada’s municipal water service prices are the lowest among a number of similar European and North American countries, and our per capita use is among the highest.

Similar but more recent data come from a 2010 study by the OECD. This compared average per unit prices for water and wastewater services, including taxes, for households across 20 OECD and non-OECD countries (see Figure 3). Again, Canada’s prices were the lowest of the responding countries, which included places such as South Korea, Poland and Hungary. Countries such as

## TECH BOX 2: THE NUMBERS SAY IT ALL...

The evidence is striking that volumetric pricing is far more effective than flat rate pricing in reducing water consumption. The typical Canadian household on a flat rate system uses an average of 467 litres per person per day (L/p/day). The average for a household on a volumetric charging system is only 266 L/p/day or 43% lower, a sizeable difference by any standard.<sup>vi</sup>

A number of factors may explain this gap, including differences in housing stock, average family size and income, the accuracy of water use accounting practices and better system leak detection in metered areas. In some cases, past water-related challenges have driven utilities to use more effective pricing systems. However, these explanations account for only some of the discrepancy. There is no avoiding the fact that when a municipality introduces variable pricing, people respond by reducing their water use. In most cases, consumption drops over the next few years.

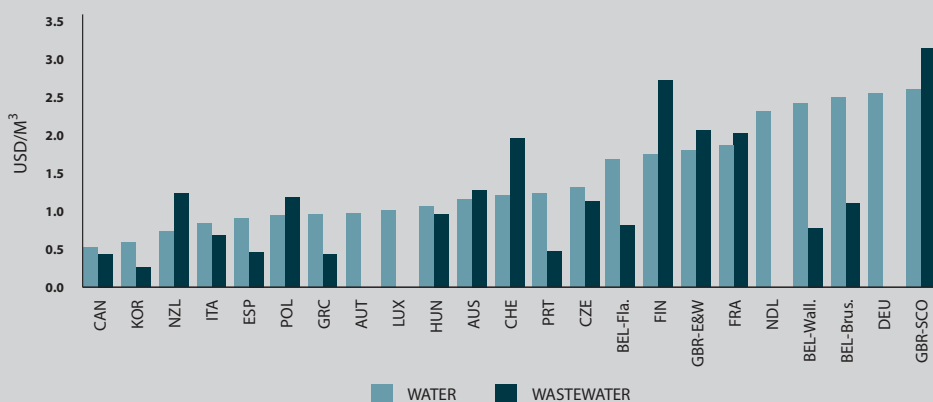
Australia, New Zealand, Great Britain and others in Western Europe all seem to charge much more for water, yet they enjoy a very comparable quality of life.<sup>vii</sup>

It is a bit perplexing that Canada is such a cheap supplier of water, but some likely explanations exist. Part of it is rooted in an historic “frontier” belief that we enjoy an endless supply. This “myth of abundance”—the popular misconception among many Canadians that we have an unlimited availability of fresh water—leads to a deep-seated overconfidence that we can afford to waste. This kind of thinking creates substantial political barriers to pricing reform.

In reality, our situation is really not so different from many other places. The technology we use to capture, treat and distribute water is similar to that used in other countries. The proximity of water supplies to major settlements is comparable to, for example, much of northern Europe. And finally, potable water supplies in the southern part of Canada are not really much more abundant than in many other parts of the world.<sup>viii</sup> Indeed, if anything, our low population densities and variable climate should mean *higher* average prices for water services than many developed countries.<sup>ix</sup>

## Figure 3:

COMPARISON OF UNIT PRICES OF WATER SERVICES AND WASTEWATER SERVICES TO HOUSEHOLDS, INCLUDING TAXES (USD/M<sup>3</sup>)



Source: Organisation for Economic Co-operation and Development (OECD). (2010). Pricing Water Resources and Water and Sanitation Services. OECD Environment Directorate, ENV/EPOC/GSP(2009)17/FINAL, 18 January 2010.

## WHY WATER UNDER-PRICING AND OVER-CONSUMPTION ARE PROBLEMS

If over-consumption and under-pricing are linked, why should we care? The answer is that there are a number of sound financial, social and environmental reasons to change water pricing models, including:

- water service providers experience higher operating costs due to the need to pump and treat water that is not always used efficiently;
- excess water treatment, pumping and heating requires significant energy inputs, which in turn can mean unnecessary greenhouse gas emissions;
- sewer flows are higher than need be, which results in unnecessary treatment and disposal costs and environmental impacts on receiving water quality and fish populations;
- because water demand is generally higher than it needs to be, new bulk supplies such as dams or new groundwater wells may need to be constructed sooner or larger than necessary, resulting in higher than necessary capital and overhead costs as well as environmental impacts;
- *peaking factors*—the point at which water use is greatest during the year (usually on hot summer days)—are very high because people have little incentive to moderate their consumption. This means that pipes, pumps, treatment plants and reservoirs must be constructed and oversized to meet excess demand on these very few days of the year, which inflates the price tag of our infrastructure;
- in order to curb demand, water utilities often have to rely on less effective and relatively more costly tools, such as outdoor watering restrictions or product rebates;

## WHAT DO WE ACTUALLY SPEND?

As part of its 2010 study, the OECD assessed the share of net disposable income that households in different countries spend on water and wastewater services. For Canada, the figure is 0.3%, among the lowest of the 20 responding countries in the study (tied with Japan and Italy and ahead of South Korea).

Similarly, according to Environment Canada, the median expenditure per household for water services in 2004 was \$37.93 per month for 25 cubic metres and \$50.46 per month for 35 cubic metres. Compare this to the 2005 median expenditure per household per month for basic utility costs of water, fuel and electricity for principal accommodation, which was \$192.30—representing 3.2% of total household expenditures. In other words, water bills account for about 20–26% of our already low basic utility costs.<sup>x</sup>

- equity and fairness: those who waste water and place excess demand on the system pay about the same as those who conserve; and
- under-pricing stifles innovation: consumers have little financial incentive to invest their scarce dollars in water efficient goods and services because it takes so long to recover their investment. As a result, scientists, inventors, engineers and investors also have little incentive to improve water using technologies.

Probably the biggest, and most surprising, implication of water under-pricing is that the amount of revenue we currently collect from water bills is often insufficient to cover the expenditure required to provide the service. In fact, the aggregate ratio of what Canadian water agencies brought in (revenue) compared to what they spent (expenditure) in 2007 was only 70%, and is actually falling (see Figure 4). In other words, water users are not even coming close to covering the full costs of the water services they enjoy—and it is getting worse.<sup>6</sup>

This situation means that there are generally not enough funds available to cover the costs of maintaining and replacing infrastructure, to implement necessary system upgrades, or to replenish the organization’s reserve funds. As a result, senior levels of government are periodically called upon to inject large amounts of subsidy funding into infrastructure renewal—often leading to further overbuilt systems and future waste.<sup>7</sup> Alternatively, costs may be subsidized at the local level through property taxes, reserves, or other sources. In short, our water systems are neither self-funded nor financially sustainable—hence, the mounting water infrastructure deficits across Canada.

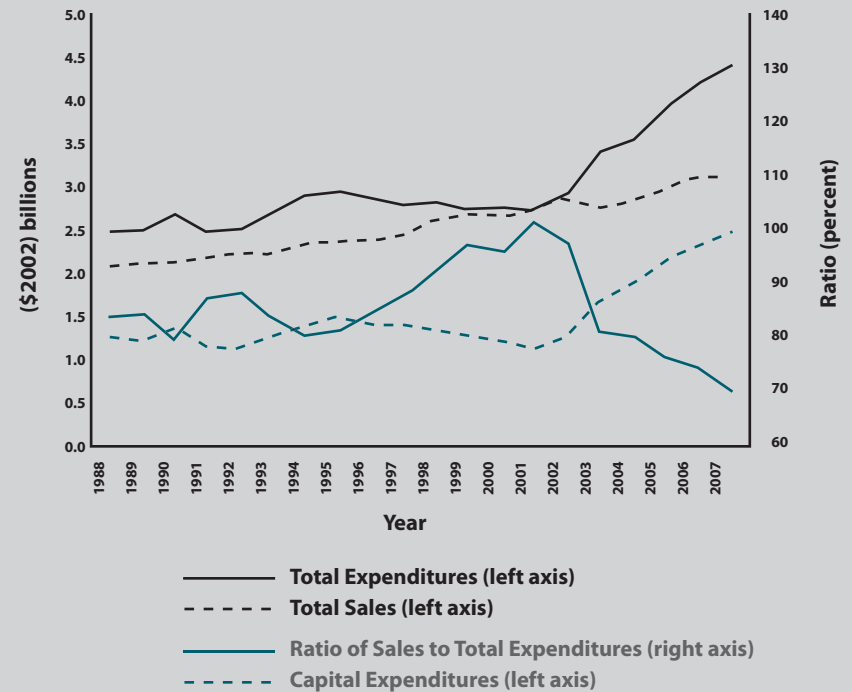
So why are we so far off the mark? The question is open to speculation, but experts have identified a number of core reasons. The pricing system in a typical Canadian municipality results from a complex mix of local politics, equity considerations, economic development motivations, industry past practices and sheer accident.<sup>xi</sup> The Canadian “myth of water abundance” discussed above is also part of the explanation. The public also generally

6. A positive feature of Figure 4 is that we are finally increasing the amount we spend on water system infrastructure (“Capital Expenditures”). However, much of this spending comes from unpredictable infusions from senior government programs. Reforming water prices would provide water agencies with predictable sources of funding to support infrastructure repairs. It could also have the added benefit of reducing future infrastructure needs by promoting water use efficiency and innovation.

7. The recent round of federal “stimulus” spending on infrastructure to combat the recession provides an excellent case in point. An alternative is to apply such senior government transfers to foundational water management elements, such as metering projects or efficiency and conservation programs.

# Figure 4:

REVENUES AND EXPENDITURES OF CANADIAN MUNICIPAL WATER AGENCIES: 1988 TO 2007



Source: Renzetti, S. (2009). *Wave of the Future: The Case for Smarter Water Policy*. C.D. Howe Institute. Commentary No. 281, February 2009, p. 2.

has a poor understanding of the water challenges that lie ahead and so are not motivated to change practices or habits. Finally, history and entrenched expectations are against us as water has been supplied to households at very low prices for a very long time. This inertia presents a stubborn challenge for politicians, water managers and communities alike. Fortunately, solutions for moving to a more financially and environmentally sound pricing system exist.

## TECH BOX 3: THE PRICE ELASTICITY OF DEMAND FOR WATER

In basic economic theory, the key principle to explain why conservation-oriented pricing works is *price elasticity of demand*. In simple terms, people respond differently to changes in price for different goods and services. Some goods and services are very inelastic, meaning that people's consumption does not change much when the price goes up, so the seller's revenue will likely increase. Inelastic goods are typically ones that have few substitutes or where having them is a necessity. For example, the price of insulin is very inelastic for people who need to use it every day.

As it turns out, water is indeed generally an inelastic good, but less so than you might think.<sup>8</sup> This is not surprising considering that many uses are not really "essential" (like car washing or lawn watering). Economists have conducted many studies into this issue over the last 30 years. Many home technologies and simple behaviour changes can reduce consumption without significant difficulty or cost. Furthermore, the available evidence suggests that the higher prices get, the higher water's price elasticity becomes. Thus, as water service prices rise, we can expect households to increasingly (by proportion) reduce their demand for water. An important but subtle point is that household demand for water responds more to higher prices in the long run than in the short run. Changing consumer behaviour and retrofitting appliances takes time. So, it might take a while for a conservation-oriented rate structure to impact demand. Not surprisingly, studies also show that outdoor water use is much more sensitive (elastic) to price changes than indoor water use. Finally, the research indicates that industrial and commercial firms also respond to changes in price in much the same way that households do—by changing practices and replacing technologies.

It should be noted that studies often find widely different price elasticities depending on the context. Factors such as location, season, and the presence of other demand management programs all affect the responsiveness of price to demand.<sup>xii</sup> This can have a major impact on the results of any price modifications, so analysis of the predicted price elasticity in your area should be undertaken and carefully considered. Any effort to increase price requires anticipation of households' (and other water users') responses to the proposed rate changes in order to accurately predict the impacts on the water supply system and revenues.

8. Espey et al. (1997) reviewed 162 estimates of the price elasticity of water that were made between 1963 and 1993. They found an average price elasticity of -0.51. This is a measure of the expected change in demand when price increases by 1. Similarly, Dalhuisen et al. (2003) analyzed 300 studies conducted over the past 20 years and found an average price elasticity of -0.41.

Sources: Espey, M., J. Espey and W.D. Shaw. (1997). Price Elasticity of Residential Demand for Water: A Meta-analysis. *Water Resource Research*, 33(6), pp. 1369-1374, and Dalhuisen, J. M., R.J.G.M. Florax, H.L.F. de Groot and P. Nijkamp. (2003). Price and Income Elasticities of Residential Water Demand: A Meta-analysis. *Land Economics*, 79 (2), pp. 292-308.

## SECTION III:

### SETTING UP A CONSERVATION-ORIENTED PRICING SYSTEM



*At the most basic level, conservation-oriented pricing is based on the economic premise that if price goes up, the quantity demanded will go down. The more the cost of water increases, the more consumption will drop.*

This price relationship is, of course, more complicated. When establishing a new pricing regime, a water service provider and its governing body needs to carefully consider the actual sensitivity of water demand to price, which means considering the price elasticity of demand (see Tech Box 3). However, in general, this basic principle does hold up, and we can expect consumption to drop over time as price increases and people gradually change their fixtures, appliances and behaviour. It then becomes a subtle question of the extent or rate of change relative to the amount of the price increase.

With these concepts in mind, two main tasks need to be undertaken:

1. determine how much revenue is needed in order to cover the full costs of operating, both now and in the future; and
2. select from a number of different pricing approaches and billing structures to determine how you are going to set the rate in order to fully recover the costs.

### HOW MUCH REVENUE DO YOU NEED TO COLLECT?

The key to effectively establishing conservation-oriented pricing is having a full cost accounting system in place. As the name suggests, this means all the costs that an agency incurs, including its capital costs, are recorded and then reflected in the price.<sup>xiii</sup> Full cost accounting includes a range of items, such as operations and maintenance, administration, overhead, reserves, costs of

complying with regulations, financial costs (depreciation, debt servicing, etc.) and capital costs.<sup>9</sup>

Beyond these obvious items, full cost accounting should also cover “soft costs”, including environmental externalities. These include, for example, the cost of environmental management and source water protection. An agency might also want to set aside funds for projects to mitigate impacts on the environment from operations—for example, greenhouse gas abatement projects or restoration work to compensate for impacts on aquatic ecosystems from wastewater disposal.<sup>10</sup>

By having a full cost accounting system in place, the water service provider can accurately report all of its costs of operating. With this information in hand, costs passed on to customers through water bills can be explained. Without this, it can be difficult to justify the sometimes significant per unit rate increases to customers and elected officials.

Various utilities both in Canada and other countries have a long track record of full cost accounting; much can be learned from them. Seattle Public Utilities in Washington State, explored in Case Study 2, bases its retail prices on “cost of service studies”, which are completed every two years. Charges applied are designed to achieve financial targets set out in these studies.

Many Canadian utilities are also making great strides in improving asset management systems. When tied to full cost accounting methods, this provides the information and planning foundation for creating infrastructure replacement funds.

## HOW DO YOU SET THE RATE?

Once you know your costs, you need to set your rate, which is both a technical and political exercise. Some of the many issues that must be considered include:

- revenue needs;

---

9. Historically, utilities have used other accounting methods that did not always fully account for all the costs of operating. These older methods do not always account for the costs of depreciating assets such as aging pipes, which partly explains why most Canadian water service providers do not fully recover their costs. Analysts sometime refer to this as an “infrastructure deficit”—the difference between the funding needed for maintenance, repair, rehabilitation, retrofitting and replacement of existing deteriorated infrastructure and the funding available from all sources, including taxes, government subsidies, grants and private sector contributions.

10. Although not always easy to calculate, these environmental considerations and the ecological goods and services that flow from our watersheds and aquifers are critical to the long-term financial and ecological sustainability of the operation and are increasingly being taken into account in planning and decision making.

# Case Study 2:

## SEATTLE PUBLIC UTILITIES, WASHINGTON

Seattle Public Utilities (SPU) provides water services to 1.4 million people, mostly in King County, Washington. Seattle is known for having plenty of water in the winter, but there is far less precipitation during the summer when demand is highest. Residents depend on water stored in mountain reservoirs to meet demand and to provide enough water to release into rivers to maintain watershed function and populations of fish and other aquatic species.

SPU has a long history with conservation-oriented pricing, having first introduced volumetric charging decades ago. In 1989, they were among the first in North America to introduce a seasonal surcharge, wherein all customers pay more for water in the summer when demand is at its highest and availability is lowest. A drought surcharge was also added to bills for the first time in 1992, and included a strong rate penalty for excessive water use. SPU has also had volumetric wastewater charges for over 20 years. This charge is calculated on a household by household basis based on the amount of water each household uses in the winter months, when most water is discharged to the sewer system.

In 2001, SPU permanently introduced increasing block rate tiers for single-family residential customers. Three rate tiers are used. Tier three kicks in when a customer exceeds a water use of approximately 51 cubic metres. Around 10% of single-family residential customers fall into this category during the summer, and as a result face a much higher charge for that portion of their water demand. In 2010, the potable water charge at the third tier will be about US\$ 4.04 per cubic metre. Of particular interest is that retail charges are based on “cost of service studies”, which are completed every two years. Charges are set to achieve full cost recovery while components of the rate structures are also based on marginal costs. In any given year, rates and fees charged must be sufficient to pay the total costs of the water system and meet adopted financial targets. SPU refers to this as the “water system revenue requirement”, defined as the minimum amount of operating revenue required to fund the water system operating budget and meet financial policy targets. This includes targets for net income, cash balances, financing of the capital improvement program, revenue stabilization fund balances and debt service coverage.

Since introducing peak usage charges and other demand management measures, SPU has seen significant and sustained reductions in their customers’ water use. While water rates have continued to increase, the average customer bill has not increased as quickly because the average customer is using less water than in the past.

For more information, see:

- [www.seattle.gov/util/Services/Billing/Rates\\_Summary/SPU\\_001469.asp](http://www.seattle.gov/util/Services/Billing/Rates_Summary/SPU_001469.asp)
- [www.seattle.gov/util/Services/Water/Rates/THIRDTIER\\_200312020910308.asp](http://www.seattle.gov/util/Services/Water/Rates/THIRDTIER_200312020910308.asp)

- likely impact of the price change on the community;
- how to communicate the change to residents;
- strengths and weaknesses of the price structure that is currently in place;
- impacts on the organization's existing business systems;
- “buy in” and coordination of finance, human resources, IT, marketing and other parts of a water agency and across the whole municipal administration; and
- some pricing model changes may require regulatory approval from senior levels of government.

From a technical point of view, two key considerations need to be addressed. First, an economic methodology for setting the price should be developed. The technical theory in this area becomes fairly dense, and a number of different approaches can be employed, as outlined in Tech Box 4.

Whichever approach to price setting is selected, the first objective of the organization should be to fully recover all its costs without relying on grants or general tax revenue, consistent with the concept of full cost accounting discussed above. Ideally, the price structure adopted will also be forward looking, meaning that it will include not just costs for things that happened in the past but will also seek to capture future costs, such as possible system expansion, future upgrades and infrastructure renewal. Ideally, the pricing approach should also inform individuals about the financial and environmental impacts of their decisions. In other words, the rate should allocate costs to customers in such a way that they are well informed about the full costs of the services they receive and want to receive into the future.

Second, a *rate structure*, or a way to compute and communicate the customer's bill must be established. As Tech Box 5 demonstrates, a number of different rate structures exist, each with its own advantages and disadvantages.

## COMPONENTS OF A RATE STRUCTURE

In general, a conservation-oriented structure will often have two components. First, there is a *fixed charge* (sometimes called a *connection fee* or *meter fee*), which is the portion of the bill that does not change when consumption increases. Second, there is a *volumetric charge* that goes up as one uses more water.

## TECH BOX 4: MARGINAL COST VS. AVERAGE COST PRICING

Economic literature generally recognizes long-term marginal cost pricing as the best pricing option for water utilities—at least in theory. Marginal cost essentially means the cost of producing one more unit of a good—for example, one more cubic metre of water. Marginal cost pricing therefore involves linking the volumetric component of a water bill to not only historic costs but environmental and future costs, such as costs of system maintenance and regulatory requirements.

Economists prefer marginal cost pricing because it tells consumers about the costs they are creating today, rather than just historic costs. This is especially preferable in situations where agencies' costs are rising. Marginal cost pricing also reflects the way that total costs rise with each user's consumption. In other words, it sends the right signal to consumers: if you use more water, here's what it will cost the agency and the community to supply it.

Marginal cost pricing is used in other regulated utilities, such as telecommunications, natural gas and electricity. It is also used in the water services sector in a few countries, but is not generally being used in Canada. Many reasons for this exist, but it is partly because determining marginal cost is complex, depending on weather, distance, how total use compares to system capacity, and many other factors. The existing empirical evidence, though limited, also indicates that the gap between our current water price and long-term marginal costs is significant.<sup>xiv</sup> It may not be practical or realistic to switch over without a significant transition period.

Most Canadian utilities use some form of average cost pricing, which involves setting prices so that average costs are just covered, allowing the producer to break even—usually as per a requirement of senior government. A number of variations are used, but in general, these approaches limit the water service provider to recover its costs on a full cost accounting basis. These models often do not allow a water service provider to accumulate reserves to meet future expansion or technology needs. These are always based on historic (or “sunk”) costs, and so prevent achieving true economic efficiency.

## SENIOR GOVERNMENTS' CRUCIAL ROLE

Senior governments play an important role in facilitating or inhibiting positive change. For example, Ontario has made efforts to bring in legislation that requires water and wastewater agencies to revise their accounting practices to record all costs and reflect them in their prices—see Ontario's yet-to-be-proclaimed *Sustainable Water and Sewage Systems Act* and the Financial Plans Regulation under the *Safe Drinking Water Act*. Alberta Environment has also developed a full cost accounting program to promote better fiscal planning for municipal waterworks systems, although on a voluntary basis. Other jurisdictions are slowly following suit. Many resources are now available to help with moving to this accounting method.

Existing senior government legislation also may create significant barriers to change by limiting which financial structures are allowed. This can constrain progressive municipal governments and water managers from implementing full cost pricing.

For the volumetric component, customers pay relative to use. Two types of rates are most common:

- a *uniform rate* (sometimes called a constant unit charge or single block rate): the per unit price does not change no matter how much you consume; and
- *inclining block rates*: the price per unit increases in incremental steps as consumption increases.

A third type of volumetric structure is the declining block, where the per unit price decreases as consumption increases. Declining block rates are typically offered only to very high volume users, such as industrial or institutional customers, but are still offered to residential customers in some places. Use of this structure is based on an oversimplified argument that when quantity purchased goes up, price should go down—the “volume discount” idea—which is usually supported by the argument that the fixed cost portion has already been paid and the higher consumption fees should be based on marginal operations costs only. This approach has very obvious drawbacks in terms of encouraging water use efficiency.<sup>11</sup> Figure 5 graphically compares the different kinds of rate structures.

There are pros and cons to uniform and inclining block systems, and both have their proponents (see Tech Box 6). Regardless of what approach

11. The declining block approach also ignores factors such as timing of use. Perhaps price could go down when time of delivery is not an issue, but when it all has to be supplied at once (for example, on hot summer days), price should go up because cost of delivery goes up. For these reasons and others, use of declining block structures has declined steadily in Canada for the past 20 years, from covering 24.0% of residential ratepayers in 1991 to only 7.9% in 2004 (see Endnote v).

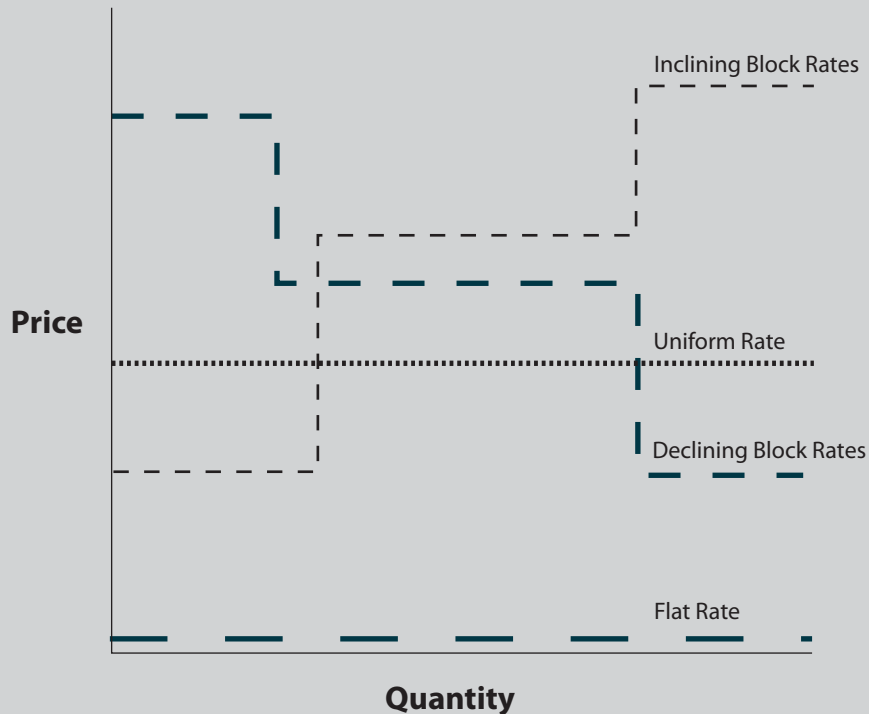
## TECH BOX 5: TYPES OF RATES

TYPE	DESCRIPTION	COMMENT
Flat Rate	Fee is independent of actual water use	The least effective pricing structure for reducing demand; most common in utilities that are unmetered
One Part Rate	Includes a volumetric charge only	Less common at the retail level but often found at the wholesale level
Two Part Rate	Includes both a fixed and a variable rate	Recommended as best practice by the Canadian Water and Wastewater Association
Components of a Two Part Rate		
Fixed Charge	The portion of the bill that does not vary by volume of water consumed (though it may increase with increase in meter size)	Provides increased revenue stability; some local governments use parcel taxes in a way similar to fixed charges
Variable Charge	The portion of the bill that increases with the amount of water consumed	The most effective rate structure for reducing demand; requires full metering
Variable Charge Formats		
Uniform Rate Constant Unit Charge Single Block Rate	Price per unit is constant as consumption increases	Targets all users equally; simple to calculate bill
Inclining Block Rates	Price increases in steps as consumption increases	Targets high volume users; requires more complex calculating for billing
Declining Block Rates	Price decreases in steps as consumption increases	Charges low volume users the highest rate; typically used where utilities want to provide large industry with a lower cost of service
Excess Use Rate	Price is significantly higher for any consumption above an established threshold	Can be used to target high consumption during peak periods; more effective with frequent (e.g., bi-monthly) meter reading
Seasonal Surcharges	Price is higher during peak periods (i.e., summer)	Targets seasonal peak demand; tied to the higher marginal costs of water experienced during peak periods
Distance Rates Location-based Rates Spatial Rates Zonal Rates	Users pay for the actual cost of supplying water to their connection	Discourages difficult-to-serve, spatially diffused connections
Scarcity Rates	Price per unit increases as available water supply decreases (e.g., during drought)	Sends strong price signal during periods of low water availability; an alternative to outdoor watering restrictions
Lifeline Block	A first block of water is provided at low or no cost beyond the fixed charge in order to ensure everyone has a minimum amount of water to meet basic water needs	Used to address equity issues and ensure that all consumers' basic water needs are met

**Source:** Based on Wang, Y.-D., W.J. Smith, Jr. and J. Byrne. (2005). *Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity and Meet Minimum Flow Levels*. Denver, CO., American Water Works Association, p. 7, and Federation of Canadian Municipalities and the National Research Council. (2006). *Water and Sewer Rates: Full Cost Recovery*. In *InfraGuide: National Guide to Sustainable Municipal Infrastructure*. March 2006.

# Figure 5:

## TYPES OF WATER RATES ILLUSTRATED



**Source:** Based on Wang, Y.-D., W.J. Smith, Jr. and J. Byrne. (2005). *Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity and Meet Minimum Flow Levels*. Denver, CO., American Water Works Association, p. 7.

is employed, the most important considerations are whether the price set accurately informs consumers about the costs of their water use and whether it provides a signal that is sufficient to affect their decisions (i.e., is the price high enough?).

## TECH BOX 6: THE GREAT RATE DEBATE: UNIFORM VS. INCLINING BLOCK

Which is the better approach: uniform or inclining block rates? Academics and practitioners continue to debate this question. Each approach has its supporters. From a conceptual point of view, the challenge really comes down to the need to balance equity among users with the relative ease of administration for the organization—including real practical challenges faced in the billing process and financial administration. Those who favour the inclining block approach argue that it can be more effective in addressing equity objectives. They point out that this approach targets those who are using above average amounts of water, which is likely to include a lot of discretionary use. They also argue that an inclining block approach will be more effective in reducing peak demand, again because it goes after high volume users (often people watering gardens) more aggressively.

Those who favour uniform rates argue that introducing differing rates for different volumes is inefficient because it creates artificial differences in price (referred to as *price distortions*). That is, it moves us away from the goal of effectively linking the price of water to the marginal cost of supplying it. They also argue that, in practice, when utilities use inclining blocks, the highest blocks tend to affect only those using extremely large volumes of water; most users pay only a low basic per unit amount for all or most of their consumption. Thus, in practice, these systems do not always work very effectively in creating an incentive for most people to conserve. They also contend that inclining block systems are unfair because they discriminate against households with larger numbers of people. They argue instead that there are other ways to more effectively address equity concerns. Finally, they point out that a uniform rate system is much simpler for residents and businesses to understand and react to, provided that the basic per unit price is sufficiently high to affect decision making.

A compromise solution that captures many of the best elements of both approaches is to have a very simple inclining block system with two or at most three tiers. The lowest tier would be based on a *lifeline block* equal to roughly the amount of water required to meet a typical family's basic needs.<sup>12</sup> Alternatively, the lifeline amount could be included at no additional cost as part of the fixed portion of the bill. The next tier of pricing would be a significantly elevated charge that is sufficiently high to affect general decision making. Finally, a third tier could be added which includes a very high charge for those who continue to consume excessive amounts.

12. Some go further and argue that if you have a lifeline rate or low price initial block, the price per unit for the next block should not be marginal but should be paid on everything consumed, including the lifeline amount. Otherwise, the subsidy goes to everyone, not just to the poorest or the lowest consuming part of the public. This does, however, create some billing and communication challenges (See Endnote v).

## SECTION IV:

### ADDRESSING THE CHALLENGES TO CONSERVATION-ORIENTED PRICING



#### *Doesn't Increasing Volumetric Price Mean Unstable Revenue for the Water Service Provider?*

#### **FIXED VS. VARIABLE COSTS**

One of the biggest challenges in moving to a conservation-oriented pricing system stems from the fact that most of the costs that a water service provider faces are fixed: items including payroll, debt payments, and plant costs. In fact, fixed costs can account for 75–80% of spending, and sometimes even more.

*Fixed costs* are expenses that do not change or cannot be changed with a change in short-term production or sales. An example from the water industry is that a water service provider must make its debt payments in any given month, regardless of how much water is used by customers.

When an organization increases its reliance on volumetric pricing, revenue will inevitably fluctuate. Customers will use more water when it is hot and dry, less when it is raining, and much less if they are faced with watering restrictions during a drought.

Some water managers and elected officials believe that increasing per unit costs will create the so-called “pricing death spiral”, which goes something like this: the price increases, demand drops, revenue drops correspondingly, the agency is faced with a budget shortfall and must raise prices again, the cycle repeats.

*Variable costs* are expenses that do change with a change in production or sales. For example chemicals and energy required for treatment—which changes with the volume of water used.

Fortunately, there are options to avoid this vicious cycle, avoid budget shortfalls and alleviate the impacts of revenue variability.



First and foremost, careful planning goes a long way. The organization needs to ensure that it carefully and conservatively forecasts the impact that price change and other water use efficiency measures and trends will have on future consumption. It should then set its rates accordingly at a level that will allow it to fully recover costs.

As discussed above, volumes of academic research exist on the price elasticity of water. There is also plenty of experience with conservation-oriented pricing from around the world to draw upon. This, combined with local information, can be used to model predicted future water demand with sufficient accuracy, taking into account the impacts of pricing model changes and other demand management measures. All else being equal, the per unit price can then be set at the right amount needed to ensure that the water service provider can meet its budget requirements over the long term.

The water service provider can also use various pricing mechanisms to mitigate the impacts of revenue variability. For example, *rolling average price* can be set for a number of years. This will be designed to conservatively account for projected short-term fluctuations in water demand. This way, in some years there will be excess revenue that can be channelled into a reserve fund that can be tapped during lower demand years when there may be a shortfall in revenue.<sup>13</sup> Similarly, as noted above, most conservation-oriented rate structures will use a two-part system that includes both a fixed and variable component.<sup>14</sup> By including a fixed component, the worst impacts of revenue variability can at least be blunted. The fixed component can provide a significant degree of revenue certainty. Other options include support by senior governments to create revenue stabilization funding mechanisms for unexpected or severe revenue impacts (as is sometimes done in the energy sector).<sup>xv</sup>

### ***Doesn't Conservation-Oriented Pricing Burden Low Income Families?***

Some fear that a move to conservation-oriented pricing will hurt low income families who spend a disproportionate amount of their income on water. This is a particular concern for larger families who must use more water for basic needs like bathing.

13. In utilities that are regulated to a "zero profit" objective, some regulatory reform may be required to enable this kind of system.

14. This is the approach recommended by the Canadian Water and Wastewater Association (1992), but it should be recognized that many utilities have successfully moved forward with pricing reform by using a "100% volumetric" billing system that has no fixed fee component, so both methods are certainly possible.

This is an extremely important consideration. However we also have to question whether the best way to address this is to have a system that under-prices water for everyone and leads to waste and environmental impacts, especially when there are other, more efficient options available to help those in need.

As discussed in Tech Box 6, one of the best options to address equity issues is to offer a *lifeline block*. This is a volume of water that is roughly equal to the amount a typical family requires to meet basic needs. It is provided at a low per unit cost on the first tier of an inclining block system. Alternatively, it can be included at no extra cost as part of the fixed charge on the water bill.

Another good option is to provide giveaways or generous rebates to low income families for high efficiency toilets or other water saving technologies. Where a water service provider already has a rebate program in place, it can be redirected to more effectively target disadvantaged groups. For example, eligibility can be based on income, as is done with many other social programs. These options are best combined with non-financial tools, including education programs.

It is also worth noting that, depending on the extent of the rate increase, low income families who use less water than the average may actually experience a decrease in their water bills. This is simply because they may choose to use less water for discretionary activities, such as outdoor use. In any case, like all families, they will be given more control over their costs of water.

Other jurisdictions around the world have implemented pricing reforms quite effectively without causing undue hardship in the community. For example, the San Antonio Water System in Texas, a continental leader in water demand management, began improving their pricing system many years ago. Over time, they have introduced a whole range of measures to help low income people (see Case Study 3).

In 2010, the OECD compared the proportion of income that the poorest 10% of the population spend on water and sanitation bills across 20 member and non-member countries. The study found that the poorest 10% of Canadian households spend 1.2% of net disposable income on these services. Of the countries surveyed, only South Korea was lower at 1.0%.<sup>xvi</sup>

# Case Study 3:

## SAN ANTONIO WATER SYSTEM, TEXAS

The San Antonio Water System in Texas was an early leader in conservation-oriented pricing and has continued to innovate in the area over several decades.

San Antonio's bill calculation is fairly complex from the residents' point of view, but it has a number of interesting features. The organization employs an inclining block system that includes a small fixed monthly service charge. For the volumetric charge, customers pay a basic rate for every 100 gallons used until consumption exceeds 5236 gallons (9.7 cubic metres) per month. After that, the rate increases considerably over four different blocks. Customers also face a sewer charge component, with volumetric charging kicking in after 1496 gallons (5.66 cubic metres) per month.

San Antonio also provides a good example of how a seasonal surcharge can be used successfully. For their second, third and fourth price blocks, the cost per unit goes up during the period between July 1 and October 31 each year. This means customers will face significantly higher bills if their consumption jumps up during the summer due to discretionary outdoor water use.

Probably one of the most interesting facets of San Antonio Water System's approach is their affordability programs:

- They offer an affordability discount to low income residential customers who meet income eligibility requirements. The amount of discount received is based on tests that include household size, household income and type of service provided.
- In 1994, they initiated the "Plumbers to People" program to provide plumbing assistance to low income residential customers. The types of problems that can be repaired include leaking faucets and toilets or broken pipes—problems that cause consumption—and water bills—to go up.
- In 2000, they established "Project Agua" to provide further assistance to customers who are having difficulty making water bill payments. Available funds are used to help low income residential ratepayers who are elderly, disabled, or have young children.
- In 2007, they launched the "Kick the Can" toilet giveaway, which offers eligible customers up to two high efficiency toilets per household, absolutely free. Through this program, 30,000 toilets were installed in homes in 2007 alone. Of particular interest is that this work is funded through conservation-oriented pricing. A percentage of the revenue generated from the highest tier in the inclining block system goes into a fund that supports the program.

For more information, see [www.saws.org/service/rates/](http://www.saws.org/service/rates/)

### *What about the Impacts on the Water Service Provider's Business Systems?*

Changes to price structures will almost certainly have some impacts on existing business systems. This might include accounting, billing, asset management and demand forecasting systems, to name a few. Both business processes and computer-based information technology might be affected. As discussed further below, attention to billing systems is particularly important.

How significant the impacts will be varies depending on the organization's current situation. For example, a water service provider that is not universally metered and has flat rate pricing may face more challenges than one that already uses volumetric pricing.

Fortunately, most of the impacts on business systems are reasonably predictable and can be resolved with "off-the-shelf" technologies and practices. But again, careful planning is called for. We provide some further advice in the next section about how to smoothly make the transition.

### *Does Volumetric Pricing Lead to Privatization?*

No evidence exists to support the claim that moving to conservation-oriented pricing leads to privatization of water resources. Indeed, a more compelling argument is that moving to full cost pricing strengthens rather than weakens public systems. Critics of water infrastructure privatization can actually be valuable supporters of price reform, but support requires that:

1. water must continue to be considered a common good owned by the Crown on behalf of the people, not a private good that can be bought and sold for profit;
2. fees for providing water services must be collected by a not-for-profit, publicly-owned, democratically accountable agency;
3. fees collected should be put back into infrastructure, source water protection, demand management programs, etc. and not into corporate profits; and
4. pricing systems must ensure that no one is denied water because of inability to pay.<sup>xvii</sup>

Indeed, places that have moved to conservation-oriented pricing often have strong support from citizens groups and social advocates. To build this kind of support, careful consultation and communication with key stakeholder groups

at the outset is strongly recommended to ensure that the objectives of pricing reform are fully understood by all.

### ***I'm Sold on the Idea of Conservation-Oriented Pricing, but How Do I Convince Others?***

Many politicians and senior managers worry, with very good reason, that they will be criticized by the community for trying to change water prices because there may be winners and losers.

When water rates go up, some residents will be angered and understandably feel frustrated. Some will view it as nothing more than a “tax grab.” Others may feel that their past efforts to save water are being “punished” by the price increase. They might argue that water use efficiency results in lower revenue for the water service provider, which will then simply raise rates to make up the shortfall.

The problem is exacerbated by the fact that Canadians have enjoyed artificially under-priced water for decades—a kind of ecological and infrastructure subsidy resulting from historic policies governing the pricing of municipal services. As a result, unintentionally wasteful practices based on the use of widely available water consuming devices and appliances and socio-cultural practices (like lush green lawns) are quite firmly established in many households and have become the norm.

Treatment costs, pumping costs, labour costs, construction costs, etc., will almost certainly continue to go up over time. Inevitably, water bills will also have to rise, whether calculated on a flat or volume-based rate. With conservation-oriented pricing, the benefit to the consumer is that they get to exercise some control over the amount of the increase by modifying their consumption habits.

Tackling this problem takes courage, leadership, a long-term view and support from others. There is no substitute for building support through an effective consultation and public education campaign. No reforms, no matter how beneficial, will be well received unless they are clearly understood.

It may be helpful to continually remind residents about the environmental benefits of reducing water use so that they do not feel they are being asked to conserve for the sake of conservation itself. You might remind them that

saving water will result in reduced greenhouse gas emissions because, for example, less water has to be pumped around systems and heated in homes. Environmental water quality may also improve because less sewage is produced, meaning that less treated water needs to be discharged. You can also take the opportunity to underscore the importance of healthy watersheds in terms of ecological goods and services that we all depend on. This can help the public understand the broader non-commodity values of water. Finally, by using less water, we will generally be more resilient to uncertainty and the impacts climate change will have on water supplies.

Another helpful approach is to highlight successes already happening around North America. The City of Guelph, Ontario, for example, has been able to justify significant pricing reform in recent years. When combined with their comprehensive approach to demand management planning and delivery, Guelph has become a Canadian leader in this field (see Case Study 4).



# Case Study 4:

## CITY OF GUELPH, ONTARIO

The City of Guelph has demonstrated that historical and political barriers to conservation-oriented pricing can be broken down. Guelph, one of Canada's fastest growing communities, relies solely on groundwater for its water. In working to sustain the community's finite supply, the City has set the ambitious goal of reducing overall water use by 20% by 2025 and has set a consumption target of using less residential water per capita than any comparable Canadian city.

In December 2008, Guelph City Council approved a 19% increase in water and wastewater user rates, following a number of other increases in recent years. The City's water rate has a two-part fee structure, including a relatively low fixed charge (at about \$ 13/month) as well as a variable charge. The variable portion includes both water and wastewater components and bills water users on a uniform basis for each cubic metre of water and wastewater used. The end result is that residents pay a combined cost of just over \$ 2 for every cubic metre—relatively high by Canadian standards.

This simple and consistent uniform rate structure allows the City to provide a straightforward and easily understood bill to the customer. In concert, the City also offers a comprehensive demand management program that includes product rebates, an outdoor water use program and other education resources.

In working to receive City Council's endorsement of this rate increase, Guelph staff noted that water and wastewater services and infrastructure needs are funded solely from the sale of water. As part of their rationale for a user increase, they also emphasized their need to comply with new regulatory requirements imposed by the provincial government.

Representatives from Guelph used a two-pronged message to achieve the desired outcome. First, they noted that, from a financial point of view, the rate increase would allow the City to replace necessary infrastructure as well as meet the needs of a growing community. Secondly, they treated improving efficiency as an equally viable approach to meeting community water needs as any other source of water supply and wastewater treatment. This bolstered the argument that conservation is the right thing to do from both economic and environment perspectives.

For more information, see:

- [www.guelph.ca/water](http://www.guelph.ca/water)
- [www.guelph.ca/waterconservation](http://www.guelph.ca/waterconservation)

## SECTION V:

### FROM CONCEPT TO ACTION - A STEP-BY-STEP PLAN TO REFORM YOUR PRICING REGIME

*How quickly a conservation-oriented pricing system can be set up depends on a number of factors, including the political climate, the status of current water use efficiency programs, the state of water resources and watershed health, and the current approach to financial accounting and other business systems. The following is an overview of the steps to consider when transitioning to conservation-oriented pricing.*

#### 1. HAVE A PLAN...

Restructuring water services pricing models is time consuming, complex and absolutely political. Good preparation and commitment are critical. Key aspects that should be addressed include:

- develop a solid consultation and communications plan. Get community input early and often through forums such as stakeholder advisory committees;

#### A 10-STEP PLAN FOR SUCCESS:

1. Have a plan.
2. Get buy in and authority from senior management and elected officials.
3. Get metered and start charging by volume.
4. Get the water bill right.
5. Improve accounting of water use in the community.
6. Account for expenditure and understand costs.
7. Consider starting with a seasonal surcharge.
8. Make it a part of a complete program.
9. Recruit the aid of senior government.
10. Take the long-term view.

- systematically assess different rate structures and rank them objectively to determine the one that will be most appropriate for your location. This is one area where you may want some expert outside assistance; and
- build institutional capacity for the future: undertake cost analysis, including consideration of future capital costs; improve asset management systems; prepare customer service staff.

## 2. GET BUY IN AND AUTHORITY FROM SENIOR MANAGEMENT AND ELECTED OFFICIALS...

Securing senior management and political input and support early in the process is critical to success because it involves senior people who will champion the cause and allocate authority and resources to effect the change. Pricing reform will necessarily involve political and administrative decisions in other parts of the municipal organization. Unless there is broad commitment at all levels of the organization, progress will be slow.

## 3. GET METERED AND START CHARGING BY VOLUME...

As an obvious first step, water service providers that do not have universal metering will want to look at the benefits and costs of putting this in place, even if the organization has done so already at some point in the past. Simply put, metering is a critical starting point for understanding and managing water demand and for pricing water services appropriately—and senior governments are increasingly willing to support such infrastructure programs.

As mentioned, about a third of Canadian municipalities are not metered. So if you are in this situation, you are not alone. Moving to universal metering (and ultimately sub-metering of multi-residential buildings), then volumetric pricing, then to a truly conservation-oriented rate structure will take time—likely a number of years—and perseverance. On the plus side, you will be able to learn from the experiences of many other communities that are already moving down this path.

## 4. GET THE WATER BILL RIGHT...

For customers to respond to price changes, they need clear information about the link between their consumption and what it costs. This allows them to make decisions about behaviour changes or technology upgrades. The water bill is one of the most effective tools available to communicate this information.

Ideally, the bill that the customer receives will compare their home's consumption over time and to others in their neighbourhood and across the municipality. The more easily the information is understood, the better. Bar graphs and other illustrations often work well.

Moving to conservation-oriented pricing can sometimes prove challenging when dealing with older “legacy” billing systems. If there are no upgrades planned, and current billing systems do not have the functionality you want, you may need to be creative and use other approaches—for example, using generic bill inserts to communicate about price changes and how customers can control their costs.

## 5. IMPROVE ACCOUNTING OF WATER USE IN THE COMMUNITY...

Collectively, Canadians have some way to go in terms of truly understanding the factors that influence water demand in communities—climate, demographics, industrial and commercial demand, unaccounted for water (including system leakage), consumer end use, changing technology and so on. Prior to introducing pricing reform, municipalities should use the best information they have to account for current water use and to forecast future consumption. This will include looking at different situations with different conservation and demand management scenarios. This information, combined with improved accounting practices, will provide a solid foundation for establishing new rates.

## 6. ACCOUNT FOR EXPENDITURE AND UNDERSTAND COSTS...

Shifting to full cost accounting is another prerequisite of effective conservation-oriented pricing. With this type of accounting method, the water service provider can accurately report all of its costs of operating.

From there, you have a basis for understanding the cost of supplying water, which in turn gives you a sound basis for rationalizing the costs passed on to customers. Without this, it can be very difficult to justify the per unit rate increases involved in pricing reform.

## 7. CONSIDER STARTING WITH A SEASONAL SURCHARGE...

Moving to a full-fledged conservation-oriented pricing system that is effectively linked to the long-term marginal cost of water will probably not happen overnight in most places. However, one reasonably simple first step is to introduce *seasonal surcharges*—charging more for the volumetric component of the water bill during the summer when more water use is discretionary.<sup>15</sup> If combined with effective communication, this can be one way to employ price at a time when consumers have the most capacity to modify their water use.

If the water service provider already has a volumetric pricing system in place, introducing a seasonal surcharge can be relatively simple since it will not require major changes to administrative and billing systems. A prime example of this is the District of Tofino (Case Study 5), which has made good use of seasonal surcharges to bring down high summer water consumption in order to address significant supply constraints.

## 8. MAKE IT A PART OF A COMPLETE PROGRAM...

Conservation-oriented pricing reform will be more successful if it is part of a concerted, multi-faceted, conservation and demand management effort. A good place to start is by building on existing local water use efficiency initiatives. These may include rebates and retrofit programs, community-based social marketing efforts, rainwater harvesting, water reuse, water conserving urban designs, and outdoor watering restrictions, all of which can reinforce the impact of the price change.

## 9. RECRUIT THE AID OF SENIOR GOVERNMENT...

Federal and provincial governments can play an important role in the transition towards conservation-oriented pricing. They provide guidelines, best practices manuals and advice on matters such as asset management, full cost accounting and pricing systems. They can also set consistent pricing and metering policies (including incentives for universal metering), and create a conducive and supportive regulatory environment. Alberta and Ontario have already begun to do this by encouraging full cost accounting. Finally, senior governments can support broader efforts to reduce water demand by

---

15. More accurately, the objective might be to link the off peak season price of water to the short-term marginal cost of supply and the peak season price to the long-term marginal cost. The fixed component of the bill may also have to be adjusted by an amount necessary to avoid budget deficits or excessive surplus (Renzetti (2009), p. 14).

# Case Study 5:

## VANCOUVER ISLAND COMMUNITIES

**B**ritish Columbia lags behind the national average for metering and volumetric pricing. But things are changing.

The *District of Tofino*, on the west coast of Vancouver Island, has a winter population of less than 2000 and a peak summer population upwards of 20,000. Tofino received notoriety not only for being a premier vacation destination but also for its dramatic water shortage crisis in late summer 2006. Over the past several years, the village's water provider introduced a series of price reforms aimed at achieving demand management goals and addressing its municipal infrastructure deficit. The rate structure starts with a small fixed meter reading levy, five different consumption tiers on an inclining block scale, and different rates applied to residential and business categories. It has a number of appealing features from a conservation perspective. First, it includes a seasonal surcharge, which effectively doubles rates in the summer months when consumption is high (due to tourists and outdoor use) and water availability is very low. Second, in 2009, the District tacked an additional \$ 1.50 levy onto every cubic metre at every level of consumption. Finally, the highest tiers in their inclining block system are charged at a very high rate by national standards. At the time of writing, consumption at the top tier was effectively charged \$ 3 per cubic metre in the winter and \$ 4.60 per cubic metre in the summer when the new levy is included, placing it among the highest in the country. Even consumption at the lowest tier is charged a substantial \$ 3.30 per cubic metre in the summer with inclusion of the levy. Although seen as controversial, Tofino's leaders agreed that the changes were required in order to cover the cost of needed capital improvements (i.e., their infrastructure deficit) and to encourage necessary water conservation.

The *Regional District of Nanaimo*, on the east coast of Vancouver Island, operates seven small water utilities, referred to as Water Local Service Areas. All seven are fully metered, and customers are billed on an inclining block system with six different consumption tiers designed to encourage efficiency. A customer would have to use a hefty volume of water to make it into the top tier (over 3.5 cubic metre/day). However, those who do, pay a premium at \$ 3/cubic metre.

The *Capital Regional District*, at the southern tip of Vancouver Island, is the bulk water supplier to municipalities in and around Victoria, and has been a leader in the field of full cost accounting for some time. Since at least 1995, the Capital Regional District has used full cost accounting to allocate the capital component of costs over the life of the assets. Its representatives have successfully argued that full cost accounting ensures sustainability of the water system, facilitates rate stability, leads to efficient resource allocation, creates the right fiscal environment for encouraging conservation and discourages overbuilding of infrastructure. In summary, they have demonstrated that it represents sound business practice.

reforming water allocation systems, modifying building codes to mandate the use of fixtures such as high efficiency toilets, or requiring commitments to conservation as a condition of infrastructure funding.

## 10. TAKE THE LONG-TERM VIEW...

Canadian water providers, policy makers and researchers still have much to learn about water use in our communities and about how people will respond to different pricing approaches. As our knowledge and understanding grows and communities become more familiar with conservation-oriented pricing, the sophistication of rate structures can increase. Demand for innovative and effective approaches to water use efficiency and conservation will also grow as communities adapt to the realities of climate change and its impact on our water supplies.

In the future, price, rather than outdoor watering restrictions, may well become the main tool to ration water during drought (known as *scarcity pricing*). Utilities might begin to use *distance pricing*, where users pay for the actual cost of supplying water to their individual connection. *Non-linear price schedules* and other more esoteric economic tools, where the mapping from quantity purchased to total price is not a strictly linear function, may become the norm.<sup>16</sup> Non-linear pricing is already commonly used in the mobile phone industry and even in the energy sector. Over time, this may become more common with water, particularly as “smart meter” technology proliferates.

Much of this is probably in the distant future for most Canadians. However it illustrates the idea that conservation-oriented pricing will be an evolving tool that can continue to help us manage water demand in our communities for many years to come.

## WHERE TO GO FROM HERE?

Regardless of where water service providers are today, developing an effective conservation-oriented pricing structure will take time, courage and resources. Numerous political and historical barriers stand in the way—with many of these outside the sphere of influence of municipal water managers. Moving forward requires careful planning, communication and consensus building within the organization and the broader community.

One powerful motivator may help build consensus and perseverance—conservation-oriented pricing makes sound sense from both economic and environmental points of view. The objective is simply to cover the costs of supplying water and maintain the assets required to do so over the long term. It is also perhaps the most powerful instrument available to impact short-term water demand and thereby improve environmental performance. Wasting water and not being able to fund the operation of water systems are in nobody's best interest. It is not really a question of *if*, but *when*: when will Canadian communities begin to move to a 21<sup>st</sup> century approach to water infrastructure planning and pricing?

---

16. For a brief discussion of non-linear pricing, see Renzetti (2009), p. 281.

## APPENDIX A: ADDITIONAL RESOURCES

### Detailed Water Pricing Guidance

American Water Works Association. (1996). *Managing the Revenue and Cash Flow Effects of Conservation*. Denver, CO.

American Water Works Association. (2000). *Principles of Water Rates, Fees and Charges: Manual of Water Supply Practices M1, 5th ed.* Denver, CO.

Australian Government. (2008). *Approaches to Urban Water Pricing*. Prepared by Frontier Economics for the National Water Commission. Waterlines Occasional Paper, No. 7, July 2008.

Canadian Water and Wastewater Association. (1992). *Municipal Water and Wastewater Rate Manual: A New Approach to Rate Setting*. Ottawa, ON.: Canadian Water and Wastewater Association in co-operation with Environment Canada and the Rawson Academy of Aquatic Science. Available at: [www.cwwa.ca/publicationorder\\_e.asp](http://www.cwwa.ca/publicationorder_e.asp).

Wang, Y.-D., W.J. Smith, Jr. and J. Byrn. (2005.) *Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity and Meet Minimum Flow Levels*. Denver, CO: American Water Works Association.

### Full Cost Accounting

Canadian Institute of Chartered Accountants. (1997). *Full Cost Accounting from an Environmental Perspective Research Report*. Toronto, ON. Available at: [www.cica.ca/research-and-guidance/research-activities/other-publications/item13274.aspx](http://www.cica.ca/research-and-guidance/research-activities/other-publications/item13274.aspx).

Federation of Canadian Municipalities and the National Research Council. (2006). *Water and Sewer Rates: Full Cost Recovery. In InfraGuide: National Guide to Sustainable Municipal Infrastructure*. March 2006. Available at: [www.infraguide.ca/lib/db2file.asp?fileid=4903](http://www.infraguide.ca/lib/db2file.asp?fileid=4903).

Government of Alberta. (2008). *A Guide to Alberta Environment's Full Cost Accounting Program*. March 2008. Available at: [www.environment.alberta.ca/2275.html](http://www.environment.alberta.ca/2275.html).

San Antonio Water System. (2004). *Comprehensive Cost of Service and Rate Design Study*. Prepared by Raftelis Financial Consulting. November 2009. Available at: [http://www.saws.org/who\\_we\\_are/community/RAC/Docs/2003\\_2004\\_RateStudyReport\\_FINAL.pdf](http://www.saws.org/who_we_are/community/RAC/Docs/2003_2004_RateStudyReport_FINAL.pdf).

U.S. Environmental Protection Agency. (2009). *Full Cost Accounting, Online Resources*. Available at: [www.epa.gov/waste/conserve/tools/fca/index.htm](http://www.epa.gov/waste/conserve/tools/fca/index.htm).

### Price Elasticity Estimates

Dalhuisen, J.M., R.J.G.M. Florax, H.L.F. de Groot and P. Nijkamp. (2003). *Price and Income Elasticities of Residential Water Demand: A Meta-analysis*. *Land Economics*, 79 (2), pp. 292-308.

Espey, M., J. Espey and W.D. Shaw. (1997). *Price Elasticity of Residential Demand for Water: A Meta-analysis*, *Water Resource Research*, 33(6), pp. 1369-1374.

### Municipal Water Infrastructure and Policy Reform

Renzetti, S. (2009). *Wave of the Future: The Case for Smarter Water Policy*. C.D. Howe Institute. Commentary No. 281, February 2009. Available at: [www.cdhowe.org/pdf/commentary\\_281.pdf](http://www.cdhowe.org/pdf/commentary_281.pdf).

Water Strategy Expert Panel. (2005). *Watertight: The Case for Change in Ontario's Water and Wastewater Sector*. Report prepared for the Ontario Ministry of Public Infrastructure Renewal, Toronto, ON. Available at: [www.waterpanel.ontario.ca](http://www.waterpanel.ontario.ca).

### Resources for Comprehensive Programs

*Thinking Beyond Pipes and Pumps* (2006) Victoria, BC: University of Victoria, POLIS Project on Ecological Governance. <http://poliswaterproject.org/publication/22>.

*M52 Water Conservation Programs—A Planning Manual*. (2006). Denver, Colorado, American Water and Wastewater Association. <http://www.normas.com/AWWA/pages/30052.html>.

*Resources from Waste: A Guide to Integrated Resource Recovery* (2009) Victoria, BC: Ministry of Community and Rural Development [http://www.cd.gov.bc.ca/lgd/infra/resources\\_from\\_waste.html](http://www.cd.gov.bc.ca/lgd/infra/resources_from_waste.html).

*Good Governance for Water Conservation: A Primer*. (2008). Vancouver, BC: UBC Program on Water Governance <http://www.wateregovernance.ca/publications/Primer.pdf>.

*POLIS Water Sustainability Toolkit* <http://poliswaterproject.org/toolkit>.

*Alliance for Water Efficiency Resource Library* [http://www.allianceforwaterefficiency.org/Water\\_Resources\\_Content\\_Listing.aspx](http://www.allianceforwaterefficiency.org/Water_Resources_Content_Listing.aspx).

## ENDNOTES

i. Brandes, O., T. Maas and E. Reynolds. 2006. *Thinking Beyond Pipes and Pumps*. Victoria, BC: University of Victoria, POLIS Project on Ecological Governance. pg 8.

ii. Environment Canada. (2009). *Municipal Water and Wastewater Survey: Municipal Water Use 2006 Summary Tables*. Ottawa, ON.

iii. Environment Canada. (2009). *Municipal Water and Wastewater Survey: Municipal Water Use 2006 Summary Tables*. Ottawa, ON.

iv. Organisation for Economic Co-operation and Development (OECD). (2003). *Improving Water Management: Recent OECD Experience*. OECD Observer Policy Brief, March 2003.

v. Environment Canada. (2008). *Municipal Water Pricing Report* (2004 Statistics). Available at: [www.ec.gc.ca/eau-water/default.asp?lang=En&n=AE97B7F3-1](http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=AE97B7F3-1)

vi. Environment Canada. (2008). *Municipal Water Pricing Report* (2004 Statistics). Available at: [www.ec.gc.ca/eau-water/default.asp?lang=En&n=AE97B7F3-1](http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=AE97B7F3-1)

vii. Organisation for Economic Co-operation and Development (OECD). (2010). *Pricing Water Resources and Water and Sanitation Services*. OECD Environment Directorate, ENV/EPOC/GSP(2009)17/FINAL, 18 January 2010.

viii. Environment Canada. (2008). *2004 Municipal Water and Wastewater Survey Pricing Summary Database – Summary Tables*. Ottawa, ON. Statistics Canada. (2006). *Spending Patterns in Canada 2005*. Catalogue no. 62-202-XIE. Available at: <http://dsp-psd.pwgsc.gc.ca/Collection-R/Statcan/62-202-XIE/62-202-XIE2004000.pdf>

ix. Sprague, J.(2007). *Great Wet North? Canada's Myth of Water Abundance*. In *Eau Canada: The Future of Canada's Water* (K. Bakker, Ed.). UBC Press, Vancouver, BC

x. Renzetti, S. (2009). *Wave of the Future: The Case for Smarter Water Policy*. C.D. Howe Institute. Commentary No. 281, February 2009. Available at: [www.cdhowe.org/pdf/commentary\\_281.pdf](http://www.cdhowe.org/pdf/commentary_281.pdf)

xi. Renzetti, S. (2009). *Wave of the Future: The Case for Smarter Water Policy*. C.D. Howe Institute. Commentary No. 281, February 2009. Available at: [www.cdhowe.org/pdf/commentary\\_281.pdf](http://www.cdhowe.org/pdf/commentary_281.pdf)

xii. Howe, C. (2005). *The Functions, Impacts and Effectiveness of Water Pricing: Evidence from the United States and Canada*. *International Journal of Water Resources Development*, 21(1), pp. 43-53, March 2005.

xiii. Water Strategy Expert Panel. (2005). *Watertight: The Case for Change in Ontario's Water and Wastewater Sector*. Report prepared for the Ontario Ministry of Public Infrastructure Renewal. Toronto, ON. Available at: <http://www.waterpanel.ontario.ca/>

xiv. Renzetti, S. (1999). *Municipal Water Supply and Sewage Treatment: Costs, Prices and Distortions*. *Canadian Journal of Economics*, 32(2), pp. 688-704.

xv. See for example, Pollution Probe (2004). *Making Everyone a Winner: Making Energy Conservation Profitable for Ontario's Electric Utilities*. Available at: [www.pollutionprobe.org/Publications/Energy.htm](http://www.pollutionprobe.org/Publications/Energy.htm)

xvi. Organisation for Economic Co-operation and Development (OECD). (2010). *Price Water Resources and Water and Sanitation Services*. OECD Environment Directorate, ENV/EPOC/GSP(2009)17. FINAL, 18 January 2010.

xvii. Barlow, M. (2008). *The Council Replies: Letters to the Editor*. Maude Barlow's Response to John Langford. The Council of Canadians. Available at: <http://www.canadians.org/media/council/2008/15-Aug-08.html>



POLIS Project  
on  
Ecological Governance  
University of Victoria

## THE POLIS PROJECT

Created in 2000, the POLIS Project on Ecological Governance is a research-based organization housed at the University of Victoria in British Columbia. Researchers who are also community activists work together at POLIS to dismantle the notion of the environment as merely another sector, and to make ecological thinking and practice a core value in all aspects of society. Among the many research centres investigating and promoting sustainability worldwide, POLIS represents a unique blend of multidisciplinary academic research and community action.

Visit [www.polisproject.org](http://www.polisproject.org) to learn more.

POLIS Project on Ecological Governance

## watersustainabilityproject

The Water Sustainability Project (WSP) is an action-based research group that recognizes that water scarcity is a social dilemma that cannot be addressed by technical solutions alone. The project focuses on three themes crucial to a sustainable water future:

- Water Conservation and the Soft Path
- Water-Energy Nexus
- Water Law, Policy and Governance

WSP works with industry, government, civil society and individuals to develop and embed water conservation strategies to benefit the economy, communities and the environment. WSP is an initiative of the POLIS Project on Ecological Governance at the University of Victoria.

Visit [www.poliswaterproject.org](http://www.poliswaterproject.org) to learn more.

The POLIS Project  
PO Box 3060  
University of Victoria  
Victoria, BC V8W 3R4  
Email: [water@polisproject.org](mailto:water@polisproject.org)  
Telephone: 250 472-4487