



The Economic Water Cycle

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Introduction

While preparing for this talk, I came across a brief news report that I clipped a few years ago: “Two Mexican peasant farmers, cousins aged 70 and 85, faced off in an old-fashioned pistol duel that killed them both after arguing for years over water rights.... Manuel Orozco and Candelario Orozco ... shot each other dead in a field on Monday night in the western state of Jalisco. Their bodies were found 3½ metres apart, each with a fatal bullet wound. Two pistols lay nearby.”

Duels may be newsworthy, but water fights are all too common. As Mark Twain said, “Whisky is for drinking, and water is for fighting over.” But you know, there’s a better way to resolve disputes about water. It’s an approach that relies on markets, and pricing, and property rights.

Many environmentalists are wary of markets. They associate them with an absence of regulation – a laissez faire environment with few constraints on industrial activity or resource use. That, I believe, reflects a serious misunderstanding of markets.

Markets are places in which prices – determined by supply and demand – play a central role in guiding behaviour. Prices communicate information about scarcity. At their best, they make users pay the full costs of their resource use. And so they provide incentives to conserve scarce resources. Sound markets rest on secure, well-defined, tradeable property rights that are protected by the rule of law. Like prices, property rights internalize the costs and risks of resource use and the benefits of conservation. Tradeable rights enable resources to be allocated efficiently, to their highest valued uses. As important, property rights create accountability through liability.

The beauty of this combination of prices, property rights, and markets is that it leads to decisions that are economically, socially, and environmentally sound. We don’t need to choose between one or the other – the choices that make the best economic sense are generally those with environmental benefits, as well. And because the system rests on voluntary exchange rather than coercion, it produces diverse solutions that respect individuals’ differing needs.

I plan to spend the next 40 minutes exploring how such an approach might work here in Alberta. I’ll focus on three areas. First, I’ll address the use of property rights to protect water quality. Second, I’ll talk about the use of pricing and trading to address water quantity issues – in other words, to manage demand and to allocate water. And then I’ll turn to the use of competitive markets to provide water treatment and delivery services.



The use of property rights to protect water quality

Let's start with water quality. Water for Life, Alberta's water strategy, lays out three goals, each of which concerns water quality. It aims for a safe, secure drinking water supply; healthy aquatic ecosystems; and reliable, quality water supplies for a sustainable economy. In other words, you need clean water for people, for the environment, and for business.

But you're currently facing some challenges on the water quality front. This summer, Alberta Environment released the River Water Quality Index for 2005-2006. It indicated that water quality was significantly lower than it had been in previous years. Four of the province's six major river systems – the Bow, the Oldman, the Red Deer, and the North Saskatchewan – rated just "fair." The lower quality was attributed to several major rainstorms, which led to flooding, runoff, and greater volumes of untreated stormwater.

Alberta Environment also reported on specific contaminants at 24 sampling locations. Levels of bacteria were just fair at four sites, marginal at six sites, and poor at two sites. One of the fair sites was the North Saskatchewan River at Devon. One of the marginal sites was the North Saskatchewan River downstream from Edmonton at Pakan.

The levels of nutrients were also disturbing – fair at 15 sites and marginal at two sites. Nutrients, such as phosphorus and nitrogen, are fertilizers, which are great on land but not so great in water. They stimulate plant growth and algae blooms. As these decompose, bacteria use up the dissolved oxygen in the water, causing fish kills and odour problems.

So who is polluting Alberta's rivers? Sewage systems are the largest point source of bacteria and nutrients in several rivers, including the Bow and Oldman. In the last few decades, tremendous progress has been made in this area. About three-quarters of the population, including the residents of both Calgary and Edmonton, are now served by tertiary treatment, which is considered full treatment. But that still leaves a quarter of the population without full treatment. And even a community providing full treatment may have problems with combined sewer systems that overflow during heavy rains.

Agriculture is the other major source of bacteria and nutrients. It also contaminates rivers with pesticides, sediments, and salts. The pollution flows into rivers from runoff, from irrigation return flow channels, and from effluent from subsurface drains. A lot of farming occurs in the Oldman River basin. Not surprisingly, contamination is widespread there. In 2000, Alberta Agriculture found fecal coliform bacteria in *all* of the samples taken from the Oldman River and its tributaries. 23 percent of the samples from the river were so badly contaminated that they exceeded provincial guidelines for irrigation water. And 83 percent of the samples taken from its tributaries had levels of fecal coliforms that exceeded those guidelines. Likewise, Alberta Agriculture found that 30 percent of the samples taken from the Oldman River and 60 percent of the samples taken from its tributaries had levels of phosphorus that exceeded provincial guidelines for the protection of aquatic life.

Alberta Environment seems oddly untroubled by the province's water quality problems. When asked about the river quality index, its spokesperson said, "There really is no cause of concern on *our* end."

I'll tell you where you'll find concern. At the *other* end. You'll find it among the people who can't swim in the polluted waters, or fish from them, or let their animals drink from them, or irrigate their crops with them. You'll find concern among the people who hate the sight of scum or the smell of decomposing algae. More than anywhere else, you'll find concern among the people who live beside the polluted lakes and rivers – the so-called "riparians."

Under the common law, riparians have powerful property rights that enable them to protect their interests in clean water. The common law gives people a right to both use and enjoy their property. But there's an important limit to this right. In using their property, people have a responsibility not to interfere with their *neighbours'* rights to use and enjoy *their* property. The rule under the common law is: "Use your own property so as not to harm another's."



One of my favourite statements of this rule appeared in a case about Edmonton's sewage, of all things. The case was called *Groat v. Edmonton*. Back in the 1920s, the Groats owned a piece of land between 102nd Avenue and the river. Groat's Ravine ran beside and through their property. In those days, water flowed through that ravine – I gather that the creek has since been culverted and buried. But it flowed freely in those days. At one time, the water in the ravine had been pure enough to drink. But the city of Edmonton had allowed one branch of the ravine to be used as a garbage dump, which fouled the water flowing through it. Sewage from a pumping station on another branch of the ravine also contaminated the water. And below the pumping station, a six-foot wide storm sewer emptied into the ravine. It carried not just rain water but also horse droppings and other filth from the city streets.

The Groats went to court, claiming that the pollution violated their property rights. They asked for an injunction and damages. The case went all the way to the Supreme Court of Canada, which issued a decision in 1928. It's a terrific decision – one I've always loved. The justices quoted liberally from previous judgements, giving a sense of the history and the scope of the common law. The decision is also a great illustration of the role that property rights can play in environmental protection.

In the decision, one of the justices cited this statement from an earlier English case: Prima facie no man has a right to use his own land in such a way as to be a nuisance to his neighbour, and whether the nuisance is effected by sending filth on to his neighbour's land, or by putting poisonous matter on his own land and allowing it to escape on his neighbour's land, or whether the nuisance is effected by poisoning the air which his neighbour breathes, or the water which he drinks, appears to me wholly immaterial. If a man chooses to put filth on his own land he must take care not to let it escape on to his neighbour's land.

That's a broad prohibition against pollution of any kind. And just in case there's any doubt of that, here's what another justice had to say in the same case: "Pollution is always unlawful and, in itself, constitutes a nuisance." That's strong stuff – and it's from the Supreme Court of Canada.

The justices also looked at water pollution in particular. Under the common law, riparians have the right to clean water. As one justice said, again quoting from an earlier English case, "Every riparian proprietor is ... entitled to the water of his stream ... without ... sensible alteration in its character or quality." Those living upstream must respect this right. That applies to those operating sewage works as much as it applies to anyone else. Yes, the court acknowledged, sewers are necessary. But, as one justice explained, "unless Parliament otherwise decrees, 'public works must be so executed as not to interfere with private rights of individuals'.

But there's the rub. "Unless Parliament otherwise decrees." The legislature is supreme. The laws and regulations that it makes take precedence over the common law. If the government determines that a particular activity is lawful, then that activity – and all of its inevitable effects – are protected from common-law liability.

Riparian rights to clean water still exist in Alberta. In fact, the *Water Act* specifies that it does not remove these rights. But common-law rights can only be used to constrain activities that governments haven't authorized. How many of those can you think of? What sewage effluent or pulp mill discharge is not now governed by a law or a regulation? They call them EAB approvals, or discharge limits, or release standards. I call them pollution permits.

The next time you hear someone say that property rights threaten the environment, let them know that they've got the story backwards. Government-made laws prevent people from exercising their common-law property rights to clean water. The best solution to water pollution isn't stronger laws – it's the removal of laws that undermine property rights.

I could talk about property rights all night long – it's a real passion. But I promised a lecture on the entire economic water cycle. I've been discussing water *in* the stream. Let me move on to water being taken *out* of the stream.

The use of pricing to manage demand for water



Back in 2002, the provincial environment minister warned that the province was “running out of water.” That was doubtless an exaggeration. But it’s true that fresh water is increasingly scarce in Alberta. During the summer, river flows are now 35 to 84 percent lower than they were a century ago. Meanwhile, the demand for water keeps rising. The population is growing, and so are industrial practices that use a lot of water.

As a result, a number of rivers are fully allocated. Fourteen months ago, the province announced that it would no longer accept new water licence applications for the Bow, Oldman, and South Saskatchewan sub-basins. Even without new licences, some of these rivers are already over-allocated. That means that the holders of more recent licences may not get their allocations in drier years. A number of towns are suffering from water shortages. Some are rationing water. Some are looking for new supplies.

New supplies – pipelines, dams, even desalination – may be technically feasible, but they tend to be very expensive, both economically and environmentally. It makes far more sense on both counts to reduce demand, and to shift current allocations to those who most value the water. You need two tools to accomplish this: pricing and tradable water rights.

Water prices are absurdly low – they’re some of the lowest in the developed world. Users pay only a fraction of the costs of water treatment, storage, and delivery. Some users pay modest administrative fees for licences. But none pay a penny for the water itself. This raises an issue of common sense and fairness. Those who use a resource, or benefit from a service, should pay for it. But there’s also an ecological value. Those who pay for a resource will conserve it. You wring your hands about water scarcity, but you give the stuff away for free! As Environment Canada said, “The fact that water is cheaper than dirt is thought to explain why Canadian industries are relatively primitive in their water-using practices.”

In a market, pricing balances supply and demand. When a good is scarce, its price goes up, and consumers demand less of it. Provincial water strategists understand why this pricing convention should apply to water. It’s clearly explained on the Water for Life web site: “Putting a dollar value on water emphasizes its value and creates an incentive to conserve.”

This really has become conventional wisdom. It seems that everywhere you turn these days, another economist or bureaucrat is advocating higher water prices. A few years ago, the Australian states agreed to implement prices that reflect the principles of user pays and full cost recovery. This summer, the European Commission announced that “the user pays principle needs to become the rule.”

And yet, here in Alberta, where the need for better pricing is so pressing, the government continues to dole out subsidies. Last year, it agreed to pay up to 90 percent of the capital costs of regional water and sewage systems. This year’s budget includes \$679 million over three years to fund these projects, along with irrigation rehabilitation, dams, canals, and erosion-control infrastructure.

The government is under a lot of pressure to subsidize water use. The pricing proposals in Water for Life prompted a flood of objections. Agriculture – which is the province’s largest user of surface water – has been quite critical. In a survey of irrigation districts, just 13 percent of the respondents supported a price based on the volume of water used.

What dismays me isn’t the opposition from resource users – it’s the opposition from some environmentalists. Many environmentalists – especially those of the Maude Barlow school – don’t want water to be treated as a commodity. Water, they say, is essential for life. It would be unethical to taint it with pricing or other market mechanisms. You know, I really don’t understand this concern. We commodify all sorts of essential products. Food is essential. No one objects to food being sold and bought in the marketplace. Why should water be any different?

I do understand some activists’ concerns that pricing might put water out of reach of the needy. Of course, this mustn’t happen. But the solution to this potential problem is to subsidize the poor’s *incomes*, rather than to subsidize their water use. Everyone, rich and poor alike, needs incentives to conserve water. Everyone needs prices.



What goes into the prices for water and water services will inevitably be subject to fierce debate. It is critical to remove this debate from the political realm. The best solution is to give the job of pricing to an independent economic regulator. This agency – perhaps the Natural Resources Conservation Board, or the Energy and Utilities Board, or another established for the purpose – should oversee the pricing of municipal, industrial, agricultural, and any other uses of water. Getting the price right will be a complex technical task and must not be left to politicians.

The price should cover the full costs of the infrastructure required to treat, store, and distribute the water. That means, for example, that the price should vary depending on the users' distance from the source of supply. The price should include a charge for the water itself – one that reflects the value of the resource, and its scarcity. That portion of the price should vary depending on the availability of water in a particular watershed. It should also vary with the season, and even in some cases with the time of day. The price should also reflect how much of the water is “consumed” (say, through evaporation) and how much is returned to the source. Using water temporarily should cost less than permanently removing it from the source.

Such pricing would send important signals to consumers about the value and availability of water. It would enable them make informed decisions. It would give them incentives to consider alternative technologies and practices. And so it would limit demand for water. But there remains the question of how limited supplies are allocated. That's where tradeable water rights come in.

The use of trading to allocate water

Alberta's water users have been acquiring water rights since the late nineteenth century. They've always had incentives to use their full allocations. Alberta has a “use it or lose it” system. Only if licence holders use their allocations do they get to hold on to their licences. The rights are also subject to the doctrine of prior appropriation – or “first in time, first in right.” Under this system, older water rights have priority over newer rights. In times of shortage, senior licensees get to use their full allocation before junior licensees use any water at all. In the absence of tradeable rights, such a system locks in water uses that made sense 50 or 100 years ago, and precludes newer uses that might be of far greater value today.

The *Water Act*, which came into force in 1999, laid the foundations for water transfers. Transfers may be for all or part of an allocation, and they may be temporary or permanent. But the *Water Act* imposes a number of restrictions. Transfers may occur only if authorized by an area's water management plan or by an order of Cabinet. Each proposed transfer requires an application to Alberta Environment and a public review. Alberta Environment will, quite rightly, consider the effects of the transfer on other water users and on the aquatic environment. But it may also consider any other matter that it deems relevant. For example, it may consider the suitability of the land to which irrigation water might be transferred. That seems like central planning overkill. A bigger barrier to trades may be the agency's power to withhold up to 10 percent of the water allocation in a proposed transfer. It can do this to conserve water and protect the aquatic environment.

The rules governing irrigation districts impose still more barriers to the transfer of water. The districts – rather than individual farmers – hold the water licences. And they are not enthusiastic about markets. In a 2005 survey, just eight percent of the district managers and board members supported water rights transfers. Perhaps there's just not much in it for them. After all, they can't actually profit from them – they're non-profit authorities. Nor do the farmers themselves have clear incentives. Their costs don't reflect the amount of water they use. They can't make private arrangements to sell their allocation to someone outside the district. Decisions are made collectively. Each proposed transfer is subject to a plebiscite of the irrigators.

Perhaps because of these restrictions, or perhaps because the system is still new, just 26 transfers have occurred since 2003. In 14 of these cases, the same party was both the buyer and the seller of the allocations. Most of the transfers moved water from one irrigation use to another. A couple moved water from irrigation to stock watering. A couple more from irrigation to municipal use. One, to lawn and garden watering; another, to a golf course. In all, 11.4 million cubic metres of water



have been transferred.

These transfers are pretty modest compared to those in other jurisdictions that have implemented trading, such as Australia and the western United States. But things got a slow start in those places, too. Although Californians started talking about transfers in the late 1970s, they didn't really take off for a decade. And then they continued to grow. By 2002, the volume traded was eight to 10 times that traded in the mid-1980s.

All sorts of creative trading arrangements have emerged in the United States. In some cases, one party pays for another party's efficiency improvements, and then keeps the conserved water for itself. One municipal water supplier spent more than \$100 million lining irrigation canals and creating other efficiencies for an irrigation district. In return, it got the right to use the conserved water for 35 years. Several cities have purchased farmland in order to gain access to the farms' water. Water banks have been created where water rights holders can deposit excess water for withdrawal in dry years. Special publications have sprung up to track water markets.

Experience suggests that, here in Alberta, trades will increase as the market becomes more familiar, as information on potential buyers and sellers and prices becomes more readily available, and as other transactions costs decline. Trades are also likely to become more common as water becomes scarcer, as it becomes more expensive, and as current users' opportunity costs increase. Such conditions will create incentives for water rights holders to use their allocations more efficiently and to sell or lease their unused portion to others.

Another way to encourage trades would be to remove the government's 10 percent withholding option. So far, through holdbacks on six of the transfers, Alberta Environment has moved almost half a million cubic metres of water to instream uses – typically from irrigation. But there are far better ways to put water back into the stream. Rather than *taking* the water, the province should *buy* the water. Other parties should also be allowed to purchase water rights for instream flows. Right now, only the province itself can hold a licence for conservation objectives. Conservationists, recreational water users, fishermen – all have an interest in seeing more water left in certain streams. A thriving water market would make it easy for them to acquire rights.

In the western United States, water markets for instream flows have been tremendously successful. Oregon pioneered instream flow markets in the late 1980s, and other states soon followed. Between 1998 and 2005, almost six million acre-feet were acquired for instream flows. More than \$300 million went into leases and purchases. About half of this money came from the federal government. Private parties didn't spend nearly as much as governments, but in fact they made almost twice as many transactions. Interestingly, many of the projects have involved donations of water to charitable trusts, in exchange for tax receipts.

In the last half hour, I've been discussing the role that market mechanisms – in particular, property rights, pricing, and water transfers – can play in protecting water quality and quantity. I want to turn now to municipal water services – specifically, to the benefits of using competitive markets for their provision.

The use of public-private partnerships to provide water treatment and delivery services

Alberta's municipal water utilities need work. In 2003 and 2004, the province conducted an assessment of its 534 water treatment plants. It looked at water sources, treatment facilities and performance, and system monitoring and operations. It found widespread problems – especially in southern Alberta, where 70 percent of the systems got poor ratings. On a scale of one to five, with five being the worst, 70 percent got grades of four or five. Central Alberta fared better, but even so, 43 percent of its plants got poor ratings, as did 51 percent of those in the north. The assessment revealed inadequacies in the design and capacity of many facilities: 99 were not up to current design standards, 44 were too small, 69 couldn't meet turbidity standards, 105 couldn't meet disinfection criteria. The assessment also revealed serious shortcomings in the operation and management of many facilities. It found inadequately trained operators. It found a lack of understanding of basic disinfection concepts – especially among the operators of small systems. It found problems with cleanliness. It found deficiencies in the monitoring of water flows, and turbidity, and chlorine residuals.



And what did the province do when it received this assessment? It tried to cover it up. When the *Edmonton Journal* requested a copy, the government claimed that releasing it could be “harmful to individual or public safety” and “harmful to intergovernmental relations.” Only this summer, when facing an inquiry by the information commissioner, did it release the report.

This whole episode – not just the assessment but also its aftermath – points to three problems that commonly plague publicly financed and publicly operated water utilities: inadequate infrastructure, insufficient operating expertise, and a lack of accountability. Greater private-sector involvement, and a more competitive market for water services, can help address each of these problems.

Some of the infrastructure problems reflect chronic under-investment. This isn't exactly news. In 1998, the Canadian Water and Wastewater Association warned that Alberta would need to invest \$6.5 billion over 15 years in water and wastewater infrastructure. And that was before the current growth spurt, which is placing far greater demands on utilities. Neither municipal nor higher-level governments have ever given any indication that they are willing to invest that kind of money.

Happily, there's a lot of private capital available for investment. Some water companies have the capacity to invest enormous sums. In England and Wales, the water companies have invested more than £50 billion. Infrastructure funds also have the capacity for large investments. Last year, globally, about \$100 billion in new money was raised for such funds. Here in Canada, a couple of large pension funds are putting their money into water utilities. A year ago, CPP offered \$1 billion to buy one-third of a water utility in the UK. In August, the Ontario Teachers' Pension Plan announced its second investment in Chilean water utilities. Why not invite these funds to invest some of their capital in Alberta's infrastructure?

A number of features – besides its availability – make private capital attractive. Private capital tends to be used more efficiently than public capital, so municipalities will get more for less. Private capital allows municipalities to offload some financial risks. And private capital reduces the conflicts of interest that prevent governments from demanding improvements to inadequate infrastructure.

You'll recall that inadequate infrastructure was just one of the problems that emerged from the assessment of Alberta's water facilities. Other problems concerned operations and management. The assessment uncovered insufficient training and expertise, especially in small communities. This is another challenge that the market can help solve.

There are a number of established water companies out there that have far greater expertise than your average municipality. They have more experience meeting a wider range of challenges. They have greater capacity. It's no coincidence that both the Walkerton and Kashechewan fiascos were caused by public operators, or that the operations of both systems have recently been turned over to the private sector. These communities were desperate for the expertise that a professional water company could provide.

A municipality that uses a competitive bidding process to select an expert water provider gets other benefits as well. Competition for contracts creates incentives to design and operate systems efficiently. A bidder will be more attractive if it can bring its price below its competitors'. So it looks for smarter ways of doing things. It may find them in design changes, in technological innovations, in the elimination of waste and duplication, in staff reductions, or in economies of scale. These efficiencies often bring impressive savings – sometimes as much as 40 percent.

The contracting process can also create incentives for good performance. Municipalities can write incentives into the contracts. They can structure contracts to reward good performance and to penalize bad performance. Contracts can set tough operating standards. They can guarantee water quality, monitoring and reporting procedures, maintenance levels, and customer service levels. They can guarantee schedules and costs. And they can provide for steep fines – or even termination – if they aren't met. Enforceable contracts give municipalities meaningful control over their utilities. They enable municipalities to compel compliance. In short, they are invaluable accountability mechanisms.



Contracting out the operations of water utilities creates other levels of accountability as well. One of the most important of these is regulatory accountability. I mentioned earlier that the province tried to suppress the unflattering assessment of its water utilities. The *Edmonton Journal* was very critical of the government's efforts to "downplay" the problems. It accused the government of "refusing to point the finger at local authorities for fear of upsetting them." And it heaped scorn on an "old-boys network that conspires to make problems go away before they ever become public, and embarrassing."

Involving private partners in the financing and operations of water utilities will help solve that problem. It will put greater distance between utilities and regulators. It will help resolve the conflicts of interest that so often prevent regulators from doing their jobs. In other words, it will free up regulators to regulate.

Conclusion

This evening, I've spoken about three challenges facing Alberta: polluted rivers, water shortages, and poorly performing utilities. All of these problems result from fundamental institutional weaknesses. Polluters, consumers, utility operators, and regulators have perverse incentives - incentives to pollute water, to waste it, and to hide problems. Decision makers rarely bear the costs of bad decisions, and they rarely reap the benefits of good ones.

The challenge is to develop institutions that create more appropriate incentives. Institutions that internalize the costs and benefits of actions. Institutions that hold people accountable for their actions. Property rights, legal liability, prices, tradeable rights, competitive bidding, enforceable contracts - all of these elements of markets help create the necessary incentives. The principle behind all is the internalization of costs and benefits.

Markets won't be perfect. But they will protect water far more effectively than will the alternative - which is political control. Political control brings with it the short-term thinking, the concessions to special interests, the regulatory compromises, and the conflicts that are so common today. Far safer is a market-oriented regime for water - one that relies on property rights to protect water quality, pricing and trading to allocate water and manage demand, and competition among expert firms to provide water treatment and delivery services. Water is simply too precious for politics. We can't afford *not* to begin moving towards markets.

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