

At a Watershed: Ecological governance and sustainable water management in Canada¹

FINAL PROJECT FOR COMPLETION OF RNS PROGRAM

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ABSTRACT

The era of a virtually limitless supply of water in Canada has ended. Water limits exist and scarcity is an emerging reality. Innovative approaches to water management in Canada are desperately needed, as pollution, profligate habits, poor management, increasing urbanization and climate change challenge the status quo. Solving Canada's water resource problems requires accommodating various competing interests – most importantly, fundamental ecological function, understanding historical forces that have created the exiting framework, innovation and leadership to address emerging complexity, and policy coordination at all political and administrative levels. Institutional reform and ecological governance are attainable goals for the water sector in Canada as this report demonstrates through an in-depth literature review and engagement with key informants and practitioners in the field.

Substantive conclusions from this survey demonstrate that at the core of the needed new paradigm for water management in Canada must be a clear focus on conservation and managing demand. Going beyond reliance on ever increasing supplies through pumps, diversions and reservoirs and even beyond just efficiency – doing the same but with less water – requires paying attention to the underlying ecological reality of a finite world and creating institutional environment that enables water conservation as a primary management tool.

In many parts of the world, a water ethic and focus on sustainability permeates policy and informs practice. Experiences in Australia and South Africa, which are reviewed in this project, reveal opportunities to integrate ecological concerns into water allocation systems. Other examples, such as in California urban water management and innovation go hand in hand. Conservation planning, increasing water efficiency and improving water reuse and recycling are fundamental aspects of water management. In France, a water parliament system has government modifying its water management role from that of central controller to facilitator of local decisions in the context of river basins and watersheds and provides a starting point to begin addressing broad issues of governance.

This review begins the dialogue towards the needed institutional shift towards ecosystem-based water allocation and management that promotes innovative urban water management and fundamentally embraces conservation and demand management. This research demonstrates that a clear focus must be on creating institutions that are adaptable and can creatively handle this new paradigm of uncertainty and limited freshwater resources.

¹ This research summarizes a body of work that the author completed while enrolled in the Restoration of Natural Systems program at the University of Victoria. This summarized research is the culmination of that research phase and is provided here to fulfill the requirements to complete the RNS program. This research has been formally published in a variety of other peer review journals, articles and chapters and other media include a detailed research report originally published in April 2005, by The POLIS Project on Ecological Governance and the Environmental Law Centre at the University of Victoria, BC – O, Brandes, K. Ferguson, M. M;Gonigle and C. Sandborn, *At a Watershed: Ecological Governance and Sustainable Water Management in Canada* (Victoria: The POLIS Project on Ecological Governance – University of Victoria, 2005). The full version of the report and details about the water sustainability project are available at www.waterdsm.org. A similar abbreviated research summary that parallels this contribution was invited and published as Brandes, O.M. 2005 "At a Watershed: Ecological Governance and Sustainable Water Management in Canada," *Journal of Environmental Law & Practice*, 16(1):79-97

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SECTION I: Introduction

Constantly in motion through an eternal cycle, a vital resource, critical to the health of societies and ecosystems alike – sometimes too much, often too little. Water. It knits the landscape together and is the lifeblood of modern civilization. Despite its central importance to life in Canada, we continue to recklessly pollute, pipe, pump, dam and waste water.

Canada stands at watershed. Even as one of the few relatively water-rich nations of the world, threats to our freshwater resources are mounting. Pollution, profligate habits, poor management, increasing urbanization and the looming spectre of climate change conspire to create scarcity. In other words, a water crisis in Canada will be of our own making.

Historically, water was managed as a virtually limitless resource; now jurisdictions across the nation face a new reality where water limits are increasingly obvious. Uncertainty of future supplies, constraints to economic growth, increasing conflicts between users and evidence of emerging ecological impacts are some of the many problems being addressed in the water sector. These problems signal the end of the era of abundance and portend a new era of scarcity. To solve them requires a shift from supply-side management toward a more holistic and sustainable approach to water management.

Currently in Canada, water policies and institutions at all levels of government define the rules of water development, allocation and use. These rules are based on a framework that emerged in an era where the view of never ending supply dominated. The emphasis on engineering solutions, water as a free economic good, and standard bureaucratic allocation and management regimes – hallmarks of the supply era – are no longer consistent with the water challenges of the 21st Century.

Governance enabling water sustainability and contributing to the field of restoration of natural systems

This social science research grapples with important questions of governance, seeking to address the nature of broad social decision-making that will enable more sustainable choices and options. The report recognizes the challenge of making the transition from a supply to a demand management regime, and offers possible solutions to some of the conflicts between past policies and emerging scarcity. The purpose of this research, (which builds on a phase of research that has produced a variety of detailed reports and action plans³) is to present feasible strategies and innovative opportunities for reforming Canada's water management institutions – towards a more holistic approach to

³ The first two report *Flushing the Future?* (August 2003), and *What the Experts Think* (December 2003), laid out the examination and diagnosis of Canada's ailing urban water management system. The third report, *The Future in Every Drop* (April 2004), provided the prescription—practical action plans for all levels of government to implement a comprehensive approach to demand management for urban water in Canada. *At a Watershed* goes beyond the urban environment presenting detailed solutions from around the globe to “operationalize” the prescriptions laid out in the third report—providing the long-term plan for sustainable water management in the context of governance.

sustainability based on the recognition that water is a limited and precious resource and must be conserved. By addressing issues of governance, the author hopes to contribute to the field of restoration by enabling a broader social environment that will enable a more comprehensive and lasting approach to full system functionality.

The governance and institutional case studies and practical examples presented in the more detailed report reveal models that can be adapted and implemented across Canada, demonstrating that institutional reform towards water sustainability and ecological governance are attainable goals. The first step is to develop an enabling institutional environment where ecosystem health and social sustainability are fundamental to a long-term, integrated and comprehensive approach to water management in Canada.

Methodology

Qualitative and quantitative data for this report was acquired through an extensive literature review and detailed secondary and policy application documents. This foundation of research was enhanced through further inquiry extracted through informal interviews, and electronic communications with practitioners, leaders in the field and decision makers.

The research presented here represents work that has been published in a variety of forms during the period the author was completed the final Restoration of Natural Systems project. This research has been formally published in a variety of other peer review journals, articles and chapters and other media include a detailed research report originally published in April 2005, by The POLIS Project on Ecological Governance and the Environmental Law Centre at the University of Victoria, BC – O, Brandes, K. Ferguson, M. M;Gonigle and C. Sandborn, *At a Watershed: Ecological Governance and Sustainable Water Management in Canada* (Victoria: The POLIS Project on Ecological Governance – University of Victoria, 2005). The full version of the report and details about the water sustainability project are available at www.waterdsm.org. A similar abbreviated research summary that parallels this contribution was invited and published as Brandes, O.M. 2005 “At a Watershed: Ecological Governance and Sustainable Water Management in Canada,” *Journal of Environmental Law & Practice*, 16(1):79-97.

Layout and format

This first section has introduced this project and provided the methodology and outlined the contribution that it seeks to make to the field of restoration. Section II provides the critical background and context that will frame the detailed discussion and reforms that will enable a more holistic approach to water management provided in Section III. Section III starts by introducing the concept of ecological governance and then provides a more detailed discussion about the application to the water sector as manifested through the concept of a managing demand paradigm and provides a detailed exploration of the types of institutional and governance reforms needed to enable such a shift. Section IV concludes and outlines some of the challenges moving forward.

SECTION II: Context and background

Water management in Canada – a crisis of our own making

Government, industry, agriculture and cities across the nation are now being forced to deal with limits to their water supply. According to Environment Canada, 1 in 4 cities have reported recent water shortages.⁴ Both water quality *and* quantity have emerged as complex and challenging issues facing many communities across the country. The wasteful habits of our past are colliding with ecological and economic limits – and the need for innovative water management is acute.

Comparing Canadian water use with other nations demonstrates that it is possible to reduce water use with minimal impacts on quality of life. For example, the level of residential water use in Canada is 2.5 times higher than it is in many European cities with similar standards of living; and the level of total water use is 4 times higher in Canada.⁵ In a 2001 report, Canada ranked 28th out of 29 OECD countries in a comparison of per capita water use.⁶ While Canada's high water use is a concern, the fact that it continues to rise is of even greater concern. Over the past 20 years, water use in Canada has increased by 25 per cent while in many developed nations, including the United States, overall water use has decreased. An upward trend was observed in Canada throughout the 1990s, with total residential water use increasing 21 per cent, and total municipal water use increasing 6 per cent.⁷

Many factors conspire to create and entrench unsustainable water use habits. Water prices in Canada are the lowest in the industrialized world, encouraging patterns of excessive use and waste.⁸ Other factors, such as lack of consumer awareness and incentives to conserve, a dearth of effective policies, regulations that stifle innovation, and limited strategic planning all reinforce the status quo. These habits not only cause environmental damage; they also inflict huge and unnecessary infrastructure costs on already overburdened municipalities and taxpayers.

Canada's stock of supply infrastructure is aging and deteriorating rapidly. Huge costs are associated with rebuilding and modernizing this infrastructure – imposing significant pressures on communities and municipalities across the nation. The National Round Table on the Environment and Economy estimates that “under current pricing regimes new capital demand for water and wastewater infrastructure will exceed \$41 billion by the year 2015.”⁹ High urban water use exacerbates this challenge and increases

⁴ Environment Canada, *Urban Water Indicators: Municipal Water Use and Wastewater Treatment*. (Ottawa: Environment Canada, 2002).

⁵ OECD, *The Price of Water: trends in OECD countries*. (Paris: OECD, 1999).

⁶ D.R. Boyd., *Canada vs. The OECD: An Environmental Comparison*. (Victoria: The POLIS Project on Ecological Governance – University of Victoria, 2001).

⁷ O. M. Brandes with K. Ferguson, *Flushing the Future? Examining Urban Water Use in Canada*. (Victoria: The POLIS Project on Ecological Governance – University of Victoria, 2003).

⁸ OECD, *Environmental Performance Review of Canada - Water Management*. (Paris: OECD, 2004).

⁹ NRTEE, *State of the Debate on the Environment and the Economy: Water and Wastewater Services in Canada*. (Ottawa: National Round Table on the Environment and the Economy, 2003).

infrastructure costs. The combination of crumbling infrastructure, the costs associated with increasing quality requirements and the inaccessibility of new water sources, suggests that urban water management can no longer function as it has in the past.

A crisis of governance

Water is not specifically mentioned in the Canadian Constitution, but as a “natural resource” it is a primary responsibility of provincial and territorial governments. Urban water management is typically delegated to local governments and water utilities. The federal government’s role is less direct. It does, however, have an important role promoting national standards and guidelines, providing infrastructure funding and supporting research and data collection – and perhaps most importantly, initiating and supporting the effort to create a truly “national” (not just federal) approach to water resource sustainability in Canada.

Despite its critical importance, water management by senior government is characterized as bewilderingly complex administrative galaxy where myriad public agencies share authority with little accountability and leadership. The resulting bureaucratic gridlock and inaction leads to a fundamental failure to address the underlying physical problems eroding freshwater ecosystems.

Freshwater management within the federal government is described as “massively horizontal.” An interdepartmental assistant deputy ministers’ committee on freshwater, for example, includes representatives from 19 departments and agencies. While Environment Canada and Health Canada lead many aspects of the committee’s work, Natural Resources Canada, Fisheries and Oceans and other departments also have lead or supporting roles.¹⁰ This spread of responsibility, competing mandates and unfocused objectives impedes effective action. And most provinces have a similar scattergun approach.

Few realms of policy making are more out of sync with modern ecological and societal realities than those concerning freshwater resources.¹¹ Signs of water scarcity and ecosystem disruption are increasingly apparent and spreading, yet existing policies, regulations and legal frameworks continue to promote inefficient, unproductive, and ecologically harmful practices. The current institutional, jurisdictional and legal complexity associated with water management represents a significant barrier to developing water sustainability in Canada. *Governance* of freshwater resources in Canada is in need of sober reform if sustainable water is a serious goal.

Increased awareness about water issues is generating momentum for new approaches to water governance in Canada. This interest stems from greater understanding of the complex interconnections between water and almost every other major issue of the day,

¹⁰ PRI, *Fresh Look at Freshwater*. (Ottawa: Policy Research Institute, 2004).

¹¹ S. Postel, *Liquid Assets – The critical need to safeguard freshwater ecosystems*. (Washington: World Watch Paper 170 World Watch Institute, 2005) at 52.

from energy, climate change, and economic development, to environmental health, peace and security. Water is *the* strategic resource for the 21st Century.

Solving Canada's water resource problems requires accommodating various competing interests – most importantly, healthy ecological function. It also requires understanding historical forces that have created the exiting framework, innovation and leadership to address emerging complexity, and policy coordination with conservation as a central principle at all political and administrative levels.

Solutions are local in nature, but a national approach to water management is vital.

SECTION III: Ecological governance and water

In searching for durable solutions to water scarcity, the concept of governance must be expanded beyond decisions and rules made only by *government*. Governance includes other social decision-makers – in particular, *business* and *civil society*. This broader more integrated perspective is critical to moving ecological principles from the periphery to the core of decision-making.

Although ecological governance speaks to a much larger process where institutions incorporate ecological sustainability, the water sector has specific potential for reform. The first step towards reforming institutions and ways of thinking about water management is to ensure that watershed needs – and more broadly ecosystem needs – are considered in our collective decisions. This “watershed lens” provides the critical context for a shift from supply-oriented to demand-oriented water management and emphasizes the need to manage people in the watershed and not the watershed itself. The approach parallels the move from ecosystem management to *ecosystem-based* management and signals the beginning of a sustainable water management paradigm.¹²

Instead of managing a watershed as an adjunct of the water supply, maintaining healthy watersheds is considered a prerequisite to water management. Water allocations are constrained by the larger need to ensure that natural processes are maintained. Under ecosystem-based management, human activity is situated within the structure and function of natural contexts – a shift that requires humans to manage themselves to fit into nature, not the reverse.

Ecological governance cannot simply be designed in the abstract and then implemented. It must evolve out of the constellation of existing interests, practices and institutions. By exploring common themes arising from the experiences of water providers, regulators, innovative projects, and consumers and civil society, a platform for institutional redesign in Canada is possible.

¹² The field of “ecosystem management” emerged in the 1980s to give presence in decision making to multiple ecosystem values. Today, with greater emphasis on maintaining ecosystem integrity, a shift is occurring to “ecosystem-based management” that takes the ecosystem as the basic unit of analysis and is committed to ecosystem integrity. With the ecosystem as a starting point ecosystem-based management emphasizes the need to adapt economic, political and social process to fit within that unit.

Demand management the new water paradigm

Water management can be viewed on a continuum (or spectrum) that includes three distinct approaches – supply-side, demand management, and the “soft path” (see table 1).

Both supply and demand strategies are used today and the balance between them varies depending on geography, geology, culture, and economic and political choices. Canadian water utilities employ a variety of demand management techniques – most commonly education programs, watering restrictions and rebates for efficient fixtures. However, most demand-side management (DSM) programs are limited and reactive, focusing only on standard cost-benefit criteria with little attention to the underlying ecological needs. They are typically implemented in response to emergency situations such as drought or are used as temporary measures until additional supply options can be developed. Rigorous application of DSM within the water sector, particularly in Canada, remains in its infancy.¹³

At one end of the spectrum, supply-side approaches seek to increase the capacity to withdraw water through large infrastructure such as dams, reservoirs, pumps and pipelines. Demand-side management complements the supply-side approach and shifts thinking to cost-effective measures that aim to reduce the need for more supply – measures such as consumer education, conservation-based pricing, “smart” technologies and regulations that force innovation by promoting efficiency, conservation and recycling. At the other end of the spectrum, a “soft path” for water takes the management approach beyond traditional concerns to consider how we might redesign the underlying human systems that determine demand and our approach to supply.

Demand management is the first step towards a new water paradigm. Using less water to meet the same human needs, through conservation and a dramatic increase in water use efficiency, is the stamp of a more holistic approach to water management.

Moving along the spectrum, programs are increasingly designed to integrate diverse activities such as water provision and wastewater management, energy and water use, land use, and influencing consumer behaviour, to redirect social development onto a new “soft path.” This path moves beyond efficiency and focuses on conservation, looking to meet underlying human *needs* instead of just supplying more water. It requires water planners to satisfy demands for water-based *services*, rather than simply delivering more water as the *product*.¹⁴

¹³ O. M. Brandes and K. Ferguson., *The Future in Every Drop: The benefits, barriers, and practice of urban water demand management in Canada*. (Victoria: The POLIS Project on Ecological Governance — University of Victoria., 2004).

¹⁴ See D. B. Brooks, “Against the Flow” (2003) 29 (2) *Alternatives*, 29; D B Brooks, *Another Path Not Taken: A Methodological Exploration of Water Soft Paths for Canada and Elsewhere*. (Ottawa: Friends of the Earth 2003); D. B. Brooks, “Beyond Greater Efficiency: The Concept of Water Soft Paths” (2005) 30(1) *Canadian Water Resources Journal* 83; O.M. Brandes and D.B. Brooks *The Soft Path for Water in a Nutshell* (Victoria: The POLIS Project on Ecological Governance and Friends of the Earth Canada, Forthcoming).

Table 1: A continuum of water management¹⁵

	Supply-Side Approach	Demand-Management (DSM)	Soft path for Water
Philosophy	Water resources are viewed as virtually limitless; the primary constraint is capacity to access new sources or store larger volumes of water.	Water resources are viewed as finite, to be used efficiently. Conservation is key and economic cost-benefit analysis guides development choices between increased supply and managed demand.	Water resource are viewed as finite and driven by ecological processes. The focus is on a fundamental re-evaluation of the way we meet the services that water currently provides.
Basic Approach	Reactive. Currently, the status quo approach, developing resources driven by exogenous human needs and wants.	Short-term and temporary. Generally used as a secondary approach, complementing and deferring supply-side options until future supplies are secured. When used in a comprehensive, integrated and long-term fashion, DSM represents an incremental step towards a broader "soft path" approach.	Proactive. Long-term, based on making attitudinal changes (which are not seen as outside the process-not "exogenous") and on fostering new patterns of resource use.
Fundamental Question	How can we meet the future projected needs for water given current trends in water use and population growth?	How can we reduce needs for water to conserve the resource, save money and reduce environmental impacts?	How can we deliver the services currently provided by water in new ways that recognize the need for long-term systemic changes to achieve social sustainability?
Primary Focus	Built Infrastructure	Efficiency	Conservation
Tools and Primary Disciplines	Large scale, centralized, expensive engineering solutions. Examples include dams, reservoirs, treatment plants, pumping stations and distribution systems.	Innovative engineering and market-based solutions focused on any measure that increases the efficiency and/or timing of water use. Examples include low-flow technologies, drip irrigation, conservation-based pricing, education and policies and incentives to reduce use.	Encompasses the full suite of social sciences and generally relies on decentralized distribution coupled with management strategies aimed at ultra efficient ways of meeting end-use demand. The focus is on measures to deliver the services provided by the resource taking full environmental and social costs into account, and identifying new options to provide services associated with water use. Examples include drought resistant native landscaping, grey water reuse, ultra-low flow technologies, and dry sanitation. In addition, the soft path encourages new forms of urban development ("smart growth") and industrial innovation (e.g. new products, changes in agricultural practices and food preferences) that are inherently more sustainable.
Planning Process	Planners model future growth, extrapolate from current consumption, plan for an increase in capacity to meet anticipated future needs, then locate and develop a new source of supply to meet that need.	Planners model growth and account for a comprehensive efficiency and conservation program to maximize use of existing infrastructure. Increasing capacity would be a final option as part of a least-cost approach.	Planners model future growth, describe a desired sustainable future state (or scenario) and then "backcast" to devise a feasible and desirable path to that future. Sustainability built into the economic, political and socio-cultural choices made along the way.

A "soft path" for water moves away from "forecasting" the future by simply extrapolating from the past. Instead it relies on "backcasting" – a planning approach based on a future scenario that integrates human needs within ecological limits. After determining what water might be available (ecologically), planners then work *backwards* to find feasible paths to meet long-term social and economic needs. To reach a

¹⁵ *At a Watershed* full report page 7.

sustainable future, the soft path relies on policies and programs that change behavior and promote greater water productivity.

At the core of this process are structural changes that embed conservation complemented by technologies and practices that increase efficiency. Communities are not just retrofit with low flow fixtures to increase water efficiency; instead they are redesigned *for* conservation. Initiatives like "smart growth" that reduce or eliminate sprawling lawns and the concomitant demands for watering, and incentives for xeriscaping and other drought resistant and ecological appropriate yards are examples of the fundamental changes possible with such a long-term and comprehensive approach. Concepts like rainwater harvesting and fully integrated stormwater management ensure our urban communities are redefined as part of the landscape, saving money and reducing our ecological footprint.

A national strategy for sustainable water use – learning from other places

Historically, water conservation in Canada has been implemented in response to specific local or regional water crises. This approach addresses proximate and short-term concerns. It does not, however, take advantage of strategic opportunities to reduce cumulative environmental impacts and enhance long-term human prosperity by protecting the "natural capital" associated with our aquatic and riparian ecosystems. A national strategy that sets the objectives for a more holistic approach is necessary to achieve the full environmental, social and economic benefits of sustainable water use. Such a strategy demands government leadership and commitment by all levels of society.

Senior governments are uniquely situated to provide the necessary leadership. By promoting tools and institutional structures, they can enable effective action by all stakeholders. These levels of government can benefit from real world experiences in jurisdictions around the globe, which provide signposts as Canada moves along the path toward a sustainable water future.

In many parts of the world, a water ethic and a focus on sustainability inform both policy and practice. For example, water allocation systems in Australia and South Africa reveal opportunities to integrate ecological considerations. Watershed-based management institutions protect ecosystems and nature is recognized as a legitimate "user" of water.

In California, urban water management and innovation go hand in hand. Conservation planning, increasing water efficiency and improving water reuse and recycling are fundamental aspects of water management.

In Europe, new and experimentalist governance systems modify the government's water management role. In France, for example, instead of being the central controller, government now acts as a facilitator of local decisions in the context of river basins and watersheds. Government, through a central river basin agency acts as a clearinghouse of information and helps develop policies and plans that address basin-wide problems. These plans and policies provide guidance to the nested management bodies of the

smaller watersheds, which in turn develop detailed action plans tailored to local conditions.

Any effective water strategy must address a range of issues, from the control of water withdrawals and source protection at the watershed level to the creation of institutions specifically for DSM implementation at the urban level and across sectors.

Putting nature first – water allocations for the 21st Century

The need to reform our approach to water allocation is the most compelling example of why good water management should start at the source to protect ecological function and ecosystems. Currently in Canada, the water allocation process, which consists of permitting and regulating the withdrawal of water for our cities, industry, power production and irrigation for farms, has little or no regard for the health and function of the watershed. This development-focused approach sometimes allocates more water to human users than is even available in the river, lake or aquifer. We are running down the “natural capital” instead of simply living off the “interest” – a recipe for ecological bankruptcy.

A long-term, sustainable strategy allocates water for human activities only after ecological needs are met. Once the ecological limit of an aquifer, river basin or watershed is reached, any additional water demand must be met through increased water “productivity.” Imposing such a limit to the amount and timing of water withdrawals requires water planners and providers to satisfy demand for water-based services, rather than simply providing more water. This unleashes the full potential of demand management.

Once ecological water needs have been identified they require legal protection. The current system of water allocation in Canada produces a constant decline in the amount of water available to sustain ecosystem health and productivity. An alternative to this historical approach is to nest the human water economy within the finite “natural water economy” by placing a sustainability boundary on human water use. This boundary acknowledges the hydrologic limits of watersheds and aquifers and can be used to set explicit goals for allocating water to sustain healthy aquatic ecosystems and to ensure long-term human prosperity.¹⁶

Australia, Europe, Israel, South Africa and some US states build the ecological sector directly into their water-planning framework. Ontario has indicated in its White Paper on source protection that it intends to do the same. The European Union issued a directive establishing a new framework for water policy that includes a focus on river flows. A key feature of the directive is the establishment of criteria for classifying the ecologic health status of rivers (and other water bodies) as “high, good, moderate, poor, or bad”

¹⁶ S. Postel and B. Richter, *Rivers for Life: Managing Water for People and Nature*. (Washington DC: Island Press, 2003) at 39.

depending on how much the ecosystem's ecological characteristics deviate from natural or undisturbed conditions.¹⁷

An allocation system based on managing "ecological flows" and ensuring a river's long-term health has significant potential for the future; however, correcting over-allocations poses a daunting challenge. Overuse of water resources occurs when too many withdrawal permits are granted or when actual withdrawals exceed permitted amounts, possibly a result of poor monitoring or lack of enforcement. Undoing past over-allocations is difficult and expensive, hence the need for an effective preventive model. The Murray-Darling Initiative in Australia, for example, recently devoted \$500 million to reversing past over-allocations. While the expense is significant, failure to address over-allocation increases ecological damage and results in even greater costs in the future.

Permanent vested rights in a particular volume of water, as is common in Canada's allocation systems, are a serious legal barrier to sustainable water development.¹⁸ Reducing all volumetric allocations *pro rata* appears to be a simple solution to existing or future over-allocation, yet such an approach is problematic. It is politically unpopular, may take water away from the most efficient water users, and fails to target areas where environmental concerns are most pressing.¹⁹ Targeted DSM measures can help rectify over-allocations by requiring all water withdrawers and users in an over-allocated watershed to address inefficient practices.

Linking water conservation to water taking permits can be a powerful incentive to promote efficiency, innovation and to change behaviour. Legislation and/or withdrawal permit conditions requiring efficient water use exist in several US states including Florida, New Mexico and Texas. In Ontario, the City of Guelph was denied a permit for additional water-taking until the municipality demonstrated that its existing water supply was being used as efficiently as possible. This prompted the development of an outdoor water use program to improve outdoor water conservation.²⁰

Various market-based or economic instruments can also promote water conservation and sustainability:

- volume-based withdrawal pricing to create a constant incentive to reduce water use;

¹⁷ EU Directive (2000/60/EC). Directive of the European Parliament and of the Council, October 23, 2000. Official Journal of the European Communities, 327. EUROPA Water Framework Directive (WFD). (2004). [Electronic version]. Retrieved August 2004 from http://europa.eu.int/comm/environment/water/water-framework/index_en.html.

¹⁸ Although adaptable allocations are required to deal with changing and emerging realities, they challenge the certainty required by water users, whose plans and investments reflect expected water availability. The full report explores three approaches – time-limited withdrawal permitting, granting of shares in the "consumptive pool" and water trading schemes – to address this tension.

¹⁹ N. Schofield, A. Burt and D. Connell, *Environmental water allocation: Principles, policies and practices*. (Canberra: Land and Water Australia, 2003). [Electronic version]. Retrieved from http://www.lwa.gov.au/downloads/publications_pdf/PR03054_1.pdf.

²⁰ *Supra* note 15 Brooks 2005 at 90.

- tradable withdrawal permits, which when situated in an appropriate market, help ensure allocations are directed to the most economically beneficial uses and create incentives for rights holders to invest in conservation technologies; and,
- legal liability for environmental damage which ensures users investigate and avoid potential environmental harm that might result from their water development activities.

Although market-based and economic instruments are receiving increasing attention, they must be used cautiously. They are not a panacea for water sustainability. As Cantin et al. caution “location and context are everything.”²¹ Market-based and economic instruments must be applied with a clear understanding of the policy objectives they are to achieve and must be part of a larger policy package that includes, at a minimum, education, effective regulation and government oversight, and attention to socio-political impacts.

Postel and Richter emphasize the limits of economic instruments: “Markets, trades, and transfers, however can accomplish only a small part of the large challenge of rebalancing water allocation between human uses and ecosystem support. They are not a substitute for a broader legal or regulatory mandate to designate flows for the health and function of freshwater ecosystems.”²²

The best source of ‘new’ water

It is widely recognized that influencing consumer demand is often a cost-effective strategy to deal with water limits and increasing scarcity, especially in the urban environment. Measures focused on efficiency and conservation can significantly reduce the demand for water. Most water experts believe that cost-effective water savings of 20 to 50 per cent are readily available.²³ For example, a recent study in California by the Pacific Institute, demonstrates the potential of fully integrated demand management for urban water use. The results reveal that total commercial, industrial, residential and institutional water use could be cut by at least 30 per cent using available “off-the-shelf” technologies and existing prices, and “this improvement can be achieved more quickly and cleanly than any new supply project under consideration.”²⁴ As a result, even if California continues to grow at a rapid pace, no new supply projects would be required in the foreseeable future.

²¹B. Cantin, D. Shrubsole, and M. Ait-Ouyahia, “Using Economic Instruments for Water Demand Management: Introduction” (2005) 30(1) *Canadian Water Resources Journal* 1 at 3.

²² *Supra* note 18 at 117.

²³ D.B. Brooks and R. Peters, *Water: The Potential for Demand Management in Canada* (Ottawa, Science Council of Canada, 1988); A. Vickers, *Handbook of Water Use and Conservation*. Amherst, Massachusetts, WaterPlow Press, 2001); S. Postel, *Last Oasis: Facing water scarcity* (New York, WW Norton and Company, 1997); P. Gleick, “Water in Crisis: Paths to Sustainable Water Use.” (1998) 8(3) *Ecological Applications* 571; L. Owens-Viani, A. Wong and P. Gleick, ... *Sustainable Use of Water - California Success Stories*. (Oakland, Pacific Institute, 1999).

²⁴ P. Gleick, P., D. Haasz, C. Henges-Jeck, V. Srinivassan, G. Wolff, K. Cushing and A. Mann, *Waste not, Want Not: The potential for urban water conservation in California*. (Oakland, California, Pacific Institute, 2003).

Water conservation is the next best source of new water in Canada. But water conservation does not just happen. It requires leadership and an active role for senior government. Working together, federal and provincial governments can promote the tools and institutions to allow all local interests – suppliers, businesses, consumers and local governments – to take effective action developing water sustainability.²⁵

Thinking like a watershed

Ultimately, sustainable water management requires managers to “think like a watershed” – to consider the complex interaction of human activities and natural processes in planning and decision-making. Ecological sustainability is only possible when the focus moves to managing people in the watershed, and not manipulating the watershed itself.

Opportunities for such management are the major theme of *At a Watershed*. These include integration of water supply and conservation planning, surface and ground water management, waste and storm water management and urban design.

Demand management is a foundational tool for watershed managers. When applied across all sectors up and down the watershed, a broader social process of change begins to take root – starting in the urban arena but moving beyond the city to include power generation, industry, manufacturing and agriculture.

Watersheds are generally selected as the proper scale of applied management based on the idea that water management organizations should reflect all interests and activities related to the shared water resource. The river basin – comprised of many watersheds – is a logical administrative unit to handle the regional externalities linked to water pollution, resource development and conflicts of use. The basin or watershed is the context for a holistic integration that moves away from end-of-pipe treatment toward identification of cumulative water quality and quantity problems and solutions.

France has embraced this approach with its water parliament system. Water agencies and River Basin Committees exist in each of the six French river basins. The water agencies perform executive functions and the River Basin Committees act as the central clearinghouse and consultative bodies.²⁶

Australia also manages activities on a watershed scale. The Australian focus has shifted from government as the administrator of policy on behalf of industry and community members as passive recipients, to government as the “enabler” and “facilitator.” This

²⁵ The full report provides an extensive list of legislative, policy, economic, collaborative, staffing, educational and research actions that promote urban DSM and help embed water-sustainability into local institutions. Examples include updated building and plumbing codes, mandating planning guidelines, model bylaws, technical assistance, conditional and dedicated funding, full cost accounting, green taxes, government procurement, pilot and demonstration projects, social marketing and education.

²⁶ R. S. da Motta, A. Thomas, L.S. Hazin, J.G. Feres, C. Nauges and A. S. Hazin. (2004). *Economic Instruments for Water Management: The Cases of France, Mexico and Brazil*. (Northampton, Massachusetts: Edward Elgar, 2004) at 37.

way, government supports an empowered industry-community alliance to articulate catchments strategies.²⁷ This brings together the three pillars of governance discussed above.

For large watershed basins, a “nested scale” approach is often appropriate, as illustrated by the French water parliaments. This ensures appropriate vertical integration and accountability and enables local solutions and actions. This approach is used in the Chesapeake Bay and the Great Lakes programs, as well as in the Murray Darling Basin in Australia.²⁸

Meaningful public participation and sufficient capacity for all stakeholders to contribute and identify objectives and priorities is necessary for success, and requires senior government leadership to enable – but not micro-manage – solutions.

This kind of multi-tiered governance structure embodies the principle of *subsidiarity*, with each level of governance addressing those issues that are most appropriately handled at its scale of management. Watershed management bodies must be given sufficient capacity and authority to plan and implement. However such devolution must also ensure sufficient higher (senior government) and lower (municipal and regional bodies) level government involvement. A hierarchy of plans and policies guided by overarching objectives and principles is usually created by various governing bodies, starting with international, national and inter-provincial water sharing agreements, moving down through provincial land and water use polices, individual basin and watershed plans, and finally to local/municipal DSM and land use plans.

SECTION IV: The challenge of moving beyond efficiency

The question is not whether Canada must use water more efficiently. It is to what extent we will go beyond increasing efficiency to implement more fundamental change – a paradigm shift in water management.

Canada is indeed at a watershed as it moves from historical abundance to a future of freshwater scarcity. Yet, as David Brooks, Canada’s foremost water conservation expert warns, “[o]ur management systems for fresh water in Canada are becoming less, not more, sustainable...”²⁹

Evidence is mounting. The science is clear. Opportunity abounds. We have the prescription for action and we have access to successful models from around the world. The time for action in Canada is now.

²⁷ J. Bellamy, H. Ross, S. Ewing and T. Meppem, *Integrated Catchment Management: Learning from the Australian Experience for the Murray-Darling Basin*. (CSIRO Sustainable Ecosystems, 2002). [Electronic version]. Retrieved from http://www.mdbc.gov.au/naturalresources/icm/icm_aus_x_overview.html; COAG (Council of Australian Governments). (2004). Web site: <http://www.coag.gov.au>.

²⁸ EPA (US Environmental Protection Agency) (1997). *Top 10 Watershed Lessons Learned*. [Electronic version]. Retrieved from <http://www.epa.gov/owow/lessons>; B. Karkkainen, “Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism” (2002) 21 *Virginia Environmental Law Journal* 189.

²⁹ *Supra* note 15 Brooks 2003 at 42.

In the words of Marq deVilliers, Canada's poet laureate of water:

*Sustainability of fresh water ... is simple enough to define: ensure sufficiency of supply, protect it from over-use and from contamination over the long term, and manage both aspects under the onslaught of burgeoning population and the uncertain effects of global warming...easy enough to say, a simple declarative statement does the trick – but ferociously difficult to execute.*³⁰

The challenge is to ensure that the institutional shift towards ecosystem-based management, ecological water allocations and innovative urban water management fundamentally embraces conservation and demand management. Such a move to, what we call, *watershed governance* creates the institutions that are adaptable and can creatively handle a paradigm of uncertainty and water resource limits. Water agencies across the nation must have the capacity and the incentives to implement comprehensive solutions at the local level – to ensure this we need commitment by all levels of government and we must move beyond just “getting the prices right” or “getting the property rights right” to a focus on “getting the institutions right.”

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³⁰ M. de Villiers, “*Water and Sustainability in sub-Saharan Africa*” (2002). Fall 3(2) *ISUMA*.