

## Canada – Its Waters and its Policies

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### ***Introduction***

I would like to start by thanking the conference organisers for their kind invitation to participate in the **VII Seminario Internacional de estudios comparados Argentina-Canada “Espejo de agua espejo de vida” y el III Encuentro de Jovenes y Nuevos Canadianistas**.

I am truly honoured to have been invited to speak to you. I should however immediately state that I am not a specialist in Canadian studies, nor am I a specialist in social sciences or political studies. I am an engineer specialized in modelling, simulation and control of environmental systems in general, and of water resources systems and wastewater treatment plants in particular. In the spirit of this conference, I did not think that it would be appropriate for me to talk to you about technical issues in the field of water resources management (e.g., such as wastewater treatment plant modelling, simulation and control) which is what I am most familiar with. However, I thought that it might be of interest to you to hear about water and water policies in Canada.

[An aside ] Over the years, I have had the pleasure of working with many wonderful graduate students. One of those students is Ing. Daniel Nolasco – Daniel who is here today and will be speaking to you on “**Tendencias Actuales sobre Saneamiento en Latinoamérica**”. Daniel joined my research group at McMaster University back in 1988 – he was one of my most impressive graduate students – so much so that following graduation Daniel eventually came back to work for the company that I founded – Hydromantis, Inc. – before completing a masters at MIT and returning to Argentina a few years ago. The quality and impact of Daniel’s contribution can also be illustrated through his research contributions. Earlier this month, one of the papers that we co-authored together was chosen as ‘*one of the most important ground-breaking papers in the 40 years history of **Water Research***’ published by Elsevier and is one of the most important journal in the field of water water research.

Allow me to return to the topic that I have been asked to address, i.e., water and water policies in Canada.

When we consider that 70% of the earth’s surface is covered by water, and that Canada is at first glance ‘water-rich’, we might assume that we are dealing with an unlimited, renewable resource and that there is little need for the establishment of water management policies. However, few people realize that Montreal, Canada’s second largest metropolitan area, with close to 2 million people, discharged raw sewage directly

into the St Lawrence river until the mid 80's. On the east coast, more than 43 billion litres of raw sewage are dumped in Halifax Harbour each year.<sup>1</sup>

The perception and interest of Canadians towards water, water quality, and the supply of safe drinking water has changed dramatically in recent years. In January 2002, Justice Dennis O'Connor's handed over a 700-page report that marked the end of investigation into why seven people were killed and 2,300 became sick when *E. coli* bacteria flooded the Town of Walkerton's water supply in May 2000.

Earlier this year we could read in one of Canada's major newspaper:

### **“Ottawa launches plan to improve water on reserves<sup>2</sup>”**

The federal government introduced a plan Tuesday to improve water safety on native reserves. Standards and water systems on many reserves are woefully inadequate compared to national standards.

Last year, residents of Kashechewan, a northern Ontario reserve had to leave their homes because of contaminated drinking water.

While Canada's drinking water is among the safest in the world, Canadians are concerned about the safety of their drinking water<sup>3</sup>. In fact, 7 in 10 Canadians want more government attention on this issue. Before we talk about policies, I thought that it would be interest to provide an overview of the issue. In the next few minutes, I will address:

- Some facts about the consumptive use of water
- Canada's geography and water supply
- Water Policies in Canada
- Recent Developments
  - Ontario's Clean Water Act (2005)
  - Quebec's Water Policy

## ***Consumptive Use of Water***

While water appears, at first glance to be plentiful, it is always important to contextualize that resource in terms of its use, its availability and its quality.

On average north americans consume between 400 and 500 liters per capita per day (L-cap-day) while europeans consume between 150 to 200 L/cap-day. It is also interesting to note that of that amount less than 5 L-cap-day is actually used for drinking.

It is also interesting to reflect on the consumptive use of water. For example:

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<sup>1</sup> That situation is expected to change in the next year or so, when three wastewater treatment plants are brought into operation.

<sup>2</sup> Globe and Mail, Tuesday, March 21, 2006.

<sup>3</sup> 2005 Ipsos Reid Survey.

- 2000 – 5000 L of water is needed to produce one kg of rice
- 11000 L of water is required to produce 125 g of beef (hamburger)
- 1000 L of water is needed to produce one glass of milk

Economists have introduced the concept of **Virtual water export**, i.e., the water involved in growing and manufacturing of traded products. For example, the export of 1 tonne of rice is equivalent to the export of 1000 tonnes of virtual water because it takes 1000 tonne of water to produce 1 tonne of rice. On that basis, net virtual water exporters include:

- United States (grain)
- Canada (grain)
- Australia (cotton, sugar)
- Argentina (beef)

Net virtual water importers include Japan, the European Union, the Middle East. In fact, some arid region countries are virtual water exporters, e.g., Israel, South of Spain, Ethiopia (coffee), Mexico.

In fact, some would argue that Virtual Water is at the heart of a global water crisis.

## ***Canada's Geography***

The second largest country in the world after Russia, Canada covers close to 10 million km<sup>2</sup>. When we mention Canada, we usually think of winter, snow, and ice hockey. Let me assure you that there is more to Canada than snow, ice, hockey.

Bounded on the East by the Atlantic ocean, on the North by the Arctic, the West by the Pacific and the South by the United States, Canada has more than 200,000 km of coastline and more than 8,900 km of shared border with the United States (2500 km are with Alaska). 72% of Canada's 32 million inhabitants live within 150 km of the US border (85% within 300 km) and 60% live along the Great Lakes and St. Lawrence River. Notwithstanding the fact that Canada's population density is amongst the lowest in the world (3.5 pers/km<sup>2</sup>), close to 80% of the Canada's population resides in urban areas. Canada's strategic position between the United States and Russia was particularly important during the Cold War. With the end of the the Cold War and with the importance of global warming and the melting of the Arctic ice masses resulting in the opening of the Northwest Passage, Canada's Arctic maritime claims are becoming increasingly important for the Canadian government. In fact, Prime Minister Harper is on record about Canada's sovereignty over the Arctic waters.

In 2004, Environment Canada published a 124 page report entitled "Threats to Water Availability in Canada"<sup>4</sup> highlighting the current status, trends, and knowledge and program needs around the availability of water in Canada, including water allocation,

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<sup>4</sup> Environment Canada (2004). "Threats to Water Availability in Canada".  
<http://www.nwri.ca/threats2full/intro-e.html>

water regulation, droughts, floods, municipal water supply, manufacturing and thermal energy water demands, agriculture use, etc.

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In 2001, 79.4% of Canadians lived in an urban area with a population of 10 000 people or more, compared with 78.5% in 1996. Seven of 27 census metropolitan areas had a growth rate at least double that of the national average of 4%; the largest growth rates were in Calgary, Oshawa and Toronto. With three exceptions, the census metropolitan areas with the strongest growth were located in three regions: the extended Golden Horseshoe in southern Ontario, the Calgary-Edmonton corridor in Alberta, and British Columbia's Lower Mainland and southern Vancouver Island.

The three exceptions were Ottawa-Hull, Windsor and Halifax. Immigration played a major role in Windsor's growth (+7.3%), followed by migration from other parts of Ontario. The growth in Ottawa-Hull was the result of a mix of internal and international migration, as well as natural increase. Ottawa-Hull had nearly 1 064 000 people, a 6.5% increase.

In 2001, 20.3% of Canadians lived in rural and small town areas, down from 21.5% in 1996. The population of these areas declined in every province except Ontario, Manitoba and Alberta. The population of the most remote rural areas grew 1%. The high rate of natural increase may be attributed to the higher birth rate among Aboriginal people.

## ***Canada's Waters***

Overall, Canada may be considered a freshwater-rich country: on an average annual basis, Canadian rivers discharge close to 9% of the world's renewable water supply, while Canada has less than 1% of the world's population.

Water is also highly visible in Canada: probably no country in the world has as much of its surface area covered by freshwater as does Canada. Of particular note are the Great Lakes. This set of lakes, which is shared with the United States, makes up the largest surface area of freshwater found in one place anywhere in the world.

Table 1 shows the distribution of freshwater by province and territory. Most provinces and territories have large areas covered by lakes or rivers, in particular provinces or territories that also have large areas underlain by the Canadian Shield. Readers should note when using this table that it refers to the surface area of standing water only. When assessing water availability, it is important to consult other data such as the amount of streamflow on specific river systems, data on groundwater, and, of course, climate data.

**Table 1.** Canadian Provinces and Territories Ranked by their Freshwater Surface Area

<b>Province Or Territory</b>	<b>Total Area (land + water) (km<sup>2</sup>)</b>	<b>Freshwater Area (km<sup>2</sup>)</b>	<b>% Covered by Fresh Water</b>	<b>% of Total FW Fresh Water</b>
Quebec	1 542 056	176 928	11.5	19.9
Northwest Territories	1 346 106	163 021	12.1	18.3
Ontario	1 076 395	158 654	14.7	17.8
Nunavut	2 093 190	157 077	7.5	17.5
Manitoba	647 797	94 241	14.5	10.6
Saskatchewan	651 036	59 366	9.1	6.7
Newfoundland & Lab	405 212	31 340	7.7	3.5
British Columbia	944 735	19 549	2.1	2.2
Alberta	661 848	19 531	2.9	2.2
Yukon	482 443	8 052	1.7	0.9
Nova Scotia	55 284	1 946	3.5	0.2
New Brunswick	72 908	1 458	2.0	0.2
Prince Edward Island	5 660	0.0	less than 0.1	
Canada	9 984 670	891 163	8.9	100.0

Source: Canada. Natural Resources Canada. The Atlas of Canada. Facts About Canada: Land and Freshwater Areas. Ottawa, 1999.

Canada holds vast reserves of water:

- 9% of the world's fresh water,
- a quarter of humid lands and
- the third largest amount of glaciers (after Antarctica and Greenland).

Due to extensive glaciation, Canada hosts more than two million lakes: of those that are entirely within Canada, more than 31,000 are between 3 and 100 square kilometres (1.2 & 38.6 mi<sup>2</sup>) in area, while 563 are larger than 100 km<sup>2</sup>.

There are 5 main watersheds in Canada (Figure 1):

- The Arctic watershed,
- The Atlantic,
- The Pacific,
- The Hudson watershed and, due to parts of the Milk River running through Alberta, and
- The Gulf of Mexico watershed.

**Table 2.** Ocean Drainage Basins in Canada

<b>Drainage Basin</b>	<b>Approximate Area (square kilometres)</b>
Atlantic Ocean	1 520 000
Hudson Bay, James Bay and Ungava Bay	3 861 400
Arctic Ocean	3 583 300
Pacific Ocean	1 009 100
Gulf of Mexico	21 600

Hudson Bay drainage includes internal drainage areas (areas whose drainage flows into groundwater or evaporates) Atlantic drainage includes areas of diverted drainage that could otherwise flow into James Bay.

Is Canada fresh-water rich? Canada certainly has lots of water. However, as I indicated earlier it is important to contextualize this resource in terms of its use (its demand), its availability, and its quality. 60% of Canada's freshwater drains to the north, while 70% of the population lives in the south within 150 km of the US border. Moreover, many municipalities experience periodic or even regular water shortages. In fact, many municipalities have introduced water conservation measures, restricting water use at certain times of day or for certain applications, such as lawn watering – some municipalities even go so far as banning lawn watering altogether.

#### Did you know?<sup>5</sup>

- The percentage of Canadians who receive municipal drinking water: **About 75 percent**
- The number of municipal water treatment facilities in Canada that treat water from lakes, rivers, and groundwater sources: **About 4,000**
- The number of water-borne disease outbreaks reported in Canada between 1974 and 1996: **160 (involving about 8,000 people)**
- The number of boil-water advisory days in municipalities across Canada: **2,494 in 1993 and 3,100 in 1998—an increase of 24 percent**

## ***Water Governance in Canada***

In Canada water governance is a shared responsibility between the federal, provincial, municipal and territorial governments. However, it is fair to say that Canadian provinces have primary jurisdiction over most water management and water protection issues. Provinces in turn delegate certain responsibilities and authorities to lower levels of government, such as municipalities and/or local authorities, including water supply and distribution, water and wastewater treatment, watershed management.

The Federal government has jurisdiction over:

- Conservation and protection of oceans;
- Fisheries;
- Navigation;
- Federal lands (National Parks), federal facilities, First Nation reserves, along with interprovincial and international transportation vessels; and
- International and boundary waters.

In addition, the Federal government has authority in the development of the *Guidelines for Canadian Drinking Water Quality*.

<sup>5</sup> Office of the Auditor General of Canada (2005). 2005 Report of the Commissioner of the Environment and Sustainable Development. Chapter 4. Safety of Drinking Waters – Federal Responsibilities.

The shared federal-provincial responsibilities include:

- agriculture;
- health; and
- environment.

In practice, all orders of government, communities, the private sector, and individual Canadians have responsibilities and make decisions every day that influence the health and sustainability of freshwater resources.

Canada's Federal Water Policy dates back to 1987<sup>6</sup>. "It is a statement of the federal government's philosophy and goals for the nation's freshwater resources and of the proposed ways of achieving them. It recognizes that water is, at present, Canada's most undervalued and neglected natural resource. In no part of Canada is freshwater of sufficient quality and quantity that it can continue to be overused and abused in the way it has been in recent decades. The underlying philosophy of the policy is that Canadians must start viewing water both as a key to environmental health and as a scarce commodity having real value that must be managed accordingly."

While the principles, goals and objectives of the 1987 Federal Water Policy are still applicable, many would argue that it should be revisited and updated.

In 2004, the Interdepartmental ADM (Associate Deputy Ministers) Committee on Water (IWAC) developed a Federal Water Framework (Figure 2). The following year, Commissioner on the Environment and Sustainable Development indicated that ... "The 2004 Federal Water Framework is a first step toward a coherent federal approach to dealing with water matters, including those related to human health. However, even though in 2003 the government declared water to be a sustainable development priority, the current status of the Federal Water Framework is unclear and its future is uncertain. Senior officials who prepared the Framework have not met for over a year, and the next steps for its use have not been clearly established."<sup>7</sup>

Surface and ground waters that lie within the boundaries of a province fall under the authority of that province (including the Government of the Yukon)<sup>8</sup>, including:

- flow regulation;
- authorization of water use development;
- water supply;
- wastewater treatment and pollution control; and
- thermal and hydroelectric power development.

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<sup>6</sup> Environment Canada (1987). Federal Water Policy. 37 pages.

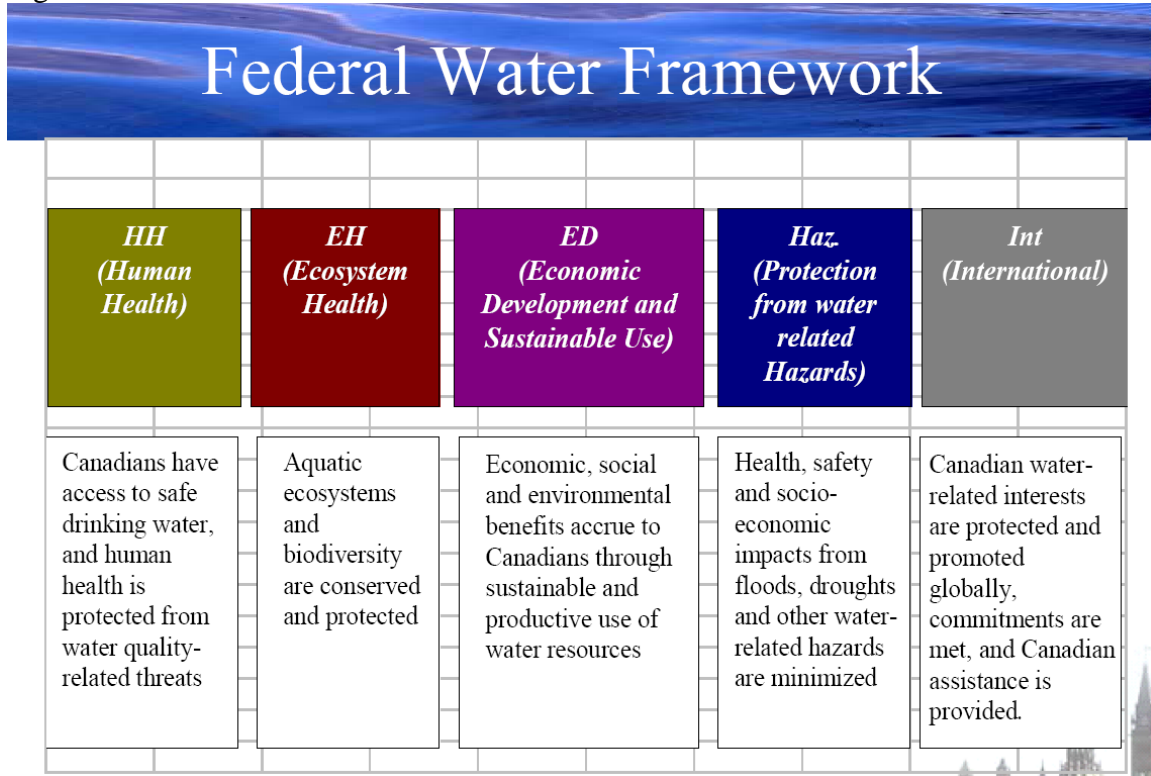
<sup>7</sup> Office of the Auditor General of Canada (2005). 2005 Report of the Commissioner of the Environment and Sustainable Development. Chapter 4. Safety of Drinking Waters – Federal Responsibilities.

<sup>8</sup> Waters in Nunavut and the Northwest Territories are under Federal authority.

The reader can get a comprehensive overview of the water-related policies and legislation in Canada's provinces and territories by consulting the following web site:

[http://www.ec.gc.ca/water/en/policy/prov/e\\_prov.htm](http://www.ec.gc.ca/water/en/policy/prov/e_prov.htm) .

Figure 2. The 2004 Federal Water Framework



Paul Muldoon, Executive Director of the Canadian Environmental Law Association speaks of the need to for a Canadian Water Policy<sup>9</sup>

Serageldin<sup>10</sup> (1995) suggests that a comprehensive framework for water management be adopted to ensure that our water policies and management practices are sustainable from a social, economic and environmental perspective. Serageldin points to four principle failures with current policies:

- A) Water needs to be treated as an economic good and needs to be priced accordingly;
- B) Too much reliance on government to collect, treat, distribute and dispose of water. Government agencies are often over extended and lack proper incentive structure
- C) Management of water is fragmented between sectors and institutions
- D) Health and environmental concerns are seriously neglected

<sup>9</sup> Muldoon, P. (2006). The Need for a Canadian Water Policy.

<sup>10</sup> Serageldin, I. (1995). Water Resources Management: A New Policy for a Sustainable Future. Water Resources Development, 11(3):221-232..



Serageldin goes on to identify the lessons that can be used in developing a framework for improving water resources management:

- A) Water must fit squarely into a long-term vision for national development;
- B) Water must be managed comprehensively – interactions between various elements of a watershed's ecosystem must be taken into account;
- C) Decentralization and greater stakeholder participation; and
- D) Markets and prices improve the allocation of water among competing users.

Following the Walkerton tragedy in 2000 Canadians are increasingly concerned about the quality and safety of their drinking water. In a recent, Ipsos-Reid survey, less than half of Canadians rate the safety of their water at home as good, 1 in 5 are concerned while 3 in 10 do not drink tap water. Accordingly, many governments have made significant policy and program changes. For example, early this year, the Government of Ontario introduced Bill 43 – known as the *Clean Water Act* designed to protect existing and future sources of drinking water through local identification and assessment of drinking water threats and the development of a source protection plan that addresses these threats. The Act establishes local committees to address those threats. It also provides municipalities with much-needed tools to better protect their waters. Potential threats the Act will help address include bacterial contamination from human or animal waste, industrial pollution, urban runoff and water depletion from overuse. Following consultation and amendments to the proposed legislation, the Bill should be approved this fall.

In 2002, the Quebec government adopted its own Water Policy designed to:

- ensure the protection of the resource
- manage the resource in a sustainable way
- protect public health
- protection of the eco-systems

Under this policy water governance will follow a watershed-based approach. The Québec Water Policy ultimately revolves around the five following key orientations:

- **Orientation 1: Water governance reform;**
- **Orientation 2: Integrated management of the St.Lawrence River;**
- **Orientation 3: Protection of water quality and aquatic ecosystems;**
- **Orientation 4: Continued clean-up and improved management of water services;**
- **Orientation 5: Promotion of water-related recreotourism activities.**

The framework identifies 57 action items ranging from the revision of the legal framework with respect to water to allow the implementation of the policy, to the development of performance indicators to assess and monitor the implementation of the policy.

## ***Conclusions***

- Canada can be characterized as a water-rich country
- This resource must be assessed in terms of its use (water demand), its availability and its quality
- Water governance is a shared responsibility between the federal, provincial, municipal and territorial governments
- The Federal government has initiated the development of a Federal Water Framework based on five key pillars
- Following the Walkerton tragedy several provincial governments have enacted legislation to protect the health and safety of Canadians along with the protection of the resource