THE CASE OF CANADA – INSTITUTIONS AND WATER IN THE SOUTH SASKATCHEWAN RIVER BASIN

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This paper was completed in February, 2007 as a backgrounder document for the Social Sciences and Humanities Research Council project, "Institutional Adaptations to Climate Change: Comparative Study of Dryland River Basins in Canada and Chile." This paper provides an overview of the principal Canadian institutions with shared responsibilities for water resource management. It is specifically focused on the water institutions within the agricultural boundaries of the South Saskatchewan River drainage basin, an agricultural zone located in southern Alberta and Saskatchewan. Three institutional drivers affecting water resource management are presented.

ABSTRACT

Canadian society and culture are intricately linked to water. This paper provides an overview of the key institutions with some degree of interest in water resource management in Canada, and principally within the South Saskatchewan River Basin in Alberta and Saskatchewan. To better understand Canadian water institutions and their roles in water resource management, three driving factors are identified as key institutional drivers (forces that shape institutions and how they function):

- **Decentralization and shared jurisdictions**
- **Sustainable development and integrated water resource management**
- **Governance and the need for leadership and clearly focused federal, provincial and local roles.**

Canada is a federation with unique institutional arrangements for water resource management. In essence, the provinces have the mandate and authority to manage water resources. The federal role is limited and its involvement with the provinces often rests within targeted federal-provincial agreements. Local government has direct responsibility to protect and manage water resources. Because many levels of government and non-government organizations have a vested interest in water management, the shared jurisdictions are often seen as a complex network, where roles often overlap. Canada has evolved from the days when water management was driven by nation-building activities where water resources were harnessed and utilized for society's needs. In the 1980s, water management shifted from water development projects, to sustainable development and integrated water resource management. This change recognized the complex nature of water management for all of society, the economy and the environment. Increasing Canadian environmental awareness drove governments towards sustainable development approaches in managing water. The Government of Canada established the Federal Water Policy in 1987, as a result of the 1985 Inquiry on Federal Water Policy. This remains Canada's most current water policy, and it is recognized that not all of the recommendations were able to be acted upon. Waterborne disease outbreaks in drinking water during the period 2000 to 2005, have highlighted that water governance remains a challenge in Canada. After these outbreaks, water inquiries were instrumental in changing governance structures for water institutions across Canada.

Semi-arid regions such as the Canadian prairie and the South Saskatchewan River Basin are particularly vulnerable to water and climate impacts. Over the years, Canadian institutions have adapted to increasing pressures caused by water and climate, placed on society and the environment. It is anticipated that future vulnerabilities caused by global warming and increasing competition for water will require future adaptations. The roles that institutions assume will also require adaptation. Water governance is always challenging and will become more complex in the future. Water and the environment are cross-cutting issues involving inter-disciplinary approaches, and the active participation of many institutional actors. All orders of government will need to find new ways of working together, within and between their own hierarchies. All orders of government will need to engage and empower all stakeholders, including citizens, industry and academia, with desired goals of making efficient and timely water resource management decisions, and of finding improved capacity to deal with water conflict and competing interests in water resources. Federal, provincial, and local roles and responsibilities for water resource management will need to become more clearly defined and focused, in order to truly achieve sustainable integrated water resource management.

INTRODUCTION

Canadian society and culture are intricately linked to water. Since the development of the country, water has been managed to supply human needs for drinking water and waste management, and to reap benefits from irrigated agriculture, power generation, transportation, fisheries, food and non-food processing, mining, forestry, and a multitude of industrial needs.

In Canada, the evolution of the institutions responsible for water management has been influenced by nation-building (water development for settlement and economic development), the legal and political framework of a decentralized structure of government, and the principles of sustainable development in balance with the need to protect water resources in the natural environment.

Since the severe prairie drought years of the 1930s, federal, provincial and local institutions have long recognized the vulnerability of Canadian society to climate-induced water shortages. Climate warming combined with human modifications to water catchments over the last 100 years have reduced summer water flows by as much as 20 to 84% in different locations of Western Canada. These reductions have occurred during a century that researchers believe to have been wettest in the last 2,000 years. If forecasted climate change scenarios result in less available water, future cyclic droughts combined with increased human-induced water demands will have far-reaching implications for available water quality and quantity (Schindler and Donahue, 2006). The effect on society and the environment will pose unique challenges for all institutions that have responsibilities for water resource management.

Semi-arid regions such as the Canadian prairie and the South Saskatchewan River Basin are particularly vulnerable to water and climate impacts. Over the years, Canadian institutions have adapted to increasing pressures caused by water and climate, placed on society and the environment. Future vulnerabilities on society, caused by global warming and increasing competition for water, will require future institutional adaptations.

In Canada, water is considered a public good due to its crucial role in providing for society's survival and well being, economic development and sustaining environmental health. Water is a cross-cutting natural resource that transcends political, economic and societal boundaries. Water is intricately linked with land use, economic development, and the natural environment. This multi-faceted nature of water has affected the development of Canadian institutions with a mandate for water, has influenced the governance structure for water resource management, and has created challenges for water resource management.

To better understand Canadian water institutions and their roles in water resource management, this paper describes three driving factors affecting institutional dynamics:

i. decentralization and shared jurisdictions,
ii. sustainable development and integrated water resource management, and,
iii. governance: the need for leadership and clearly focused federal, provincial and local roles.

All three drivers are forces that shape institutions and how they function, and all three drivers are implicitly interconnected and interwoven.

This paper provides an overview of the principal Canadian institutions with shared responsibilities for water resource management. The paper was written to explore the Canadian context as a backgrounder paper for the project "Institutional Adaptations to Climate Change – Comparative Study of Dryland River Basins in Canada and Chile." (Prairie Adaptation Research Collaborative, 2004). The Chilean context is covered under a separate paper. "The Case of Canada – Institutions and Water in the South Saskatchewan River Basin" is specifically focused on the water institutions within the agricultural boundaries of the South Saskatchewan River (SSRB) drainage basin, an agricultural region located in southern Alberta and Saskatchewan.

The SSRB stretches from the Rocky Mountains across southern Alberta and Saskatchewan, covering an area of 420,000 square kilometres with an estimated population of 1.5 million. The basin is divided into five major watersheds: Bow, Oldman, Red Deer, South Saskatchewan (Alberta) and South Saskatchewan (Saskatchewan). Approximately 65% of the basin population lives in major urban centres, notably Calgary, Lethbridge, Medicine Hat, Swift Current, and Saskatoon. The basin is under the jurisdiction of two provincial governments, Alberta and Saskatchewan, and there are a large number of local governments (rural municipalities) and approximately 225 rural communities (Sobool and Kulshreshtha, 2003).

The SSRB land use is primarily large and medium scale agriculture, producing commercial crops such as wheat and canola. Livestock production is also a main agricultural activity with large areas left for pasture. There are numerous dams, reservoirs, diversions and irrigation projects. In southern Alberta, 13 irrigation districts divert about 2.3 billion cubic metres (1.8 million acre-feet) of water to irrigate about 500,000 hectares (1.2 million acres) of land. Approximately 120,000 ha (300,000 acres) of land are irrigated by 25 irrigation districts throughout southern Saskatchewan. In addition to supplying water for irrigation, the basin is used for recreation, hydro-electricity and is the principal source of household water for 45% of Saskatchewan's population.

INSTITUTIONAL DRIVER I: DECENTRALIZATION AND SHARED JURISDICTIONS

Canada is a decentralized country. The primary responsibility for water resource management rests with the Canadian provinces. However, because water cuts across social, economic and environmental issues and objectives, water resource management in Canada inevitably relies on a number of provincial, federal and local institutional actors, working together within the political and legal framework of the country.

Canada was established as a nation in 1867 by the *Constitution Act* (formerly known as the *British North America Act or BNA Act*). Canada is a constitutional monarchy with a national federal government comprised of an elected House of Commons and an appointed Senate. The country is comprised of 10 provinces and 3 territories, which share certain aspects of legislative authority with the senior federal government. The legal system is based on English common law, with *Acts* passed by federal parliament and by provincial legislatures. The one notable exception is the Province of Quebec which has a legal system based on the French civil code. Legislative authority for water resource management rests with the provinces.

The Canadian public institutional system is therefore organized around a federal structure, with a central national government, provincial/territorial governments, and local or municipal governments. Different levels of government have different functions, responsibilities and authority, and each has some degree of autonomy. In comparison to the centralized institutional arrangements in Chile where the national government retains significant authority over water resource management, the decentralized Canadian context is in sharp contrast. The management of natural resources in Canada is a government responsibility. The Canadian arrangement of shared powers between both the federal and provincial governments imposes unique dynamics upon the functioning of government institutions and their capacity to deal with the demands and challenges presented by the various stakeholders and interest groups.

In contrast to Chile's Water Code where the concepts of water resource management are enshrined in Chile's constitution, Canada makes no reference to water management in the Canadian constitution; the noted exception relates to Canada retaining power over navigation and fisheries (Justice Canada[a], 1867 – 1982). The 1895 North-West Irrigation Act declared that the "property in and the right to the use of all water" was vested in the Crown (Percy, 2000). This was a direct attempt to secure water rights to allow the Crown to transfer the use of water to others in the form of licenses. The goal was to encourage settlement by securing access to water and by making conditions more favourable for irrigated agriculture in the semi-arid region of the Canadian prairie. Under an amendment to the *Constitution Act of 1867*, the *Natural Resources Transfer Agreement* (1930), the provinces of Alberta, Saskatchewan and Manitoba acquired ownership of natural resources within their boundaries. Since water is considered to be a natural resource, the provinces assumed the primary responsibility for controlling the use of water, regulation of flow and pollution control within their provincial boundaries. The federal government retained responsibility for the protection of navigable waters, fisheries and fish habitat, federal lands and international waters issues. Shared responsibility exists for inter-provincial, agriculture and health related water issues (Environment Canada[a], 2006). The federal government has the potential power to intervene in areas of provincial jurisdiction if it is in the national interest, although the legal justification is not clear (Pearse *et al*[a], 1985).

The majority of Canada's legislation governing water rests in a variety of federal and provincial *Acts* concerned with the environment, water management, pollution prevention, public health protection, fisheries, natural resources management and protection, shipping and navigation, ports, *etc*. The Government of Canada established the ***Federal Water Policy*** in 1987 (Environment Canada[b], 1987). This policy resulted from the Inquiry on Federal Water Policy commissioned in 1984. Also known as the *Pearse Commission*, the inquiry was created to address growing environmental consciousness and public concerns with Canada's water resources (Pearse *et al* [b], 1985). The final report to this commission was entitled *Currents of Change*, and was a precursor report to the 1987 Federal Water Strategy. The 1987 strategy continues to be Canada's most current federal water policy. The *Canada Water Act* defines the arrangement for federal and provincial roles in water resources management (Justice Canada[b], 1985). Provinces have proprietary rights over natural resources, including water resources. The federal government retains rights for research and planning and implementation of programs related to conservation, development and utilization of water resources, usually under joint federal-provincial agreements. The federal government retains proprietary rights of natural resources and water on federal lands, territories and First Nations lands. The federal parliament

also has the "power to legislate for peace, order and good government" which could enable local works to be under federal authority if it is in the national interest (Environment Canada[c], 1987). The federal government also has the responsibility to deal with water where international arrangements are necessary (*e.g.* cross-boundary water issues).

Federal government departments and agencies

Nineteen federal departments have some degree of responsibility for water management. It is estimated that the Government of Canada spends about $750 million annually on water-related activities (Banks and Cochrane[a], 2005). Primary responsibilities for federal involvement in water management rests within five principal natural resource departments, known as the 5NR: Environment Canada, Health Canada, Natural Resources Canada, Fisheries and Oceans Canada and Agriculture and Agri-Food Canada. *The following sections describe selected water activities of federal departments active in water resource management. These descriptions were extracted largely from Morrison and Gee's 2001 overview document entitled: "Federal Government Departments' Roles and Mandates for Water in the Prairie Provinces."*

Environment Canada (formed in 1971) is by far, the primary federal department responsible for water activities. Environment Canada conducts water research to protect and enhance water resources, surveys and monitors water quality and water quantity in the natural environment, monitors trans-boundary flows, and has some legal regulatory responsibilities designed to protect and safeguard natural water supplies. Environment Canada and provincial ministers of the environment set the *Canadian Environmental Quality Guidelines*. Guidelines pertinent to water include limits established for the protection of aquatic ecosystems, municipal uses of water (community supplies), recreational uses of water, and agricultural uses of water (***Canadian Council of Ministers of the Environment***, or CCME). Environment Canada has responsibility for such *Acts* as the *Canada Water Act*, the *Canadian Environment Assessment Act*, *Canadian Environmental Protection Act*, and the *International River Improvements Act*. Environment Canada plays a critical role in protecting the natural environment, including Canada's water resources. Under administrative or equivalency agreements with many provinces, federal legislation is held in abeyance providing provincial legislation is equivalent to, or more stringent than that expressed in the federal *Acts*. With respect to the South Saskatchewan River Basin, a very important role of Environment Canada is leadership of the ***Prairie Provinces Water Board***. This unique arrangement is covered in detail under the section entitled "Institutional Driver III: The Governance of Water in Canada."

Health Canada assumes responsibilities for public health protection and safeguarding human health. Health Canada is the lead federal department responsible for establishing formal *Guidelines for Canadian Drinking Water Quality*, in dialogue with the provincial and territorial governments through the *Federal-Provincial-Territorial Subcommittee on Drinking Water of the CCME*. Health Canada is also responsible for setting health-based standards for materials in contact with drinking water, ensuring the safety of pre-packaged water and ice in food production (*Food and Drugs Act*), assisting ***First Nations*** with drinking water safety on their lands, and providing drinking water guidance to other departments, governments and citizens. Health Canada is responsible for the *Pest Control Products Act.* The ***Pest Management Regulatory Agency*** governs the manufacturing and selling of pesticides (approvals,

classification, packaging, labeling). Health Canada co-leads the *Canadian Environmental Protection Act* with Environment Canada.

Natural Resources Canada retains responsibilities for natural resources and conducts water research related to earth sciences, forestry, mining and energy sectors. Under the *Resources and Technical Surveys Act*, Natural Resources Canada has broad scientific authority, and conducts natural resources research programs and mapping activities. Natural Resources Canada conducts groundwater research and ground water mapping activities across Canada. Natural Resources Canada houses the ***National Glaciology Program***, the agency responsible for maintaining Canada's national and international glacier monitoring and reporting obligations. Canada's ***Climate Change Secretariat*** reported to Natural Resources Canada and Environment Canada from 1998 to 2006. Both departments along with other Canadian government departments are actively involved on Climate Change Programs (Natural Resources Canada, 2003 and 2006).

Fisheries and Oceans Canada is responsible for freshwater (inland) and saltwater (oceans) fisheries, and has regulatory responsibilities under the *Fisheries Act*. The *Fisheries Act* prohibits any activity that results in the harmful alteration, disruption or destruction of fish habitat. Key responsibilities of Fisheries and Oceans Canada include the management and control of inland and marine fisheries, conservation, protection and restoration of fish and fish habitat, prevention and response to pollution, navigation, search and rescue, and harbour infrastructure.

Agriculture and Agri-Food Canada *(AAFC)* has no regulatory responsibilities for water. AAFC is an economic department that works with the agri-food sector to promote a competitive Canadian agricultural industry and agricultural practices that protect the environment. The sector relies on natural resources for agricultural production and therefore depends on a protected and healthy environment. In particular, the agricultural sector is by far the largest consumer of water in regions that utilize irrigation water, returning very little of the water withdrawn from its source. AAFC conducts research, demonstration, and knowledge outreach programming to encourage the adoption of agricultural best management practices that safeguard water supplies and the environment from potential agricultural contaminants such as pesticides and nutrients. One branch of AAFC, the ***Prairie Farm Rehabilitation Administration (PFRA)*** plays an active role in water development and water management infrastructure, primarily within the Canadian prairie provinces. The branch was formed by the *Prairie Farm Rehabilitation Act*, which in part, mandated the PFRA in 1935 "to develop and promote within those areas systems of farm practice, tree culture, water supply, land utilization and land settlement that will afford greater economic security" in the provinces of Manitoba, Saskatchewan and Alberta (Justice Canada[c], 1985). The creation of PFRA is an example of a federal government institutional adaptation, in response to the severe prairie droughts in the 1920s and 1930s (Agriculture and Agri-Food Canada, 2005; Khandekar, 2004). PFRA has federal responsibilities for irrigation and farm water supply systems in the prairies, plays a role in national water programs, and has some international obligations around water and agriculture.

Examples of other federal activities in water management are varied. ***Indian and Northern Affairs Canada*** has shared responsibilities with ***First Nations Band Councils*** for drinking water and wastewater systems on First Nations reserve communities. Responsibilities include the development of water infrastructure (construction, operation and maintenance). Indian and

Northern Affairs Canada is responsible for the *Arctic Waters Pollution Prevention Act*, *Northwest Territories Water Act*, the *Yukon Water Act*, and the *Dominion Water Power Act* (power installations on federal lands). ***Transport Canada*** is responsible for the *Canada Shipping Act* and the *Navigable Waters Protection Act* which regulate the building of structures within navigable waterways to ensure unimpeded navigation. ***Parks Canada*** is responsible for national parks, including activities related to water, such as ecological integrity of national parks, environmental and water resource protection, and water and wastewater systems in national parks. The ***Canadian Environmental Assessment Agency*** administers the *Canadian Environmental Assessment Act* which dictates the requirements for environmental assessments for various types of projects that involve the federal government in either a funding or regulatory capacity. While this agency is an independent federal body, it is accountable to Canadian Parliament through the Minister of the Environment. ***Foreign Affairs Canada*** assumes responsibility for the *International Boundary Waters Treaty Act (1909)*, and is concerned with trade, including the controversial topic of whether or not Canada would ever permit the bulk sale of water. The ***International Joint Commission*** is a joint bi-national commission representing Canada and the United States. The commission is designed to prevent and resolve disputes between the two nations, making rulings in accordance to the 1909 *Boundary Waters Treaty* (International Joint Commission, 2006). The *Canada Labour Code* assigns all federal departments the responsibility of managing drinking water supplies provided to federal employees and the public on any federally-owned land and within all federal institutions (*i.e.* potable water obtained from federal buildings).

Provincial government departments and agencies

Provincial (and territorial) governments in Canada have the primary authority for the management of natural resources, including water resources. The provinces are responsible for surface and groundwater management including controlling the use of water, regulation of flow, pollution control and thermal and hydroelectric power development.

Like the federal government, many provincial departments and agencies have some vested interest or are involved in water management activities. And similar to the national federal government, the primary responsibilities for water resource management rest within the key provincial natural resource departments of the environment, health, natural resources, agriculture, and, water or watershed agencies.

Provincial Watershed Authorities, Offices of Drinking Water, Water Services Boards or Corporations, Clean Water Agencies *(names and functions vary)* are generally unique to each province. Many of these provincial departments or agencies have either been created or modified to address water quality issues that were identified by two recent, and serious, waterborne disease outbreaks in Canada that occurred in Walkerton, Ontario in 2000, and North Battleford, Saskatchewan in 2001 [discussed in the section entitled "Drinking Water Issues and Evolving IWRM" in Institutional Driver II: Sustainable Development / Integrated Water Resource Management]. For example, the provincial government of Saskatchewan refers to recent provincial departmental changes as a direct response to both waterborne outbreaks: "In the aftermath of events surrounding Walkerton, Ontario and North Battleford, Saskatchewan, governments across Canada have moved to strengthen requirements and refocus the roles of regulatory agencies that manage drinking water and related raw water sources"(SaskH_2O[a], 2004).

Provincial watershed agencies are generally designed to facilitate watershed and integrated water resource management activities. Provincial water boards or corporations are generally designed to develop, operate and maintain water supply infrastructure, and often deliver water to rural regions or smaller communities with regional rural water distribution systems.

Provincial Environment departments (formed several years after the 1971 creation of Environment Canada) are responsible to protect provincial natural resources. Environment departments play a critical role in granting water licenses in some provinces. The provision of safe drinking water supplies is delegated to local municipal governments but provincial Environment departments retain the legislative responsibility to ensure that local municipalities (including towns and cities) provide safe drinking water to citizens. In at least one province (Manitoba), the environment department was recently restructured and renamed as a conservation department, largely to emphasize concepts of preservation of natural ecosystems and sustainable resource management.

Provincial Health departments are responsible for health programming and safeguarding the health of provincial citizens, including the prevention of waterborne diseases. In the event of municipal water quality problems that threaten the safety of drinking water, provincial health departments take actions to safeguard public health of the affected communities. Provincial health departments also work with ***Regional Health Authorities or Districts***, who in turn provide advice for rural citizens dealing with water and wastewater management on private water supplies.

Natural Resources departments may exist, and are generally involved in water management activities as they relate to the development and commercial use of natural resources such as fishing, forestry, mining, *etc*. In some provinces, these departments may also be involved with water management related to flood, drought, erosion management, watershed protection, water budgets, databases and mapping (*e.g.* ground water aquifers).

Provincial Agriculture, Food and Rural Development departments assist the agri-food sector and rural economies with programming to help the sector maintain economic competitiveness, and at the same time, adopt agricultural best management practices that safeguard the environment. Provincial agriculture departments are involved in research, and in some cases (*e.g.* Alberta), are involved in rural water supply development and knowledge extension. Provincial agricultural departments play a key role in irrigation development, and the operation and management of irrigation projects.

Provincial, federal and First Nations governments have forged partnerships to deal with aboriginal and treaty rights and jurisdiction over natural resources, while recognizing, accommodating, and protecting the interests and use of waters by First Nations. In some cases, water development and irrigation projects have been constructed on First Nations lands, in partnership with all three levels of government.

Other levels of local government

Other levels of local government such as municipalities and counties also have a role in water management. Community drinking water supplies are managed by ***cities, towns and villages***.

Water and wastewater treatment and distribution systems are typically owed and operated by municipal or local governments. Local by-laws often impact water management in areas such as water conservation, land use approvals, industrial and municipal solid and liquid waste disposal, *etc*. ***Rural municipalities*** are often involved in water projects. Throughout the prairies, many tank-loading water facilities are constructed by local rural municipalities. These are often untreated water supplies where water is pumped from a well or surface water source to a pumphouse facility that permits clients to collect water in their own portable water tanks. Water users (usually farmers or acreage owners) pump a bulk volume of water into large tanks, and then transport or haul this water to their own location, for storage and multiple uses on farms.

Research agencies and Academia

There are a large number of research agencies involved in water research, climate research, and environmental research. A key federal research agency is the ***National Water Research Institute*** (NWRI, 2007). Part of Environment Canada, NWRI's research is focused on freshwater. Provincial agencies that conduct a variety of research activities, including water research include the ***Saskatchewan Research Council*** and the ***Alberta Research Council.*** Of course, many universities and colleges also conduct academic and applied water research initiatives.

Non-government organizations

Non-government organizations (NGOs) also have a large role in water management in Canada. In Alberta and Saskatchewan, some NGOs working within the South Saskatchewan River Basin include the following agencies.

Rural water utilities have been created in some provinces (*e.g.* Saskatchewan and Alberta). These utilities tend to be groups of citizens living on privately-held land in rural municipalities. Since these homes and farms do not have access to community water supplies, groups have evolved to pool resources to secure better water supplies by constructing a regional water supply project. Regional pipelines offer a better and more secure water supply than each individual being responsible for their own private water supply. Often, regional pipelines are developed to deliver water from a central source (often a treated water supply from a nearby community). Water is then distributed throughout a rural region where population density and interest is sufficient to construct a group pipeline. These pipelines can span extensive areas of land, and serve hundreds of farms. Rural utilities are usually groups of farmers and rural residents (acreage homeowners). The water supply is provided for both domestic household needs and many on-farm water needs such as livestock watering (these systems are not sufficient to supply irrigation water due to the large volume demands of irrigation and associated high costs). Technical support and infrastructure funding support for rural utilities is often provided by federal and provincial governments. However, the utilities become legal entities and are responsible to own, operate and maintain any constructed rural water treatment plant or rural water distribution infrastructure. Most often, rural utilities do not have expertise or experience in constructing, owning or operating water systems. In Saskatchewan, the non-government organization ***Saskatchewan Association of Rural Water Pipelines, Inc.*** was created as a means for rural utilities to develop capacity and support for rural water utility issues. The ***Alberta Federation of Rural Water Cooperatives Ltd***. provides similar assistance in Alberta (Westacott, 2006). Both of these agencies receive support from provincial and federal government agencies.

Irrigation Districts also have a significant role in water management within the South Saskatchewan River Basin. In Alberta and Saskatchewan, irrigated agriculture accounts for the largest consumptive use of water. Irrigation water allocations account for about 75% of licensed water allocations in Alberta's South Saskatchewan River Basin (Alberta Environment[a], 2002). In Alberta, the thirteen irrigation districts supply irrigation water for 540,000 hectares of land in the basin. While much of this infrastructure was initially constructed with provincial and federal support, these districts own and operate the water management infrastructure, which has a replacement value estimated at $2.5 billion (Alberta Agriculture, Food and Rural Development, 2004). In Saskatchewan, the two major areas of irrigation are the Southwest Development Area and the Lake Diefenbaker Development Area, both of which lie within the South Saskatchewan River Basin. Irrigation districts within these areas own and operate the water management infrastructure supplying water for 40,000 hectares of land (Saskatchewan Agriculture and Food, 2003). In both Alberta and Saskatchewan, the major water storage and water diversion and distribution infrastructure (reservoirs, dams, canals, pipelines) are owned by the provincial government, with the exception of the PFRA-owned and operated projects in southwestern Saskatchewan.

Ducks Unlimited Canada promotes and funds projects that enhance biodiversity and duck habitat.

Partners FOR the Saskatchewan River Basin promotes water and land stewardship and sustainable water resource management.

Cows and Fish work with cattle producers in Alberta to protect riparian areas, the area of land adjacent to water bodies.

Many regional and local ***watershed groups*** are involved in promoting land and water stewardship, watershed planning, and providing local perspectives to senior levels of government. Examples include the ***Bow River Basin Council*** in Alberta, and the ***Saskatchewan Network of Watershed Stewards*** and ***The Swift Current Creek Watershed Stewards*** in Saskatchewan.

Numerous ***environmental NGO***s are involved in obtaining conservation easements or acquiring land to preserve wildlife habitat and protect the environment. Examples are: ***Saskatchewan Wildlife Federation,*** the ***Alberta Fish and Game Association*** and the ***Nature Conservancy of Canada***.

Some non-governmental organizations can be classified as ***advocacy and/or activist groups***. ***Pollution Probe***, the ***Sierra Club of Canada*** , and ***Greenpeace,*** are three examples of groups that lobby governments, conduct research, and promote sustainable practices to protect the environment and water supplies. *Pollution Probe* and *Sierra Club* have released numerous documents of interest concerned with Canadian water management, including primers on drinking water and watershed protection. Many policy and think-tank NGOs with an interest in water and climate also exist across Canada. For example, the ***International Institute for Sustainable Development*** has published material on water and climate (International Institute for Sustainable Development, 2007).

Industry
A variety of industries have specific water use needs, often for their own water consumptive needs and waste management requirements. Agriculture, power generation, manufacturing, mining, petroleum, forestry, food and non-food processing, fisheries, *etc*. all have unique water needs. Industry often relies on access to sufficient water quantity and quality for operational and production requirements. Water may also be required for transportation and for industrial energy requirements.

Examples of water agencies active in Saskatchewan's South Saskatchewan River Basin
In Saskatchewan, provincial agencies with responsibilities related to water management within the South Saskatchewan River Basin include the following:

- The *Saskatchewan Watershed Authority* has responsibility for water management, granting of water rights, licenses, and approvals, and watershed and aquifer planning in conjunction with local groups. The *Saskatchewan Watershed Authority* focuses on promoting watershed protection, and manages and protects water quality and quantity of surface and ground water supplies. Created in 2002 in response to recommendations from an inquiry into the 2001 North Battleford waterborne disease outbreak, the *Saskatchewan Watershed Authority* is an example of a provincial institutional adaptation – in this case, to address water management protection within watershed boundaries.
- *SaskWater* is a commercial Crown corporation responsible for water development and water infrastructure, water treatment and distribution works and wastewater services.
- *Saskatchewan Environment* protects and manages Saskatchewan's natural resources, sets water quality regulations and objectives, and retains legislative responsibility for enforcing municipal drinking water regulations.
- *Saskatchewan Health* has responsibilities for environmental health and public health protection, for regulating and providing guidance for private water supplies and sewage disposal, for establishing regulations related to plumbing, institutional sanitation and recreational facilities (swimming pools and water supplies at campgrounds), and, for conducting water quality testing services at the *Saskatchewan Provincial Laboratory*.
- *Saskatchewan Agriculture and Food* regulates farm operations and practices, provides technical support to the agricultural sector, supports agricultural research and promotes agricultural Beneficial Management Practices and Environmental Farm Plans, to protect the environment.
- *SaskPower* is the provincial agency responsible for hydro-electric and thermal power generation and distribution.
- *Municipalities* including cities, towns and communities are responsible to provide safe drinking water to citizens, and are regulated by *Saskatchewan Environment.* Municipalities are also responsible for safeguarding the environment from urban pollution and waste discharges.
- *Regional Health Authorities and Local Regional Public Health officers* advise on the safety of private water supplies and sewage systems, and enforce public health protection legislation regarding plumbing, water and wastewater systems.
- *Conservation Area Authorities* were created to help conserve land and water resources under the 1951 Conservation and Development Act (Saskatchewan Environment, 2000).
- *NGOs:* A variety of NGOs with interest in water also exist, including environmental agencies, the *Saskatchewan Irrigation Projects Association Inc.* and numerous irrigation

districts such as the *South Saskatchewan River Irrigation District*. Environmental NGOs such as *Ducks Unlimited* and *Saskatchewan Environmental Society* play active roles in conservation and environmental protection. NGOs designed to influence policy such as *Saskatchewan Agri-Vision Corporation Inc.* also play a role in water management by developing ideas for water supply and economic development (*e.g.* Agri-Vision commissioned the report "A Fifty Year Development Plan for the Province of Saskatchewan").

Examples of water agencies active in Alberta's South Saskatchewan River Basin

A number of provincial agencies are responsible for water in the South Saskatchewan River Basin in Alberta, including:

- *Alberta Environment* retains the bulk of the responsibilities for water in Alberta. *Alberta Environment* is responsible for surface and groundwater water allocation, flow regulation, water supply and flood forecasting, pollution control, regulation of municipal potable water systems, and developing watershed management plans in conjunction with local groups.
- *Sustainable Resource Development* is responsible for management of public lands, fish and wildlife, and forestry.
- *Community Development* is responsible for the management of provincial parks and protected areas.
- *Alberta Agriculture, Food and Rural Development* promotes beneficial agricultural management practices and environmental farm planning to protect the environment, and supports and conducts agricultural research. Alberta Agriculture, Food and Rural Development supports the development of water supply projects for the agricultural industry and assists with drought risk management planning for agriculture; it has also been very active in helping agricultural producers cope with water quality problems for agricultural needs and on-farm domestic water needs (household water).
- *Alberta Infrastructure and Transportation* administers grant programs which support the development of municipal water and wastewater utilities.
- *Regional Health Authorities (funded and controlled by Alberta Health and Wellness)* monitor private water supplies, municipal drinking water supplies and recreational water sources.
- *Climate Change Central* is a public-private partnership addressing issues related to climate change.
- *NGOs:* A variety of NGO agencies with an interest in water also exist, including environmental and conservation agencies, the *Alberta Irrigation Projects Association* and numerous irrigation districts such as the *Bow River Irrigation District*. Environmental agencies such as *Ducks Unlimited* and *Bow Riverkeeper* are actively involved in environmental protection projects and advocacy. Alberta also has chapter offices of some national advocacy groups (*e.g. The Sierra Club of Canada*). Policy NGOs such as *Canada West Foundation* have conducted research into water policy and natural capital, while groups such as *The Pembina Institute* have extensive material on sustainable development and climate change.

Water resource management is by shared jurisdictions
The above overview of departments and agencies with shared responsibilities or interests in water management is not comprehensive. The management of water in Canada is clearly distributed and shared between many jurisdictions. This inevitably gives rise to issues related to governance. [The issue of governance is developed in more detail as the third *institutional dynamic*, presented later in this document in the section entitled "Institutional Driver III: The Governance of Water in Canada"].

Most federal and provincial Canadian institutions manage water based on specific mandates for the respective agencies. When more unique formal arrangements are desired, the constitutional and institutional arrangements for water management in Canada often rely on developing specific federal-provincial government agreements. While this form of governance and water resource management is challenging, most government and non-government agencies share a common philosophy of managing water resources based on an "ecosystems approach" and "watershed/aquifer management approaches". Both approaches rely on an understanding of environmental issues and sustainable development principles (Policy Research Initiative[a,b], 2005 and 2004). The concept of a sustainable development approach to water resource management is the second institutional dynamic in Canada.

INSTITUTIONAL DRIVER II: SUSTAINABLE DEVELOPMENT / INTEGATED WATER RESOURCE MANAGEMENT

Canada was established as a nation in 1867, and the initial driver of water resource management in Canada was essentially related to nation-building. Water resources were developed to build the country. Water resource development projects and water infrastructure were constructed to encourage human settlement and economic prosperity. Water resource projects included the development of water supplies, water diversions, reservoirs, dams, and associated infrastructure works for the gamut of society's needs:

- canals and navigable waterways for transportation, shipping and navigation
- water as a source of steam power for the first railroad systems
- water as a source of energy in thermal and hydro-electric power generation
- water for drinking water sources and wastewater management for municipalities and urban centres
- industrial water and wastewater needs, including mining, forestry and agriculture (including irrigation)
- water used in the manufacturing of food and non-food products
- recreational water uses.

In the semi-arid prairies, water resource development for agricultural purposes was achieved with the construction of reservoirs and canals for irrigation projects. When the Canadian prairies were settled, the federal government recognized that water resources were scarce in this semi-arid region. The *Northwest Irrigation Act* was passed in 1894-1895 by the Dominion government (Saskatchewan Environment, 2000). The Act was designed to encourage settlement of the prairies; it established water management principles that would promote water development and allow for increased access to water for people and agriculture, with a focus on irrigation. The region grew in population and an agricultural economy was established, based on dryland farming and irrigated agriculture in selected locations. Over the years, after Canadian society and water infrastructure became more established, water development as a driver for

human settlement and the economy, gave way to sustainable development principles. Water management became more focused on the principles of integrated water resource management.

As the country was developed and time passed, Canadian society became increasingly aware that economic development could not be the sole driver for water management. In the 1980s, water development and its relationship with the environment was recognized as a critical factor for water resource management. Canada initiated an Inquiry on Federal Water Policy in 1985. In response to this inquiry, Canada established the ***1987 Federal Water Policy.*** The policy called for water resource management to improve economic performance and to also protect ecosystems. The policy also advocated a clearer and more consistent focus for the federal government, in matters related to water management (Environment Canada[b], 1987). The concept of managing water resources development in combination with environmental protection was an approach that was consistent with the emerging global concepts of sustainable development. The guiding principles of sustainable development were defined by the United Nations' 1987 Brundtland Report, "*Our Common Future*". Sustainable development principles unite development and the environment. At its core, sustainable development refers to *meeting the needs of the present without compromising the needs of future generations* (World Commission on Environment and Development, 1987).

Sustainable Development

During the 1990s, the federal government and many provincial governments reoriented and restructured their approaches to water management. Mitchell and Shrubsole[a] (1994) state that these changes were driven by a desire to meet the needs of sustainable development and ecosystem approaches in water management, after environmental challenges emerged from past water management shortcomings. The changes in the 1990s were also meant to increase water management effectiveness during a period of significant financial constraint, although the rapidity of change made it difficult for water managers and planners to understand who was responsible for what. Mitchell and Shrubsole concluded that several aspects emerged as important in the reorientation and restructuring of water management in Canada:

- Canada has evolved from a period of water development into a period of sustainable water management, but ambiguity exists about this concept and how to operationalize it
- water management change has been driven largely in response to local problems, and not from provincial or national water policy; the exception was the development of the ***1987 Federal Water Policy***, which resulted from the ***1985 Inquiry on Federal Water Policy***.
- governments were shifting from dealing with water as a resource to water as one component of an ecosystem; to do this, watershed management and aquifer/groundwater management principles were seen as the basis for sustainable water resource management
- all levels of government need to consider establishing new partnership arrangements to work with all stakeholders (including non-government organizations); and challenges exist with sharing or delegating responsibility and authority to such new partners
- unique water management needs of ***First Nations*** must be considered
- economic aspects of water management pricing and demand management are important factors to address, yet Canada appears to be behind other countries in considering market mechanisms
- water export is a topic that will need to be addressed
- data, information, knowledge and understanding are key factors in environmental water management; public education on environmental issues and sustainable water management will need to address the challenge that the public is poorly informed about the value of water.

The concepts of sustainable development are also firmly and clearly entrenched in the principles of integrated water resource management, and are described below.

Integrated Water Resource Management (IWRM)

At an international conference in Dublin, Ireland, nations around the globe adopted what has become to be known as the ***Dublin Principles of Integrated Water Resource Management***, sometimes referred to as "IWRM" (Dublin Principles, 1992). The principles state:

- Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.
- Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.
- Women play a central part in the provision, management, and safeguarding of water.
- Water has an economic value in all its competing uses and should be recognized as an economic good.

In 2002, Canada joined other nations at the World Summit on Sustainable Development in Johannesburg. Canada agreed to develop a national plan for IWRM under the leadership of Environment Canada, a key component of which will be water use in agriculture. It will guide future federal activities related to water (Johannesburg Summit, 2002). The IWRM approach recognizes that water is one component of a larger ecosystem, and accordingly, water is linked to other environmental resources, the economy and all aspects of society. Governments have long recognized the importance of planning, managing and developing water resources in the context of ecosystems that cover both terrestrial and aquatic resources. Although there is agreement about the need for an ecosystem approach, there is no common approach to foster it (Mitchell and Shrubsole[b], 1994). Many people and most government agencies have been promoting watershed management as the best strategy to manage a sustainable approach to water management. Watershed management is a strategy that promotes the joint management of a watershed by all of the stakeholders.

The idea of integrated water resource management has proven to be challenging. In 2004, the Policy Research Initiative observed that "The Walkerton crisis of 2000 [waterborne disease outbreak] served as a wake-up call in Canada. Now, IWRM is the preferred approach, and decision makers across the country are struggling to better understand the principles and practical implications of IWRM." (Policy Research Initiative[b], 2004).

In 2007, federal departments are reviewing and revising their water activities with an increasing focus on sustainable development and watershed management practices using "integrated water resource management" approaches. The federal lead for IWRM is Environment Canada. Individual federal departments have also developed or are developing water policies with respect to their mandates. For example, Agriculture and Agri-Food Canada (AAFC) held two *Ag-Water Forums* (in 2005 and 2007) to solicit input from the provinces on agricultural water strategies in support of IWRM, and to discuss agricultural perspectives on source water protection. AAFC is also developing a departmental strategic water plan that identifies IWRM as a key element.

As the lead in water resource management, provincial governments have developed comprehensive water policies for their jurisdictions. In Saskatchewan, the *Saskatchewan Watershed Authority* uses local advisory committee members to develop watershed and aquifer management plans. In Alberta, the *Water for Life Strategy* (Alberta Environment[b], 2003) has led to the establishment of *Watershed Planning and Advisory Councils* which are made up of local communities and stakeholders to lead watershed planning for their areas. The South Saskatchewan River Basin Plan is being led by government but has had strong local input (Alberta Environment[c], 2003).

Provincial and federal governments continue to work together on water resource management. Local participation is becoming more established as watershed groups are formed and become engaged in local water management decisions. There is an increasing understanding by all parties that water is a shared resource.

Shared mandates and participatory planning

The existence of shared federal-provincial water mandates has been a challenge for the implementation of watershed management. Local, regional, provincial and federal boundaries do not coincide with watershed or aquifer boundaries. The multitude of agencies with a vested interest in water makes water resource management decisions complex and difficult to achieve in a timely fashion. Coordination of water activities, programs and regulations is becoming increasingly complicated. These challenges are difficult enough for the visible surface water systems, but they are even more complicated for the unseen water systems below ground (*i.e.* ground water aquifers). Increased attention to groundwater management has become apparent among public agencies in the approach to sustainable water management. Sustainable groundwater management activities require quantifying the water resource, understanding water recharge mechanisms and possible contamination sources, and implementing policies that encourage best management practices for land use.

Water resource management often involves partnership arrangements that recognize a number of agencies with responsibilities for water. Watershed management requires decision-making by local governments or Non-Government Organizations (*e.g.* local watershed groups). These NGOs become responsible for water management to address issues within the local watershed. This dynamic requires appropriate levels of support from senior levels of government combined with a degree of empowerment or local authority to address regional and local issues. Participatory planning is essential for integrated water resource management. But some mechanism of conflict resolution will also be needed, when stakeholders cannot come to timely agreement on a critical water management decision.

Economic value of water

With the current trend towards sustainable development and integrated water resource management, governments are moving towards demand-management strategies (rather than supply-based strategies). Challenges exist in finding the balance between recognizing water as an environmental resource that must be protected, and valuing water as an economic resource that may improve economic performance. Demand management strategies often involve incorporating user-pay and full-cost pricing of environmental protection, conservation and development of water sources (this would include development of the water source, water distribution, and treatment if required). (See Policy Research Initiative[c], 2004, *Economic Instruments for Water Demand Management in and Integrated Water Resources Management Framework*).

Canadian water is generally treated as a public good, but some want water to be treated as a tradable market commodity. The sale, transfer or export of water beyond Canadian borders (bulk water removal) is prohibited in Canada (Environment Canada[d], 2004). The federal position is consistent with trade and environmental principles. Water in its natural state is not considered to be a good or a product subject to trade agreements. Public opinion in Canada has generally

opposed bulk export of water from Canada. (Environment Canada[e], 2004). However, there continues to be controversy over the potential sale of Canadian water as a free market commodity. Canadian fresh water is sold in the form of bottled spring water. A number of environmental groups and provinces are working to ban water exports permanently (McKenzie, 2002). Some groups argue that Canada should sell bulk volumes of water on the market like any other commodity. Others warn that the sale of bulk water under the North American Free Trade Agreement (NAFTA) leaves Canadian waters and measures designed to protect them vulnerable to foreign investor claims. A specific national bulk water export policy may yet be required in Canada.

Alberta allows transfers (sales) of water allocations *within* major basins under the new Alberta *Water Act* (2000). Water transfers are still controlled and authorized by the provincial government. In addition, the government may withhold 10% of the transfer as a water conservation holdback to be used to maintain stream flows for ecological needs.
Historically, water has been taken for granted and undervalued in Canada. Early water management practices were based on the mistaken assumption that Canada's water supply was unlimited. Even today, the prices charged for water in Canada are among the lowest in the world. Price is not always related to the volume of water consumed, and often the price charged for water is below cost. In these terms, it is not strange that Canadians consume more water per capita than any other country, except for the United States (McKenzie, 2002). Despite having 7% of the world's supply of renewable fresh water with less than 1% of the world's population, sustainable water management is very important for Canada (Environment Canada[f], 2006). The issue is one of distribution. The bulk of Canada's freshwater occurs in the north and drains north (60%) while most of the population (85%) lives in the south. As well, there is a great variation in precipitation in different areas of the county from west to east. As Canadians realize the importance of sustainability, water management practices and policies are being reoriented.

Canada has clearly embarked on a path that considers the interactions of water, the environment and society. However, of the four Dublin Principles of Integrated Water Resource Management, it is not clear how Canada will recognize water as an economic good with economic value. The economic value of water is not well understood nor well appreciated by the Canadian population. For example, the infrastructure costs of most community water and wastewater treatment systems are financed by property taxes; water users generally pay monthly fees that fund only the operation and maintenance of water delivery, and may therefore not appreciate a total cost accounting approach. Furthermore, it is unclear how economic value will be assigned to the ecological benefits of water resources. Some ideas on recognizing water as an economic good with economic value are offered by the Policy Research Initiative. Reporting to the federal government's Privy Council Office, the Policy Research Initiative produced a number of reports on water issues in Canada. The Policy Research Initiative notes that the establishment of different water pricing schemes and water markets may be useful if adopted in Canada; direct comparisons are made to other countries such as Chile, which has adopted a very unique free market approach to water management. (Policy Research Initiative[c], 2004).

Drinking Water Issues and evolving IWRM

Integrated water resource management considers all uses of water. Drinking water is essential to all humans. During the years 2000 to 2005, Canada experienced drinking water outbreaks in

Walkerton Ontario, North Battleford Saskatchewan, and Kasechewan Ontario, resulting in human deaths and disease. These drinking water outbreaks have had a profound effect on the way water is managed in the country. Canadian citizens now have a more acute awareness of water quality and water resource management issues in Canada. The issues converge on the need to understand and act on water management in a holistic manner, from the water source to the drinking water tap. Health Canada and the Canadian Council of Ministers of the Environment have recently emphasized the need to recognize the inter-relationship of health and environmental issues, and recommend adopting a multiple barrier approach from the water source to the drinking water tap (Health Canada[a], 2002; Canadian Council of the Ministers of the Environment, 2004). Watershed management, aquifer management, source water protection, and effective water treatment, distribution and monitoring are all promoted as instrumental features in safeguarding public health with drinking water supplies.

While Canadian provinces have jurisdiction over most water management issues, guidelines applicable to water management issues such as drinking water quality or protecting aquatic life are developed nationally with input from federal and provincial/territorial experts (Environment Canada[g], 2004). Drinking water guidelines are non-enforceable at the national level. In the 1990s, resources for the enforcement of environmental and health regulations were reduced in many jurisdictions due to fiscal restraint by all levels of government. The recent drinking water outbreaks in Canada, noted below, did not occur within the South Saskatchewan River Basin, but the water contamination that occurred in Walkerton, North Battleford and Kasechewan, highlight some of the issues around water management practices in Canada. Individually, each case has had a significant effect on the evolution of water management in Canada. A brief description of each case is listed below. The fourth case listed below notes water management challenges facing rural water users and private water supplies.

> **In May of 2000, the drinking water system for Walkerton, Ontario became contaminated with *E. coli*.** As a result of the contamination, 7 people died and over 2,300 people became ill (of a total population of 5,000). Some people may endure lasting health effects (O'Connor[a], 2002). The source of the contamination was manure that had been spread on a farm near one of the town's wells. An excessive rain event carried manure into one of the community's water wells. According to the report on the Walkerton inquiry (which was conducted to determine what happened, who was responsible, how to prevent it from happening again, *etc*.), the outbreak could have been prevented. The farm was following proper practices and was deemed not to be at fault for the contamination (O'Connor[b], 2002). The outbreak could have been prevented by maintaining a continuous chlorine residual and the use of turbidity monitors at the affected well. According to the report, "The failure to use continuous monitors …resulted from short-comings in the approvals and inspections programs of the Ministry of the Environment (MOE). The Walkerton Public Utilities Commission (PUC) operators lacked the training and experience necessary to identify either the vulnerability of Well 5 to surface contamination or the resulting need for continuous chlorine residual and turbidity monitors" (O'Connor[c], 2002). The report noted a number of systemic issues around water management, and offered an extensive series of recommendations, including water source protection, multiple barrier water treatment methods, and systemic checks and balances to ensure the delivery of safe drinking water. Across Canada, many water resource management agencies have followed this case closely, and have made changes to their policies, operations and mandates to improve the safety of drinking water in Canada.
>
> **Unfortunately, one year after Walkerton, in April, 2001, the protozoan parasite *cryptosporidium parvum* was detected in the drinking water system for North Battleford, Saskatchewan.** (North Battleford is a city of approximately 15,000, located on the North Saskatchewan River). The parasite entered the water system through the drinking water treatment plant that draws raw water from the North Saskatchewan River. The river has background concentrations of this parasite, and North Battleford's

sewage outlet was also upstream of the city's drinking water intake. Six to seven thousand people became ill after drinking the water. The inquiry into the North Battleford incident found that "accepted industry standards and practices for the treatment of surface water are far more specific and demanding than what was specifically identified in government regulations and guidelines, or in North Battleford's permit to operate a surface water treatment plant."(Laing, 2002) A variety of recommendations were made to improve local and provincial water management. For example, recommendations were made to improve North Battleford's wastewater treatment plant and relocate the sewage discharge downstream of the drinking water river intake, and to improve North Battleford's water treatment processes to achieve more effective multiple barrier water treatment. Changes to local and provincial guidelines and procedures were recommended to ensure the delivery of safe drinking water in Saskatchewan. The most significant recommendations were directed at Saskatchewan Environment, Saskatchewan Health and the City of North Battleford. In response to issues raised around watershed management, a new provincial agency was created. The *Saskatchewan Watershed Authority* was formed on Oct. 1, 2002 by merging elements of Saskatchewan Environment and SaskWater. This new agency has a direct mandate to manage and protect water resources around the principles of watersheds, aquifers and ecosystems.

Drinking water problems have not been fully resolved, and in 2005, Kashechewan First Nation in Ontario experienced an outbreak of *E. Coli*. Water quality issues for First Nations have been noted for some time. In 2001, Indian and Northern Affairs Canada reported that water issues existed in First Nations drinking water supplies. In 2003, the Ontario Clean Water Agency released a major report calling Kashechewan "a Walkerton-in-waiting."(as reported by CTV.ca[a], 2005). When the *E. Coli* outbreak occurred in 2005, the Kashechewan First Nation received national media attention for the contamination of the community's treated drinking water supply. The detection of water contamination became an increasing concern for other First Nations across the country, and for federal and provincial governments. Concern was expressed about the plight of drinking water for First Nations communities, and water quality problems that have the potential to affect human health (with extensive coverage by CTV.ca[b], 2005 and CBC.ca, 2006). To protect human health in the Kasechewan case, most of the 1,900 residents were relocated from the northern community to southern Ontario, until the water issues could be addressed. The causes of the problems were deemed to be related to infrastructure problems (the drinking water intake is downstream of a sewage lagoon – the river is tidal and flows both directions), equipment operation and maintenance problems, improper training, lack of government inspections, *etc*. (CTV.ca[a], 2005). Because Kasechewan is a First Nations community, questions were also raised regarding the shared responsibilities of federal, provincial and First Nations governments. Health Canada reported that over 80 First Nations communities were under Boil Water Warnings across Canada as of October 27, 2005 (CTV.ca[b], 2005). The federal government's ***Office of the Auditor General of Canada*** reported that First Nations do not benefit from a similar level of drinking water protection to citizens living off First Nations reserves, partly because there are no laws and regulations governing drinking water on First Nations communities. The Auditor General reported that Indian and Northern Affairs Canada and Health Canada have responded and accepted the Auditor General's recommendations, except for the regulatory regime (Indian and Northern Affairs Canada, 2005). The federal government is consulting with First Nations about regulatory options (Health Canada[b], 2005; Office of the Auditor General of Canada, 2005, Indian and Northern Affairs Canada, 2006).

On-going water quality issues also exist for rural and remote users, particularly for small systems. Rural communities across Canada face water treatment challenges. Boil Water Warnings are one tool used to safeguard public health, to ensure citizens are informed when water is not safe for drinking. In the province of Saskatchewan, there were 61 Precautionary Drinking Water Advisories, and 2 Emergency Boil Water Orders (both issued for *E. Coli*) in "Communities" as of February 6, 2007 (SaskH_2O[b], 2007). Rural and remote small drinking water systems also face challenges. This is not uncommon in many provinces. As of January 24, 2007 in Saskatchewan, there were 10 Precautionary Drinking Water Advisories, and 31 Emergency Boil Water Orders (27 issued for *E. Coli*) for "Public Water Supplies Under Health Region Responsibility." These are small systems such as outfitters, lodges, Rural Municipality wells, *etc.* (SaskH_2O[b], 2007). Water quality problems extend to private water supplies for farms and acreages and may also pose a concern for public health. Over 4 million rural Canadians rely on private water supplies. It is estimated that 20% of Canada's reported waterborne disease outbreaks occurred in private supplies during the period 1974-1996, and an additional 45% occurred in non-municipal systems (Robertson & Neil,

2001). While private supplies are the responsibility of citizens, federal and provincial institutions advocate protecting rural water safety from the source to the on-farm tap. It is also recognized that unique challenges exist in dealing with the water quality needs of agricultural users and other rural or remote users (Corkal *et al*, 2004).

The combined effect of these above-noted waterborne disease outbreaks, has been to serve as a catalyst for water resource management change across the country. Virtually all Canadian provinces, most municipalities and many water utilities have reacted to these waterborne disease outbreaks and subsequent inquiries. Many federal and provincial departments have reviewed and/or modified their roles and policies related to aspects of water management. The common change is that local, provincial and federal agencies are adopting watershed management approaches. Protecting the watershed is the first step in the water treatment process. Water resources are now viewed more holistically - from their source to the end-use tap. Multiple barrier water treatment is a stated common goal. Many provinces have subsequently begun to adopt new water management strategies. For example, Manitoba created *Manitoba Watershed Stewardship,* and an *Office of Drinking Water*. Saskatchewan created the *Saskatchewan Watershed Authority.* Alberta is reviewing all of its drinking water facilities to determine which ones are at risk of watershed impacts. Alberta is also adopting watershed management principles under its new *Water for Life* strategy (Alberta Environment[d], 2003 and 2006). Provinces are establishing safe drinking water strategies, beginning with protecting water in the environment.

It is clear that the institutional dynamics of water resource management in Canada involve decentralization and shared jurisdictions (the first institutional driver). Sustainable development approaches to water resource management have been recognized since the late 1980s in Canada (the second institutional driver). However, the implementation of integrated water resource management has proven to be challenging in Canada. In the period 2000 to 2005, drinking water disease outbreaks in Canada have emphasised the need for more effective water resource management strategies. Protection of water in the watershed is increasingly recognized as necessary by all of society. Perhaps the most pressing and challenging dynamic is the third institutional driver, namely, the *governance of water in Canada.*

INSTITUTIONAL DRIVER III:
THE GOVERNANCE OF WATER IN CANADA – THE NEED FOR LEADERSHIP, COORDINATION, and FOCUSED, CLEAR ROLES FOR WATER AGENCIES

A brief overview of governance

Water management requires knowledge of the physical sciences (*e.g.* biology, chemistry, physics, natural processes such as climate, hydrology and hydrogeology, *etc.*). Water management requires knowledge of the multiple interactions of the natural environment with human society. Integrated water resources management also requires knowledge of the social sciences (*e.g.* economics, law, sociology, psychology, education, communications, *etc.*). Water management requires effective and timely decision-making, sometimes when stakeholder interests are in competition or in conflict. Decisions and management must consider sustainable development and environmental protection, economic growth, and the multiple needs for society. Inevitably, water management requires decisions that affect society and the environment.

As earlier noted in “Institutional Driver I: Decentralization and Shared Jurisdictions”, water management responsibilities in Canada are shared between many federal and provincial government departments. Public institutions have established specific areas of responsibilities for the different levels of government. The definition of water as a “public good” requires an effective and efficient governance structure of water resources. Data gathering, knowledge, cooperation, communications and sharing of information and human resources are basic pre-requisites. The Canadian strategy principally involves federal-provincial agreements, and local decision-making arrangements. This approach is complex because of the complexity of the water management issues, the shear number of agencies and stakeholders with a vested interest in water, and the division of responsibility and authority. When the approach is successful, decisions are shared by the majority of agencies and stakeholders. This process is ideal when agreement is achieved. This approach is less successful when disagreement or conflict arises, or when the process prevents effective and timely decision-making. A brief summary of federal-provincial water management responsibilities are repeated in the next several paragraphs, to set the context for governance.

Environment Canada has responsibility for the *Canada Water Act* which enables federal cooperation with the provinces in a number of water management areas. The Canadian Environmental Assessment Agency also reports to the Minister of the Environment. Fisheries and Oceans Canada is responsible for the *Fisheries Act*, which confers responsibility to the Minister for the management of fisheries, habitat and aquaculture. Transport Canada is responsible for protection of navigable waters. A number of other responsibilities are shared between the federal and provincial governments, including inter-provincial and international water issues, water issues where there is significant national concern, water quantity and quality, and agriculture.

The Canadian federal government conducts research and provides guidelines and regulations for water management; it plays key roles in scientific research, information gathering, monitoring, and knowledge outreach. The *Canada Water Act* is administered by Environment Canada and calls for joint consultation between the federal and provincial governments in a number of water management areas. The introduction to the act states that it is: “An Act to provide for the management of the water resources of Canada, including research and the planning and implementation of programs relating to the conservation, development and utilization of water resources.” The *Canada Water Act* calls for joint consultation between the federal and provincial governments in matters relating to water resources. Joint projects involve the regulation, apportionment, monitoring or surveying of water resources, and the pre-planning, planning or implementation of sustainable water resource programs.

Agreements for specific water programs arrange for the participating governments to contribute funding, information and expertise in agreed ratios. For ongoing activities such as the water quantity survey agreements with each province, cost-sharing is in accordance with each party's need for the data. For study and planning agreements, frequently the federal government contributes 50% of the costs with the provincial government(s) contributing the other half. Planning studies involving the federal government often focus on large inter-provincial or international basins, or in areas that the federal government deems important for economic development or for the potential for significant environmental impact. Implementation of

planning recommendations occurs on a federal-provincial basis. Cost-sharing of the construction of works often includes contributions from multiple levels of government, with the local government being the key player.

While providing national leadership to ensure that Canada's freshwater management is in the national interest, Environment Canada also actively promotes a partnership approach among the various levels of government and private sector interests that contribute to and benefit from the wise management and sustainable use of the resource (Environment Canada[h], 2006). As previously noted, Environment Canada is the federal national lead for Integrated Water Resource Management.

Under *The Constitution Act* (Justice Canada[a], 1867 to 1982) and subsequent agreements such as the *Natural Resources Transfer Agreement* provinces have assumed the primary responsibility for the management of their water resources, which includes both surface and groundwater (Percy, 2000). The provinces are responsible for flow regulation and authorization of water use development, and they have the authority to legislate areas of water supply, pollution control, and thermal and hydroelectric power development. Provincial governments often enter into arrangements with the federal government in order to jointly address issues such as developing and coordinating the implementation of water policies and programs, as well as setting research priorities.

Although water is managed as a provincial resource, water resources often cross many political boundaries, including local, provincial, and in some cases even international boundaries. Most of the rivers in the Canadian prairies flow from west to east, crossing from one province into another. Runoff from the eastern slopes of the Rocky Mountains is the major water supply for the large southern rivers of the prairie provinces, including the South Saskatchewan River. The rivers generally flow eastward across Alberta, Saskatchewan and Manitoba and eventually flow into systems that drain northward into the Hudson Bay. Ground water aquifers also cross political boundaries. The ownership of the waters of a river system flowing through several jurisdictions, or a ground water aquifer shared by many jurisdictions, can give rise to many administrative and water use issues.

Due to the semi-arid conditions of the Canadian Prairies, water management has evolved in a unique manner. To address the above-noted inter-jurisdictional issues, the governments of Canada, Alberta, Saskatchewan and Manitoba formed the ***Prairie Provinces Water Board*** (***PPWB***) in 1948. The PPWB is one example of institutional adaptation to deal with water management issues affecting three provinces. Provincial and federal agencies established a special water management agreement to deal with water resources that cross the three provincial borders. The PPWB and its method of water resource management has been internationally recognized as a very unique and innovative approach to managing water resources where multiple jurisdictions are involved. The following excerpts describe the function and history of the board (Environment Canada[i], 2003):

> "Saskatchewan, Alberta, Manitoba and Canada formed the Prairie Provinces Water Board (PPWB) in 1948 to recommend the best use of inter-provincial water, and recommend water allocations between the provinces. This method worked well until the 1960s, when the provinces began requesting large allocations of water. Since the approach used by the Board was no longer adequate to allow long-term water planning by the provinces, a new system for sharing this limited resource was developed."

> "In 1969, the parties to the original agreement signed the Master Agreement on Apportionment, which continues to guide board activities to this day. This document contains a simple formula based on the principle of equal sharing of available water in the prairies. The formula states that Alberta and Saskatchewan may each take up to one half of the natural flow of water originating within its boundaries and one half of the flow entering the province. The remainder is left to flow into Manitoba."
>
> "The mandate of the Prairie Provinces Water Board is to ensure that eastward flowing inter-provincial streams are, in accordance with the provisions of that Agreement, shared equitably, that water quality at inter-provincial boundaries is maintained at acceptable levels, and to facilitate a cooperative approach for the integrated development and management of inter-provincial streams and aquifers to ensure their sustainability."

The provincial and federal governments set guidelines and regulations for water management. As outlined in the section of this paper entitled "Institutional Driver I: Decentralization and Shared Jurisdictions", there are numerous government institutions with responsibility for water issues, but active day-to-day management of water is increasingly undertaken by smaller local institutions. Stakeholders and residents often organize to manage and protect local water resources. Local institutions have tended to develop in conservation districts, in watersheds, in areas dominated by irrigated agriculture, and in sensitive drought prone areas. Examples of local institutions include *Partners FOR the Saskatchewan River Basin*, the *Bow River Basin Council*, the *Swift Current Creek Watershed Stewards*, and *Special Areas Board of Alberta.* Responsibilities may vary and mandated authority is not always clear.

The Need for Leadership, Coordination and Focused, Clear Roles

In the 1980s, public concern over environmental pollution and water resource management in Canada was growing. The ***1985 Inquiry on Federal Water Policy*** was the basis for the creation of the ***1987 Federal Water Policy.*** In essence these reports called on the federal government for leadership in the area of water resource management. Visionary for its time, with sound policy recommendations that for the most part are still valid, it is unfortunate that the 1987 Federal Water Policy was never fully acted upon, and that a national strategy was never developed.

The Final Report to the ***1985 Inquiry on Federal Water Policy*** found that "The constitution does not mention water", and "it is impossible to define precisely the respective roles of the federal and provincial governments in water management" (Pearse *et al* [c], 1985). In 1986, Pearse concluded the Canadian public perceived water policy "as piecemeal, lacking coherence, and hence inadequate to ensure that water will be managed appropriately in the face of conflicting demands…As water has emerged as a mainstream issue, so has the general perception that water policy and administration is disorderly, fragmented and weak."(Pearse, 1986).

In 1990, Shrubsole noted that "Canada has not adopted a single solution to remedy water management problems. Canadian federalism discourages a single national perspective…[and this] is reinforced in the Constitution…. Rather than adopt a uniform approach to problems, institutional arrangements for the management of water resources resemble a patchwork quilt."(Shrubsole, 1990).

In 1994, the author of the ***1987 Federal Water Policy*** looked back in time, to reflect on the changes and progress achieved over six years. Pearse wrote: "In retrospect, this [the 1987 Federal Water Policy statement] was the high-point in federal water policy. Since then, over the

last six years, the federal commitment to water has disintegrated." He attributed the declining progress towards a national water strategy to be a result of a variety of influences:

- federal program priorities on water changed
- the Canadian Council of Ministers of the Environment abolished its advisory committee on water (which had been designed to review the potential for a national strategy)
- federal water staff retired or were re-assigned
- regional offices were closed
- water funding was cut
- "All this was done without public announcement….the federal concern with water appears to have come full circle, insofar as it has become, once again, incidental to other policy issues...the coherent approach envisioned by the Federal Water Policy has languished."

Pearse forecasted that the future federal role in water management may be more modest than originally-envisioned by the 1987 Federal Water Policy, but he concluded that the federal role must be coherent and consistent, "…or the Government of Canada will find itself without the capability to administer even a modest water policy"(Pearse, 1994).

Over ten years later, in 2005, the Policy Research Initiative published a Briefing Note entitled, *Federal Commitments to Freshwater: Three Generations of Sustainable Development Strategies*. The document reported that "…the current institutional governance of water leads to fragmentation of the issue between many federal departments and agencies…" (Policy Research Initiative[d], 2005).

If governance is the key issue of institutional dynamics in Canada, this is in sharp contrast to the key issue of free market water commodity management in the Chilean case. In the Canadian context, the concept of government guidelines, standards, and regulations presume some degree of protection of water as a public good, but this works only insofar as guidelines are acted upon in the best interest of society. The water governance dynamic in Canada is truly a constitutional dynamic, where provinces have retained ownership of water as a natural resource, and where there are many federal, provincial, municipal and other non-government agencies, each with unique interests in water management. Because of this constitutional arrangement, the senior federal government must respect individual provincial water management mandates. Accordingly, the federal role is sometimes unclear.

In 2005, a federal Senate Committee published a report entitled *Water in the West: Under Pressure*, an investigation commissioned to report on water management and sustainable development in the prairies. The Senate Committee made strongly-worded and candid observations (Banks and Cochrane[b], 2005):

- Canadians take water for granted.
- In some areas, water demand matches or exceeds what is renewed.
- Climate change is affecting the water cycle.
- Unacceptable information gaps exist (particularly with respect to ground water aquifers); this "lack of knowledge is stunning".
- Federal activities are "uncoordinated".
- Federal government action and leadership is necessary.
- Canada needs a "national approach that transcends interdepartmental squabbles and interjurisdictional boundaries".

The Honourable Tommy Banks, Chair of the Standing Senate Committee on Energy, the Environment and Natural Resources concluded his report as follows (Banks and Cochrane[c], 2005):

> "The fact is that certain regions of Canada, notably in the prairies, face important water challenges…
>
> Water is too critical a resource to be ignored. The threats to water availability and quality are real and are particularly evident in the West. Population growth, economic expansion and climate change all contribute to putting western Canada's water resources at risk.
>
> These emerging challenges need to be addressed head on, and soon. There is no more time to waste. The longer we wait, the more it will cost to respond and adapt.
>
> It is your Committee's view that the Government of Canada has not been paying appropriate attention to the emerging water crisis in western Canada. Years of neglect coupled with budget cuts to scientific research and monitoring programs have eroded the ability of policymakers to analyze and respond to the water issues that affect the lives of millions of Canadians…
>
> It is time for the Government of Canada to reinvest in water…
>
> Canada's scientific institutions are second to none. The Government of Canada was once a well-respected leader in advancing the scientific study of water. The time has come for the Government of Canada to take up that leadership role once again."

In 2005 the Senate Committee made a number of recommendations beckoning the Government of Canada to take immediate action, provide renewed leadership and address pressing systemic water issues, or risk the consequences of inaction, a warning remarkably similar to that provided by Pearse in 1994. The Senate Report's recommendations were directed to deal with pressing water issues in Western Canada, and include recommendations for the Government of Canada to:

1. Map Canada's major aquifers by 2010, with data available in a national database.
2. Work with industry and other orders of government to standardize the collection and reporting of water-related data.
3. Restore funding for longitudinal water studies [*i.e.* across Canada]
4. Bolster support for the National Water Research Institute and Prairie Farm Rehabilitation Administration to address Western Canada's growing water challenges.
5. Create a National Water Council with representatives from industry, research institutes and all orders of government to identify key water issues that require federal government attention.

SUMMARY

This overview of Canadian institutions and their relationship to water was developed to better understand the institutional framework within the Canadian context, primarily within the South Saskatchewan River Basin and the agricultural zone of southern Alberta and Saskatchewan. It is clear that decentralization and shared jurisdictions has led to evolution of a large number of institutions with shared interests in water, water resource management, economic development and the environment. As one factor alone, the large number of institutions makes integrated water resource management a daunting task.

Water is a critical resource to society, development and the environment. Water resource management is multi-jurisdictional. Shared jurisdictional management requires negotiation, agreement and timely decision-making. Federal, provincial and local roles must be clear and institutions must be equipped to manage water resources effectively. Water resource

management trends recognize water as an environmental resource that must be protected for all of society and for the sake of environmental preservation. For some time, integrated water resource management principles have been advocated, but the method of achieving organizational integration is not clearly established.

A key principle of integrated water resource management recognizes water as an economic good with economic value. This is of paramount interest to all of society, as people require water for food, food production, industry, transportation, energy and recreation. Water may also have economic value for environmental preservation. It is not clear how Canadian society and Canadian institutions will attempt to place economic value on water.

These complexities of water resource management are largely affected by the most critical institutional driver in Canada, the subject of governance. Water institutions need to have clear roles and mandates, and sufficient stability to ensure that water issues do not fall victim to changing priorities over time. Long-term planning and stable approaches are essential for managing such a critical resource. Water resources will always require environmental protection. Society will always need water for sustainable development and economic prosperity. Changing climate and increased water demands will lead to new water resource pressures. Competition for water may lead to water conflict. Society will need to address water resource management effectively and efficiently for the benefit of society and the environment. Progress on improving water governance in Canada has proven to be difficult to attain. Implementing changes to governance has proven to be complex and time-consuming. Water governance will continue to be an institutional driver for water management in Canada. Canadian society will eventually be required to find new ways to address this institutional driver.

Water and the environment are cross-cutting issues involving inter-disciplinary approaches. The constitutional arrangement in Canada poses unique challenges to water resource management. Since the 1980s there have been increasing calls, indeed federal inquiries and commissions, recommending more proactive involvement of the senior federal government in the area of water resource management. While improvements have been made, some setbacks have also occurred. To date, it may still be argued that Canada continues to face a “patchwork quilt” of agencies working in water. Is there a better way to deal with the complex issues involving institutions? Is there a better way to address shared and separate roles, mandates and jurisdictions? Will Canada create a new way to deal with the challenges affecting water resource management?

Integrated water resource management will require all orders of government to work together, both within and between their own hierarchies. All orders of government will also need to engage and empower all stakeholders, including citizens, industry and academia. To truly achieve sustainable integrated water resource management, Canadian institutions will require clear and focussed roles and responsibilities. Timely decision-making will be necessary, and new capacity will need to be developed to deal with water conflict. A co-ordinated approach is needed, with improved integration of federal, provincial and local water resource management institutions. Should this be achieved, Canada will begin to bring to fruition the vision expressed by Pearse in *Currents of Change.*

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