

# Integrated Watershed Management

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## Introduction

Canada has been engaged in Integrated Watershed Management (IWM) for many years. The *Canada Water Act* enables co-operative agreements for consultation and collaboration between the federal, provincial, and territorial 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 resources programs. The planning studies encompass interprovincial, international, or other basins where federal interests are important. Implementation of planning recommendations occurs on a federal, provincial, territorial or federal-provincial-territorial basis. Agreements for specific water programs provide for the participating governments to contribute funding, information and expertise.

Canadian jurisdictions are increasingly moving to adopt integrated water resources management as a central water management strategy. Many provinces are implementing new policies and/or legislation to support changes from traditional water management planning based on water allocation issues, to integrated watershed management (IWM) planning supported by partnerships with the United States, municipalities, large industrial users, energy companies, agricultural producers, non-governmental organizations, and First Nations.

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## "Integration" is the Operative Word for IWM in Canada

As Canada's population expands and the pressures on our water resources grow, the need for an integrated approach to managing these resources is being increasingly recognized within and across federal, provincial, and territorial jurisdictions. Integrated Watershed Management (IWM) is viewed as a multidisciplinary and iterative process that seeks to optimize the contribution of

aquatic resources to the social, environmental, and economic welfare of Canadians, while maintaining the integrity of aquatic ecosystems, both now and into the future. Resource managers in Canada have come to recognize that the integration on which this approach depends happens at many levels. Globally, many principles have been deemed important to achieving IWM, and these are being used to help guide the design and application of IWM approaches in Canada.

IWM in Canada brings together the work of federal and provincial/territorial governments, Aboriginal peoples, and other stakeholders -- municipalities, industry, energy, agriculture, non-governmental organizations, community groups, and research teams -- into full partnership in the processes of planning, decision-making, management, and implementation.

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## Primary Strategies for IWM Actions in Canada

### Governance

#### *Designing governance mechanisms within and across jurisdictions*

Effective mechanisms for governance of water are essential to fostering an integrated management approach, and many such mechanisms are in use in Canada. One example of an international governance mechanism is the [International Joint Commission](#), which was established under the 1909 Boundary Waters Treaty between Canada and the United States to help anticipate, prevent, and resolve water disputes over boundary and transboundary waters, in particular the Great Lakes. The Commission, a model of binational cooperation for these waters, serves as an independent and objective advisor to governments, typically addressing and recommending ways to resolve transboundary water issues through bilateral arrangements that often use existing mechanisms at the federal and provincial-state levels of the two countries. Furthermore, for specific water issues or watersheds, Canadian provinces and U.S. states are working together in various binational initiatives and forums. For instance, Ontario and Quebec are associate members of the [Great Lakes Commission](#), an American organization created by joint legislative action of the eight Great Lakes states in 1955.

Promoting similar cooperation at the national level, the [Canadian Council of Ministers of the Environment](#) and the Canadian Council of Resource Ministers provide a formal mechanism for effective intergovernmental discussion and coordinated approaches to regional and national environmental issues, including water management. The federal and provincial/territorial governments also cooperate on the national collection of water quantity information through national hydrometric agreements. Regional cooperation in water management is also achieved through bodies such as the [Prairie Provinces Water Board](#), created to ensure that interprovincial surface waters and groundwaters are equitably shared by Canada's Prairie provinces and to prevent potential conflicts.

Innovative governance mechanisms for water management are actively encouraged. For example, Manitoba was the first jurisdiction in Canada to combine all water and aquatic resource functions into one department: [Manitoba Water Stewardship](#). There is also much activity under way to strengthen governance at the watershed level in Canada. Ontario's [Conservation Authorities](#), for example, have been promoting IWM since 1946. Under the *Conservation Authorities Act* (1946), watershed municipalities can cost-share water management activities, including flood control, dam maintenance, floodplain management, soil erosion, reforestation, recreation, and education. Today, there are 36 Conservation Authorities in all major populated watersheds in Ontario. Watershed councils are being established in Alberta, Saskatchewan, Manitoba, and Quebec. Numerous non-governmental watershed stewardship groups are also active in many areas.

### *Guiding principles*

- Recognition of the values of water to environment, economy and society; and
- Stakeholder representation, support, and involvement

### *Desired enabling environment*

- Market and non-market values for aquatic resources; and
- Inclusive and transparent governance and coordination mechanisms (boards, authorities)

### *Desired results for areas of federal action*

- Partners and stakeholders collaborate at basin and sub-basin levels, and decision-making is integrated, timely and adaptive

### **Instruments and tools**

#### *Applying the right mix to achieve results*

IWM must be grounded in a strong legal and regulatory framework and carried out by designing and using an appropriate mix of instruments and tools. Canada's 1987 [Federal Water Policy](#) incorporates integrated planning as a key strategy and contains many of the recognized components of IWM. Key examples of current federal initiatives that support IWM include the First Nations Water Management Strategy 2003, which applies a multi-barrier approach to the protection of source and drinking water quality for First Nations communities; Infrastructure Canada which provides funds to construct and upgrade municipal water and wastewater treatment systems and encourages watershed planning and demand management; and the Agricultural Policy Framework, which includes measures to improve the environmental performance of Canada's agriculture sector. Also, the federal ecosystem initiatives (Atlantic Coastal Action Program, St. Lawrence Action Plan, Great Lakes Action Plan, Northern River Basins Study/Northern Rivers Ecosystem Initiative, Northern Ecosystem Initiative, Georgia Basin Ecosystem Initiative), which are implemented in partnership with stakeholders, promote IWM in key areas across Canada.

At the provincial/territorial level, important strides are being made towards implementing IWM, with recently introduced water policies promoting source-to-tap drinking water protection plans or broader watershed management planning. In all cases, the move is towards improved governance, integrated management, better data and information, greater transparency and accountability, full stakeholder involvement, and an emphasis on clear goals and results. Many provinces are introducing new policies and/or legislation to support changes in governance. For example, the Province of Alberta's Water for Life strategy introduces a transition from traditional water management planning (focusing on water allocation issues) to integrated watershed management planning supported by a shared governance model, and Ontario has moved forward with a comprehensive approach to protecting sources of drinking water. This fast-moving trend of policy and legislative reform is expected to continue as jurisdictions more fully come to terms with the need to manage their water resources for sustainability.

Government and non-government groups alike are also making greater efforts to keep Canadians better informed about water issues and sustainable practices. Public awareness campaigns, information workshops, and a wide range of field activities are among the many ways in which Canadians and their communities receive information and learn how to act on it. One initiative to improve communication and reporting aims to develop a new National Water Quality Indicator. This indicator will use the Canadian Council of Ministers of the Environment water quality index as a tool to report on the quality of Canada's water at a national scale.

### *Guiding principles*

- Reflection on relationship with land use, other environmental issues, and ecosystem linkages; and
- Defining the right balance of actions for effective implementation

### *Desired enabling environment*

- Integrated policies, programs, and water management plans that address multiple issues and their linkages;
- Integrated models for trade-off and optimization analysis; and
- Design and deployment of a mix of measures (voluntary, regulatory, and market-based instruments)

### *Desired results for areas of federal action*

- Effective and efficient programs, measures and actions are in place to achieve desired outcomes

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## Science and technology

### *Informing decision-making*

Many of Canada's universities house specialized centres for water science, and both federal and provincial/territorial governments undertake research on an extensive range of water issues. Water-related expertise resides in all of the Government of Canada's science-focused departments, and specialized research organizations, such as the [National Water Research Institute](#), carry out comprehensive research and development in the aquatic sciences in partnership with Canadian and international science communities. The collaborative work of Canada's water research partners has contributed to two integrated national assessments of the state of water quantity and quality in Canada: *Threats to Water Availability in Canada* and *Threats to Sources of Drinking Water and Aquatic Ecosystem Health in Canada*. It has also contributed to the development of new water-related technologies, such as methods and equipment to reduce or eliminate undesirable substances from drinking water and wastewater, remediate contaminated groundwater and sediment, and promote the production of clean water.

Canadian researchers use baseline data from databases developed from national surveys of water and climate and maintained by the federal government. In many cases, data collected by provincial agencies are maintained by the provinces or contributed to the federal database, thereby providing research with a solid basis. Research and development efforts made by governments, businesses, and universities (e.g., the [Canadian Water Network](#)) have resulted in the introduction of technologies that address various water issues and concerns. Canadian industry includes a number of companies that develop and produce technologies that are used to reduce or eliminate substances that may be harmful to human health or the environment from either drinking water or wastewater. The National Water Research Institute has also developed advanced technologies for the remediation of contaminated groundwater and sediment. In partnership with industry, governments also play a key role in the development of clean technologies. As an example, the Technology Partnerships Canada technology investment fund supported the development of environmental technologies, including both water and wastewater treatment.

### *Guiding principles*

- Clear focus and orientation towards results and evidence-based decision-making; and
- Basis in scientific principles, sustainable management, and precautionary approaches

### *Desired enabling environment*

- Measurable outcomes, goals, targets; and
- Sound scientific and economic data and information

### *Desired results for areas of federal action*

- Decision-makers and water managers have access to relevant scientific and economic information to guide and evaluate water management

## Monitoring and assessment

### *Creating a reliable and accessible information base*

Good environmental monitoring, data collection, comprehensive assessments and interpretation, and sound management and distribution of information are needed to support the many levels and types of decision-making involved in IWM. Currently in Canada, water information is held in many different databases by many agencies located across the country, and decision-makers are looking at how to improve the systems that permit access to the information they need.

Water quantity and climate monitoring are carried out across the country through national programs under the responsibility of Environment Canada. Water quantity monitoring is undertaken through Environment Canada's hydrometric program and carried out under formal agreements with the provinces and territories. Work is devoted to the collection, interpretation, and dissemination of surface water quantity data and information.

For water quality monitoring, several federal-provincial/territorial agreement-based networks exist, and some provinces have their own networks in place; however, a more coordinated and comprehensive approach is needed. To that end, collective efforts are being made through the Canadian Council of Ministers of the Environment to revitalize capacities and build a Canada-wide integrated network for water quality monitoring. The long-term goal is to achieve a national, scientifically sound measurement and assessment network for aquatic ecosystems.

With respect to drinking water quality, Health Canada, provincial/territorial health departments, and their partners are monitoring waterborne disease under the National Enteric Surveillance Program. Health Canada and the provinces/territories also collaborate in the development of the Guidelines for Canadian Drinking Water Quality. Health Canada provides the scientific and technical expertise to these efforts, the results of which are used by every jurisdiction in Canada and are the basis for establishing drinking water quality requirements for 31 million Canadians. Similarly, over 300 Canadian Environmental Quality Guidelines, which are related to the protection of aquatic ecosystems, the quality of sediment and soil, and the assessment of contamination in aquatic life, have been developed collaboratively by jurisdictions. Efforts are currently under way to connect these health and environmental guidelines with other assessment tools (e.g., indices to establish strategies for the protection of drinking water sources).

Work is under way to build a comprehensive information system for the environment that will mobilize existing networks, interconnect different water databases, and provide one-window access to users seeking water information. Another broad source of water information is Statistics Canada's national environmental reports, which summarize trends in water quantity, water quality, water use, and human impact on important waterways.

### *Guiding principles*

- Realistic performance evaluation and continuous improvement

### *Desired enabling environment*

- Monitoring, assessment, reporting, feedback systems; and
- sound scientific and economic data and information

### *Desired results for areas of federal action*

- Decision-makers and water managers have access to relevant scientific and economic information to guide and evaluate water management

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## Lessons Learned

A shared understanding of IWM principles is emerging, and these are increasingly being put into practice through policies, programs, and efforts on the ground. Canada's experience to date confirms the importance of an enabling environment based on effective governance, sound science, appropriate instruments, and relevant information. Ongoing progress in Canada and abroad will require that key challenges in each of these areas be addressed. What follows are some lessons learned and some prospects for meeting the challenges and building on these lessons.

- **Governance and coordination mechanisms are critical**, particularly at the watershed level, for fostering transparency, accountability, and stakeholder involvement and collaboration. Adoption of IWM at the local management level is vital and is in fact spreading across Canada and establishing a new standard for governance. As trends in watershed management continue, effective leadership will help energize stakeholders, recognize contributions made, and celebrate community successes.
- **A wide spectrum of tools needs to be applied** -- a "one size fits all" approach is not effective to deal with the increasing complexity of water management issues. While legal and regulatory tools act as a strong backstop, more tailored instruments can be used to suit various situations and challenges. Application of voluntary guidelines, promotion of targeted water policies, and consensus-based tools, such as accords and protocols, are an expanding part of the toolbox. There is also increasing recognition of the impacts that economic and information instruments can have, as well as the value of having transparent and structured planning processes to further leverage integrated actions on water.
- **Water science is a major building block for applying IWM**. Water research plays an important role in helping develop environmental policy, regulations and guidelines, and instruments and tools, and in decision-making in general. Efforts continue to be made to strengthen linkages between researchers and decision-makers across governments and disciplines, as well as with other countries.
- **Water management information and reporting systems are needed** to help guide and assess priorities and emerging IWM issues. Jurisdictions have collaborated in many ways, such as

developing guidelines to assess water quality, building data collection networks, modelling, and developing indicators to report on water resource trends.

To meet the challenges of implementing IWM and build on the lessons outlined above, particular efforts will be needed in the following key areas:

- Build on current momentum and maintain a sustained and ongoing effort to both establish and strengthen governance mechanisms for integrated water management.
- Develop and improve decision support tools to analyze and guide water management decisions, particularly at the watershed scale, through research and the development of integrated models.
- Undertake and further the evaluation of instrument mixes and approaches to better understand what works, where, and under what circumstances, with a view to sharing information on best practices.
- Enhance the availability of data and information on factors important to IWM -- such as land use and cover and water quality, use, and availability -- through surveys, monitoring, and enhancement of databases.
- Improve measurement and reporting systems to help guide and assess progress, through monitoring, modelling, and the development of indicators.
- Better account for the full economic, social, and ecological value of water and ensure appropriate weighting in decision-making, through valuation research and by using integrated approaches for decision-making.
- Strengthen and improve socioeconomic and physical science for water management, as a key strategy for helping address the challenges listed above.