



Council of Canadian Academies  
Conseil des académies canadiennes

# Media Backgrounder

## SUMMARY OF RELEASE

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<b>Report Title:</b>	The Sustainable Management of Groundwater in Canada
<b>Report Type:</b>	Expert Panel Assessment Report
<b>Report Author:</b>	The Expert Panel on Groundwater (the panel)
<b>Organization:</b>	Council of Canadian Academies (the Council)
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<b>Spokespersons:</b>	Panel members: James Bruce (panel Chair) and René Therrien (panel member) Council Staff: Peter Nicholson, President, Council of Canadian Academies
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## SUMMARY OF THE CHARGE

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The federal government, through Natural Resources Canada, asked the Council of Canadian Academies (the Council) to appoint an expert panel to assess the question:

“From a science perspective, what is needed to achieve sustainable management of Canada’s groundwater resources?”

The charge to the panel was further specified in a series of sub-questions:

- What current knowledge gaps limit our ability to evaluate the quantity of the resource, its locations, and the uncertainties associated with these evaluations?
- What do we need to understand in order to protect the quality of groundwater supply — for health protection and safeguarding other uses?
- For groundwater supply and quality monitoring purposes, what techniques and information are needed? What is the current state of the art and of practice, and what needs to be developed in Canada?
- What other scientific and socio-economic knowledge is needed to sustainably manage aquifers in Canada and aquifers shared with the United States?

## **SUMMARY OF KEY MESSAGES**

### **THE SUSTAINABLE MANAGEMENT OF GROUNDWATER**

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Almost ten million Canadians depend on groundwater to supply drinking water, and more than 80 percent of the country's rural population relies on groundwater for its entire water supply. While Canada has not yet experienced widespread over-usage of groundwater, there have been a number of cases where severe local or regional problems have arisen. Canada is still in the enviable position of being able to proactively implement policies and management practices that can prevent the kind of groundwater crises experienced in many other parts of the world.

This report addresses the question – “What is needed to sustainably manage groundwater in Canada, from a science perspective?” The answer requires first an appropriate definition of groundwater sustainability – in this case through a set of goals to be achieved; then an identification of the key gaps in knowledge and capacity that need to be filled. These gaps are only partly scientific and technical; sustainable management of groundwater also depends on governance that is less fragmented than is the case today, better integrated across jurisdictions, and well equipped to apply the latest knowledge and methods in groundwater science.

The report addresses these themes – goals, gaps and governance – in considerable detail. The following summarizes the panel's broad conclusions in respect of the themes. Detailed findings are outlined in the present document and more fully in the panel's report.

#### ***Defining Sustainability***

The concept of groundwater sustainability developed by the panel encompasses five interrelated goals – three that involve primarily the physical sciences and engineering, and two that are essentially socio-economic in nature. These goals are:

- Protection of groundwater supplies from depletion
- Protection of groundwater quality from contamination
- Protection of ecosystem viability
- Achievement of economic and social well-being
- Application of good governance

The achievement of groundwater sustainability requires a careful analysis and balancing of the five goals. A comprehensive sustainability framework for groundwater has not yet been implemented in Canada. Adoption by federal, provincial and local jurisdictions of such a framework, based on the goals outlined above, would be valuable in guiding efforts to improve the understanding and management of groundwater.

#### ***Building the Knowledge and Capacity to Manage Groundwater***

- Sustainability requires that groundwater and surface water be characterised and managed as an integrated system on a watershed or groundwatershed scale within the context of the full hydrological cycle. This approach should guide the collection of data and would be the appropriate basis for assessing cumulative impacts and the effects of large-scale phenomena like climate change.
- Due to the infancy of research examining the baseline requirements of ecosystems – related, for example, to in-stream flow needs and temperature – it is difficult to identify cases in Canada where groundwater is being managed to sustain ecosystem health, and thus to determine the quantity of water that can be extracted sustainably from an aquifer.

- Poor groundwater quality is usually due to human activity – e.g., intensive agriculture, mineral extraction, contaminated legacy sites, or poor quality control in many rural wells. The ability to address these stubborn issues requires a better understanding of the relevant groundwater science and the economic and other behavioural incentives that cause the contaminating activities to persist.
- In most provinces, the use of models by regulatory agencies lags behind state-of-the-art application. Thus, as government authorities embrace sustainable groundwater allocation strategies, there is a need to improve their capacity to employ catchment-scale groundwater management models.
- There is a current shortage of hydrogeologists in Canada and there will be increasing demand for groundwater science and management skills as more rigour is applied to managing the resource.
- There is a need for more data on virtually all aspects of groundwater that are relevant for sustainable management. The collection, maintenance, and management of groundwater data, as well as ready access to these data, should be a priority for action. While Canada does not need a comprehensive national groundwater database, it is important to agree on a structure and set of best practices – perhaps based on design and practices similar to the National Water Information System of the U.S. Geological Survey – to facilitate sharing of data among the provinces, and between the provinces and the federal government. To this end, the cooperative Groundwater Information Network (GIN) needs further support.

### ***Improving the Governance of Groundwater***

- An adequate base of scientific knowledge is necessary, but not sufficient, for the sustainable management of groundwater. Many of the most challenging hurdles lie in the domain of institutional and political factors, including fragmented and overlapping jurisdictions and responsibilities, competing priorities, and traditional approaches and ways of thinking.
- Existing, high-level governance frameworks such as The Canada Water Act (1970); The Federal Water Policy (1987); and The Canadian Framework for Collaboration on Groundwater (2003) have either been little-used or have failed to produce clarity in the divisions of responsibility for groundwater management. There is a need for a more clear-cut, formally stated division of duties among the various levels of government.
- In many jurisdictions, the management of water is fragmented, with groundwater and surface water, as well as water quality and quantity, being treated independently. The integration of these responsibilities would foster sustainability.
- Groundwater management is best achieved at a local level through a regional municipality or a watershed authority, but this approach will only be successful when accompanied by sufficient financial and human resources, together with a requirement to implement and report on progress.
- An enhanced understanding of the value of groundwater's contribution to Canada's economy, environment, and society could promote more efficient decision-making. Current groundwater allocation methods in Canada rarely use market-based incentives despite considerable evidence suggesting that a greater implementation of economic instruments such as water prices, abstraction fees, and tradable permits has the potential to promote sustainable groundwater use.

- The federal government, in cooperation with the provinces and territories, should report on the current state of groundwater in Canada, and on progress toward sustainable management. Such a report should be completed within the next two years and then updated at regular intervals, possibly every five years. In this regard, there is a need for further development of appropriate measurements for the key dimensions of groundwater sustainability in order to guide management and to chart progress.

## **THE EXPERT PANEL ON GROUNDWATER**

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The panel was comprised of leaders in the science of groundwater, as well as experts in the social, economic and legal aspects relevant to sustainable groundwater management. In addition, valuable advice was contributed by the group of eighteen expert reviewers that were appointed by the Council.

**James P. Bruce, Chair** (O.C., FRSC)  
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**William Cunningham**  
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Former Professor and Director in the Geological Engineering Program, UBC (Surrey, BC)

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Research Hydrogeologist & Leader, Integrated Water Management Program, Alberta Research Council (Calgary, AB)

**Steve Holysh**  
Senior Hydrogeologist, Conservation Authorities Moraine Coalition (Downsview, ON)

**Steve Hrudehy** (FRSC)  
Professor, Environmental Health Sciences and Associate Dean (Academic) of the School of Public Health, University of Alberta (Edmonton, AB)

**William Logan**  
Senior Staff Officer, Water Science and Technology Board, National Research Council (Washington, DC)

**Kerry MacQuarrie**  
Professor & Canada Research Chair in Groundwater-Surface Water Interactions, Department of Civil Engineering & Canadian Rivers Institute, University of New Brunswick (Fredericton, NB)

**Paul Muldoon**  
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## **ABOUT THE COUNCIL OF CANADIAN ACADEMIES**

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**Mandate:** The mandate of the Council of Canadian Academies is to provide independent, expert assessments of the science that is relevant to matters of significant public interest. Here *science* is interpreted to encompass any knowledge-generating discipline, including the natural, social and health sciences, engineering, and the humanities. The Council facilitates access to the best available scientific knowledge with the objective of informing public debate and decision-making in Canada.

**Mission:** The primary mission of the Council is to manage the conduct of assessments of what is known, and also what is not known, about the science that is relevant to important public issues. The Council does this via the appointment and support of independent expert panels, whose membership includes authorities from both Canada and abroad.

**Value:** To effectively address important issues such as climate change, nanotechnology, innovation, and new infectious diseases, Canadians need access to credible, independent assessments of the underlying science. The Council provides a standing capacity to undertake such assessments and thus helps keep Canada abreast of emerging issues, gaps in knowledge, and the implications of advances in science worldwide. The procedures by which the Council appoints and manages expert panels are designed to ensure the quality and independence of panel reports. All Council reports are made public in French and English to allow both decision-makers and the people of Canada to benefit from this source of expert knowledge.

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