Summer 2001

National Environmental Indicator Series

Urban Water Indicators:
Municipal Water Use and Wastewater Treatment

Environmental indicators are selected key statistics that provide information on significant trends in the environment, natural resource sustainability, and related human activities. The indicators in this bulletin are part of a national set of environmental indicators designed to provide a profile of the state of Canada's environment and measure progress towards sustainable development.

Issue context

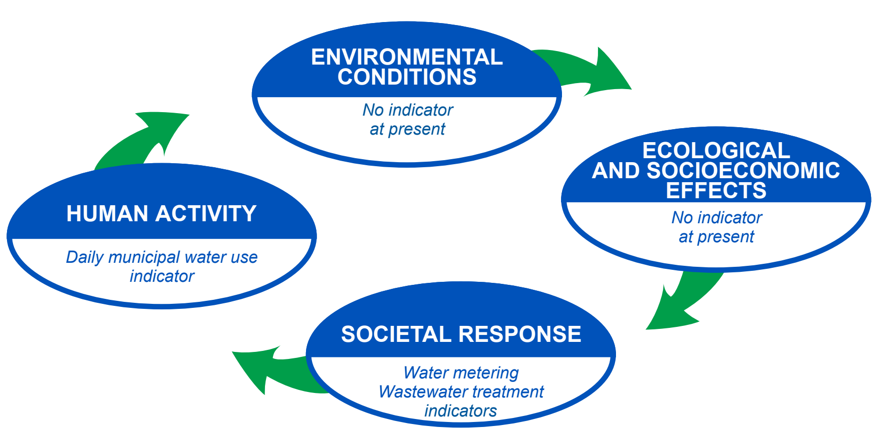
Why is urban water use an issue?

Canadians are among the highest water users in the world. Though Canada is perceived as a country with abundant water resources, about 60% of this water supply flows north and is not readily available or easily accessed where it is needed most—in a narrow 300-kilometre band along Canada's southern border, home to over 84% of the population. Eleven percent of all surface water and groundwater withdrawn in Canada is used for municipal purposes.

Current water use patterns in some Canadian towns and cities are problematic for both environmental and economic reasons:

- *Water shortages*: About 26% of municipalities with water systems reported water shortages in the 1994–1999 period. Reasons included seasonal shortages due to drought, infrastructure problems, and increased consumption.
- *Effects on the natural capability of rivers and lakes to deal with pollutants*: Water drawdown, especially in drought-prone areas, decreases water levels and stream flows, which affects ecosystem functions as well as impacts on aquatic and terrestrial habitats.
- *Drawdown of groundwater*: In 1999, about 2.8 million Canadians served by municipal water systems—including municipalities in Prince Edward Island, southern

What are the links?



Ontario, the southern Prairies, and the interior of British Columbia—were dependent on municipal groundwater systems. These municipalities experience more frequent water shortages than those relying on surface water.

- *Strain on water and wastewater infrastructure and services*: Current water use patterns result in higher energy and economic costs associated with supplying and treating drinking water and treating wastewater, as well as the need for increased volume capacity.
- *Wastewater dilution*: When water use increases, wastewater can become more diluted; wastewater treatment processes are then less efficient at removing wastes.
- *Aging water and wastewater infrastructure*: Deteriorating infrastructure results in higher losses of water through system leaks, sometimes comprising as much as 30% of municipal water use. Many communities require significant infrastructure upgrades.

What is being done to reduce water use?

Technological measures

Numerous water-saving devices are available for use in homes and businesses. For a low-flow showerhead, the flow rate can be half that of a conventional showerhead. A low-flow toilet can use as little as one-third of the water of a conventional toilet.

Household outdoor water use can be reduced, for example, with more water-efficient landscaping (xeriscaping), lawn watering devices, rain water collection (rain barrels, cisterns), and efficient car washing practices.

Greywater reuse technology (to reuse water from washing for toilet flushing and outdoor uses) has been pilot tested but is not in widespread use in Canada. Currently, there are substantial regulatory barriers to its implementation, such as existing plumbing codes. Other promising new technologies for some municipalities include alternatives to conventional wastewater treatment systems, such as off-grid sanitary sewage systems (e.g., waterless composting toilets).

Educational and regulatory measures

Jurisdictions are providing educational materials to the public through a variety of means. Internet sites such as the "Water Efficiency Experiences Database," developed by Environment Canada and the Canadian Water and Wastewater Association, encourage the sharing of knowledge on water use and water efficiency initiatives among municipalities.

The National Action Plan to Encourage Municipal Water Use Efficiency (www.ec.gc.ca/water) of the Canadian Council of Ministers of the Environment has resulted in the implementation of new government programs and policies that contribute to water efficiency. For example, Ontario and British Columbia have introduced plumbing codes that promote water efficiency.

Measures such as municipal source control programs minimize the entry of pollutants such as metals into sewer systems, thus reducing treatment costs and improving municipal wastewater effluent quality.

Federal and provincial/territorial jurisdictions are exploring strategies to ensure consistent and improved management of municipal wastewater in Canada. In addition, the best practices guide for green technologies of the Federation of Canadian Municipalities promotes the development of sustainable green municipal infrastructure.

Economic measures

In February 2000, the federal government announced the six-year, \$2.6-billion Infrastructure Canada Program. This money, along with matching funds from municipal and provincial/territorial governments, will total over \$6-billion in investments. The primary focus of this program is green municipal infrastructure projects, such as projects to improve municipal water and wastewater infrastructure.

Green municipal funds include a \$100-million Green Municipal Investment Fund, a permanent revolving fund offering financing in the form of loans and loan guarantees to support project implementation, and a five-year, \$25-million Green Municipal Enabling Fund, a fund providing cost-shared grants for feasibility studies. Both funds are administered by the Federation of Canadian Municipalities and focus on innovative environmental solutions that include the promotion of energy reduction and water conservation in Canadian municipalities (www.fcm.ca).

Metering and full-cost, volume-based, user-pay systems provide incentives for households and businesses to conserve water. An increasing number of municipalities are applying sewer surcharges to residential water bills and exploring options for financial incentives, such as low-interest loans, tax credits, and rebates for installing water-efficient devices. Using water more efficiently will conserve water, lower water costs, and extend the life of existing municipal infrastructure.

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Manitoba Conservation
Natural Resources Canada
Statistics Canada

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This bulletin is accessible on Environment Canada's State of Canada's Environment Infobase (www.ec.gc.ca/soer-ree).

A TECHNICAL SUPPLEMENT TO THIS BULLETIN IS ALSO AVAILABLE.

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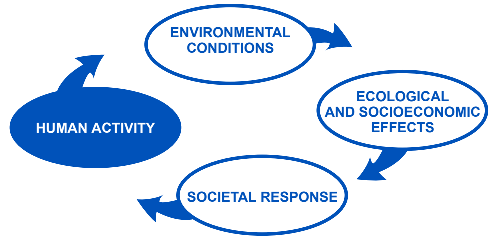


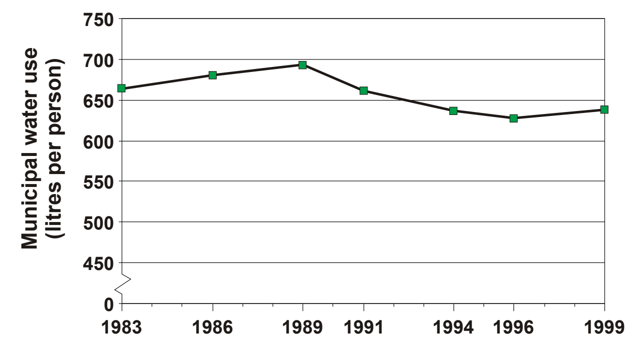
Urban Water:

Municipal Water Use and Wastewater Treatment

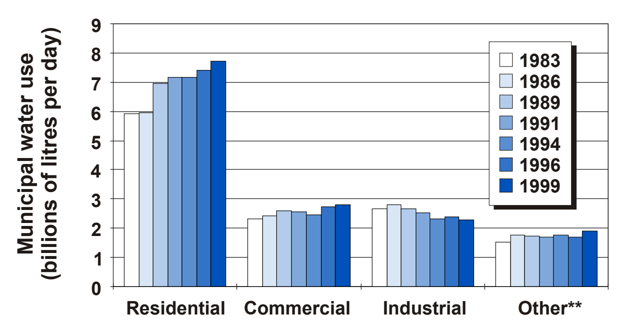
Indicator: Daily municipal water use

- Daily per capita water use for all municipal sectors (including residential, commercial, industrial, and "other") declined by almost 10% from 694 litres in 1989 to 628 litres in 1996. After 1996, daily municipal water use per person increased by 2% to 638 litres in 1999.
- Between 1996 and 1999, total daily water use increased slightly in the residential (4%), commercial (3%), and "other" (11%) sectors as a result of greater economic activity, warm summers (e.g., increased lawn watering), an increase in municipal population, and increased connections to new residential areas. A slight decrease occurred in the industrial sector over the same period.
- Daily residential water use continued to account for more than half of all municipal water use in 1999. On a per person basis, daily residential water use increased from 327 litres in 1996 to 343 litres in 1999, an increase of approximately 5%.[1] Daily residential water use peaked in 1989 at a level of 347 litres per person.
- Although water use varies by region and within regions, Canadian residential per capita water use is still exceptionally high among OECD[2] countries and is second only to that of the United States.

Daily per capita water use* for all municipal sectors in Canada, 1983–1999



Total daily municipal water use* by sector, 1983–1999



Note:

* Water use values are based on (1) municipalities that responded in a given year and (2) a regional-level estimate for all municipalities that did not respond or, in earlier years, were not surveyed.

** The "Other" category includes water lost through leakage; unaccounted water uses, such as water used in firefighting or to flush out pipes; and water that a municipality was unable to assign to one of the other three sectoral categories.

For details, see the *SOE Technical Supplement 2001–1*.

Source:
Municipal Water Use Database (MUD). Adapted by Indicators and Assessment Office, Environment Canada.

[1] Based on 1998 information collected in the 1999 Municipal Water Use Database (MUD) survey.
[2] Organisation for Economic Co-operation and Development.

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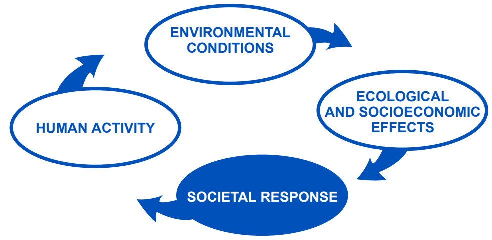


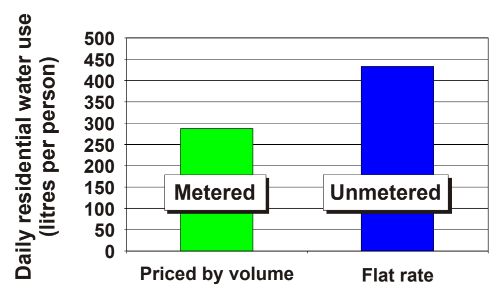
Urban Water:

Municipal Water Use and Wastewater Treatment

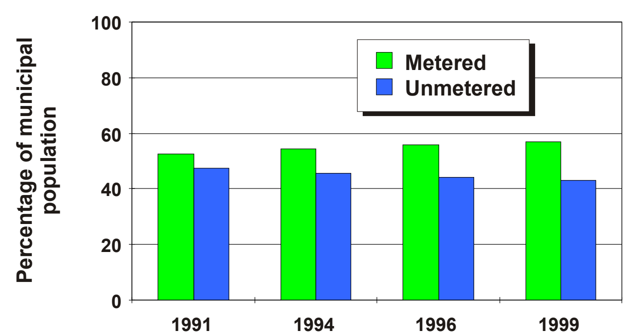
Indicator: Metered residential water use

- In 1999, households paying for water by volume (i.e., metered) used about 288 litres per person per day. Canadian households paying a flat rate for water used 433 litres per person per day[1], 50% more than metered households.
- About 57% of Canada's municipal population had water meters in 1999, up from 52% in 1991, a very gradual increase. Overall, larger centres (population greater than 100 000) have higher levels of metering than smaller centres. In 1999, Ontario and the Prairie provinces had the highest levels of metering (83 and 88%, respectively), compared with Quebec, which had significantly lower levels (15%).
- Water metering and full-cost, volume-based, user-pay systems appear to influence water-conserving behaviour. They provide a financial incentive to Canadian householders to use less water.
- Canadian municipal water prices are currently among the lowest in the world. On average, they are less than half those of most OECD countries and cover roughly half the costs of supplying water and treating wastewater.
- It is anticipated that the price of water in Canadian municipalities will rise as the true costs of supplying water and treating wastewater, including sewage treatment systems, are factored into water billing prices. As well, increased drinking water treatment requirements for public health protection and increasingly stringent sewage discharge requirements for environmental protection could also lead to higher costs and prices.

Effect of metering on residential water use in Canada, 1999



Municipal population with water meters in Canada, 1991, 1994, 1996, and 1999



Note:
Estimates were made for municipalities that did not respond in any of the four years. A municipality was considered "metered" if more than 75% of the population served water was metered and "unmetered" if less than 25% was metered. The few centres with 25–75% of the population metered were not included in the analysis.

For details, see the *SOE Technical Supplement 2001–1.*

Source:
Municipal Water Use Database (MUD). Adapted by Indicators and Assessment Office, Environment Canada.

[1] These figures are derived from the use section of the Municipal Water Use and Pricing database and may differ from those derived from the pricing section.

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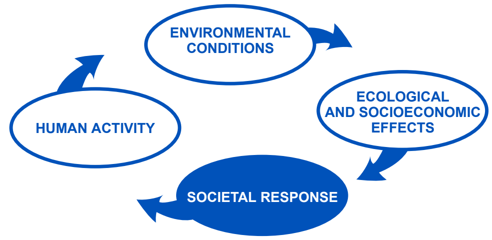


Urban Water:

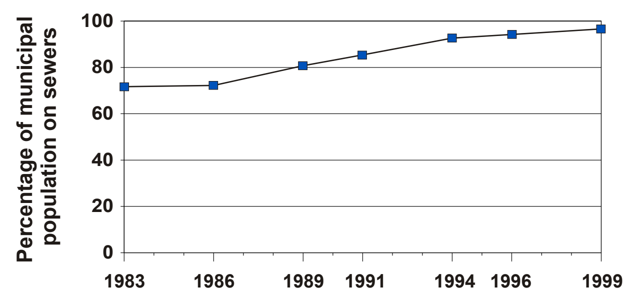
Municipal Water Use and Wastewater Treatment

Indicator: Municipal population served by wastewater treatment

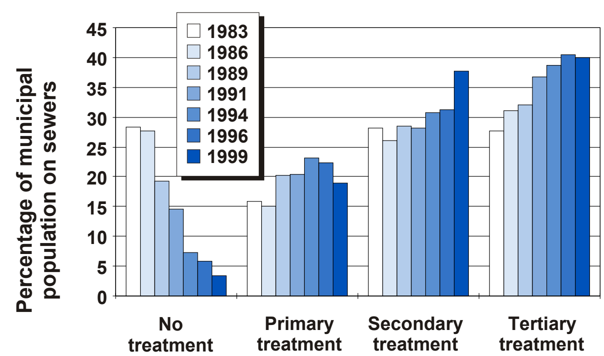
- Municipal wastewater is one of the largest point sources of pollution, by volume, to Canadian waters.
- In 1999, 97% of the Canadian population on sewers[1] was served by at least a preliminary form of wastewater treatment, compared with 93% in 1994 and 72% in 1983. This service coverage compares favourably with that of other developed countries, such as the United Kingdom (96%), Denmark (94%), and the Netherlands (92%).
- The remaining 3% of Canadians serviced by sewage collection systems were not connected to wastewater treatment facilities in 1999 and discharged their untreated sewage directly into receiving water bodies.
- The degree of treatment has improved significantly since 1983 as more Canadian municipalities upgrade their wastewater treatment facilities. In 1999, secondary or advanced (tertiary) treatment was provided to 78% of the municipal population on sewers, up from 69% in 1994 and 56% in 1983.
- The degree of wastewater treatment varies greatly across Canada. In British Columbia, about 63% of the population served by sewers had secondary or tertiary treatment in 1999. In both Ontario and the Prairie provinces, over 94% of the sewered population had secondary or tertiary treatment in 1999. In Quebec, about 43% of the sewered population had primary treatment and about 54% had secondary or tertiary treatment in 1999.

[1] Nearly 75% of Canadians (22.5 million people) living in some 1200 municipalities are serviced by municipal sewer systems. The remaining approximately 25% of Canadians (7.5 million people), mostly living in rural areas, rely on on-site sewage systems, primarily septic tanks and disposal fields.

Municipal population with wastewater treatment in Canada, 1983–1999



Level of municipal wastewater treatment in Canada, 1983–1999



Note:

(i) Municipal population refers only to municipal population served by a sewer system.

(ii) The MUD survey defines **primary** treatment as any form of mechanical sewage treatment, **secondary** treatment as biological sewage treatment or waste stabilisation ponds, and **tertiary** treatment as some form of sewage treatment providing a higher level of treatment than secondary treatment.

(iii) Derivation of this indicator using treatment level definitions other than those used in (ii) would yield different results. Under the MUD survey definitions, mechanical screening could be considered as primary treatment.

Source:
Municipal Water Use Database (MUD), Environment Canada.

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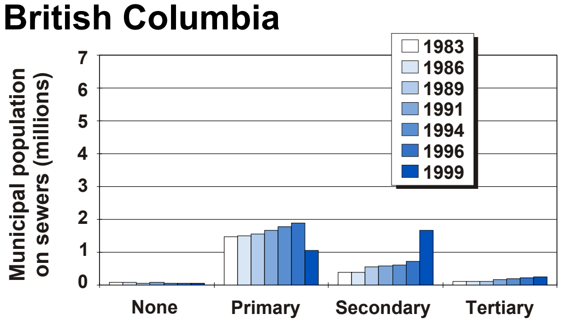
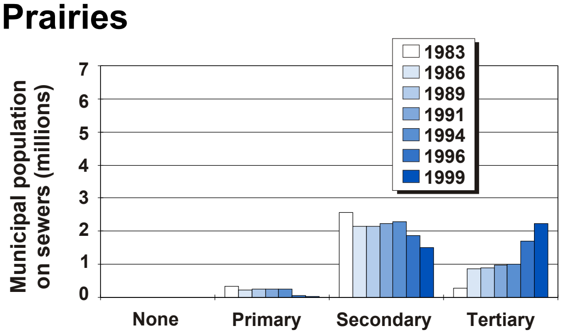
Indicator: Municipal population served by wastewater treatment (*cont'd*)

- British Columbia experienced the largest improvements in treatment level between 1996 and 1999, as approximately 1 million people served by sewers were upgraded to secondary treatment. In Quebec, about 5.5 million people were served by some level of wastewater treatment in 1999, up from 4.5 million in 1994. Infrastructure improvements in the Prairie provinces, from secondary to tertiary treatment, were also noteworthy.
- In the Atlantic provinces, the levels of wastewater treatment have remained relatively unchanged since 1983. Nearly half of the population served by sewer collection systems released untreated wastewater directly into inland and coastal waters, relying on the dilution capability of the receiving water to reduce impacts on the aquatic ecosystem.

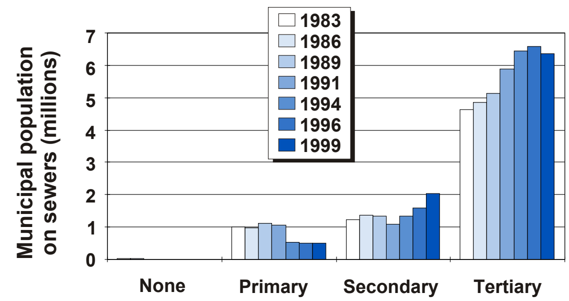
British Columbia



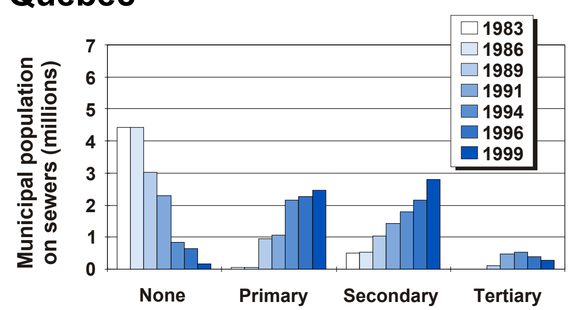
Prairies



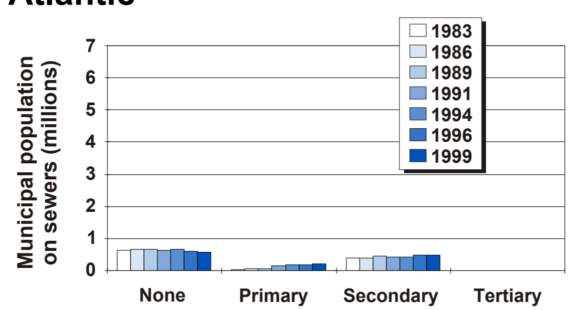
Ontario



Quebec



Atlantic



Note:

(i) Municipal population refers only to municipal population served by a sewer system.

(ii) The slight decline in tertiary treatment in Ontario and Quebec between 1996 and 1999 likely results from the change in reported data verification procedures for the MUD survey starting in 1996.

(iii) Insufficient data exist to adequately assess the degree of wastewater treatment in the Northwest Territories, Yukon, or Nunavut.

Source:
Municipal Water Use Database (MUD), Environment Canada.