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# Data Sources and Methods: Residential Water Use Indicator

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# 1. Introduction

The residential water use indicator is a part of the Canadian Environmental Sustainability Indicators (CESI) program, which provides data and information to track Canada's performance on key environmental sustainability issues.

# 2. Description and rationale of the Residential Water Use Indicator

## 2.1 Description

The residential water use indicator reports household water metering rates in Canada and per capita residential water use from 1991 to 2009.

## 2.2 Rationale

Households are the largest users of municipal water services, accounting for 57% of municipal water use in 2009.[1] When setting prices for water use, municipal water utilities adopt one of two basic rate structures: flat rates, whereby consumers pay a flat fee for water services regardless of the volume of water used, and volume-based rates, where the amount paid for water services depends on the amount of water used. Volume-based pricing requires households to have water meters so that water usage can be measured. In contrast, water utilities with flat-rate pricing measure how much water flows from the utility to all customers but do not measure households individually. Household metering and the corresponding shift to volume-based pricing increase consumer awareness of water usage and provide an incentive to conserve water, reducing household water demand for Canada's freshwater resources.

# 3. Data

## 3.1 Data source

Per capita residential water use and the percentage of Canadians with water meters for 1991 to 1999 are taken from Environment Canada's Municipal Water Use and Pricing (MUD) survey. After 1999, the survey was revised to become the Municipal Water and Wastewater Survey (MWWS). Survey results are available on the Municipal Water and Wastewater Survey's Data and Publications website (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ED0E12D7-1).

## 3.2 Spatial coverage

Prior to 2001, the MUD survey was only sent to municipalities across Canada with populations greater than 1000. Since 2001, the survey has been sent to all municipalities with a population greater than 1000 and a sample of over 600 municipalities with less than 1000 residents. Municipalities on federal lands and First Nations municipalities are excluded from the MUD surveys and the MWWS.

[1] Environment Canada (2010) 2010 Municipal Water Use Report: Municipal Water Use 2006 Statistics. (http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=596A7EDF-471D-444C-BCEC-2CB9E730FFF9)

## 3.3 Temporal coverage

The MWWS and its predecessor, the MUD survey, have been conducted every two to three years since 1983. The MUD survey was reformatted following the 1999 survey; the first MWWS was conducted in 2001.

## 3.4 Data completeness

Prior to 2001 the MUD survey collected information only from Canadian municipalities with a population greater than 1000 people. In 2001 the survey was expanded to include Canadian municipalities with populations of less than 1000 people. In 2009, the survey was expanded to include a larger sample of municipalities with less than 1000 residents. Data remain comparable among surveys, because small municipalities make up less than 3% of the Canadian population and have little effect on aggregate statistics due to population weighting.[2] For more information on changes to the survey sample and methodology, consult Environment Canada's Municipal Water Use Reports (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ED0E12D7-1#wateruse2006).

Survey response rates vary by survey year and question. In the 2009 MWWS, residential water use information was available for a responding population of 24 071 791 Canadians and residential metering information was available for a responding population of 23 080 236 Canadians.[3] For more information about 2009 residential water use statistics, see Table 3 of the 2011 Municipal Water and Wastewater Summary Tables (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ADD1975E-1). For more information on residential water metering statistics, see Table 4 of the 2011 Municipal Water and Wastewater Summary Tables (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ADD1975E-1).

## 3.5 Data timeliness

The MWWS is conducted every two to three years with data released approximately two years after the calendar year to which the collected data apply. The results are published on the Municipal Water and Wastewater Survey's Data and Publications website (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ED0E12D7-1).

# 4. Methods

This indicator is taken from results published in the MUD and MWWS reports from 1991 to 2009. The MWWS uses communities with 100% residential metering as a proxy for households with volume-based water rates, and communities with 0% residential metering as a proxy for households with a flat-rate pricing structure.

The percent difference in water use between unmetered and metered households was calculated the following way:

$$\frac{\text{Water use}_{\text{unmetered}} - \text{Water use}_{\text{metered}}}{\text{Water use}_{\text{unmetered}}} = \frac{376\text{L} - 229\text{L}}{376\text{L}} = 39\% \qquad \text{(equation 1)}$$

[2] Environment Canada (2007) 2007 Municipal Water Use Report: Municipal Water Use 2004 Statistics. (http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=8D951F7A-3866-47AA-98D6-1C49AB04E1BA)

[3] Environment Canada (2011) 2011 Municipal Water Use Report: Municipal Water Use 2009 Statistics. (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ADD1975E-1)

# 5. Caveats and limitations

The MWWS assumes metered households are on volume-based fee structures. This is not necessarily the case for all metered households. In some communities, metered households may be on flat-rate fee structures similar to unmetered households.

Any difference in water use between metered and unmetered households cannot be explained solely by the difference in water pricing structures. Although household water use is affected by pricing, it is also affected by location, climate and socio-economic variables.

The substantial decrease in per capita household water use from 2006 to 2009 cannot be explained solely by the increase in household metering rates over the same period.[4] In 2009, for Canada as a whole, temperatures were below the 1971-2000 normal and below 2006 temperatures from May through July, and were only very slightly above normal in August. Rainfall was higher than both the 2006 level and the 1971-2000 normal in July and August 2009. The lower temperatures in June and July and higher rainfall in July and August could have contributed to the lower per capita water use in 2009 compared to 2006, particularly in the residential sector where lawn watering constitutes an important end-use of water in the summer months.

The representativeness of the sample with respect to community size has changed through time. From 1983 to 1999, the MUD survey collected data only from municipalities with a population greater than 1000 residents. In 2001 the MWWS was expanded to sample municipalities with populations less than 1000 people. In 2009 the survey was further expanded to include a larger sample of municipalities with less than 1000 residents. Although improvements have been made, municipalities with small populations remain under-represented in the MWWS, while municipalities with large populations are over-represented. Data remain comparable among surveys, as the effect of small municipalities on the aggregate statistics is small due to population weighting.

Both the MUD survey and the MWWS exclude municipalities on federal lands and First Nations municipalities.

# 6 References and further reading

## 6.1 References

Environment Canada (2011) 2011 Municipal Water Use Report: Municipal Water Use 2009 Statistics. Retrieved 21 September 2011. (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ADD1975E-1)

## 6.2 Further reading

Environment Canada (2011) Water Quantity. Retrieved on 7 July 2011. (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=2DE7B40F-1)

Conference Board of Canada (2008) Environment: Water Consumption. Retrieved on 7 July 2011. (http://www.conferenceboard.ca/hcp/details/environment/water-consumption.aspx)

[4] Environment Canada (2011) 2011 Municipal Water Use Report: Municipal Water Use 2009 Statistics. (http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ADD1975E-1)