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2010 Municipal Water Use Report

Municipal Water Use, 2006 Statistics

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Introduction

Many Canadian communities are growing increasingly concerned about having enough fresh water to meet present and future needs. Such concerns are heightened by the rising demand for clean water (both domestically and throughout the world), growing urban populations, and the anticipated impacts of climate change.

Complicating the issue is the high cost of maintaining, replacing or adding new water and wastewater infrastructure. Understanding how Canadian communities use water is a prerequisite to gauging Canada's progress toward the sustainable use of its water resources. To create policies and programs that promote sustainable water use, policy makers and resource managers need to know how much water municipalities are withdrawing and where this water comes from, how much water is being used by different sectors and how efficiently they use it, what water treatment methods are applied, and how municipalities charge for their water-related services.

Environment Canada's Municipal Water and Wastewater Survey (MWWS) contributes to Canada's goal of promoting the wise and efficient management and use of water by providing a principal source of information on municipal water and wastewater in Canada. This survey—along with its predecessor, the Municipal Water Use and Pricing Survey (MUD/MUP)—has been conducted every two or three years by Environment Canada since 1983. The MWWS collects information about municipal water and wastewater services across Canada. The resulting geocoded data can be analyzed in several ways, such as by survey year, province and territory, economic sector and size of municipal population.

This municipal water use report includes updates of statistics on water use, treatment and wastewater (2006 data year) that were last published in similar reports for 2004 and 2001 data. This report summarizes some of the most important findings concerning water use, metering, population served by water and wastewater services, water sources, wastewater treatment categories and wastewater discharge destination. Some comparison to past values is also included. A companion report, due in winter 2011, will focus on the pricing and financing of municipal water and wastewater services, as well as water conservation measures.¹

An explanation of the terminology used in this report can be found in the glossary.

Methodology

The 2006 Municipal Water and Wastewater Survey (MWWS) collected data on municipal water distribution systems, water treatment plants, sewer systems and wastewater treatment plants that serve at least 100 residents or 50 total connections, for the 2006 calendar year. Data were collected over the 2007 and 2008 calendar years. The survey was sent out to all municipalities with a population of greater than 1000 and to a sample of 630 municipalities with a population of under 1000, except municipalities on federal lands, including First Nations. In 2006, the survey collected information on key statistics from 530 municipalities, accounting for just over 23.5 million Canadians. Response rates, however, vary depending on the question (see the Responding

¹ The Water Use Reports, Pricing Reports, survey questionnaire, and municipality-level water use and pricing databases and variable description documents are available from the water Web pages of Environment Canada's website at www.ec.gc.ca/eau-water. To find the MWWS survey page, click on "Water Research" in the left-hand column.

Population columns/rows in several of the tables below). Imputing for non-response where possible brought the total survey base for 2006 to 1318 municipalities, accounting for 28.2 million Canadians. Of these 1318 municipalities, 1283 were also included in the 2004 imputed database under the same name and municipality code. Eight municipalities have been added to the survey base since 2004, either because their population increased enough to cross the 1000 population threshold, or because amalgamations or de-amalgamations resulted in significant changes in name, area or population, warranting a new municipality identifier code. Similarly, 11 municipalities were removed from the survey base since 2004, due to their inclusion in another or a new municipality after amalgamation.

The initial survey responses were supplemented with call-backs and Internet searches for readily available information. Some missing records were imputed from data collected in previous years, after adjusting for changes in the population in the intervening years. Where amalgamations had occurred, responses from the constituent municipalities were aggregated to develop the missing values.

Information from all these sources was compiled in the 2006 Municipal Water and Wastewater Summary Database, which was used to generate the statistics for the summary tables and this report. In the imputed version of the database, the source of each record (survey, imputed value, etc.) is indicated; therefore, the non-imputed totals or averages can be obtained, if desired.

Most water statistics presented in this report are weighted by the population served water to make them more representative of the Canadian population. Similarly, wastewater statistics are weighted by the population served by sanitary or combined sewers.

The summary tables and reports produced by the MWWS are intended to report directly on values collected and compiled from the 2006 Municipal Water and Wastewater Survey (MWWS). While the reported statistics are derived from a large population base in responding municipalities, they are not necessarily representative of the entire Canadian population. Some statistical analyses were performed on the survey data (on the annual mean values and the differences in them between survey years), in order to verify the data quality and sample size. For further details on the survey methodology, please contact the authors of this report at h2o-info@ec.gc.ca.

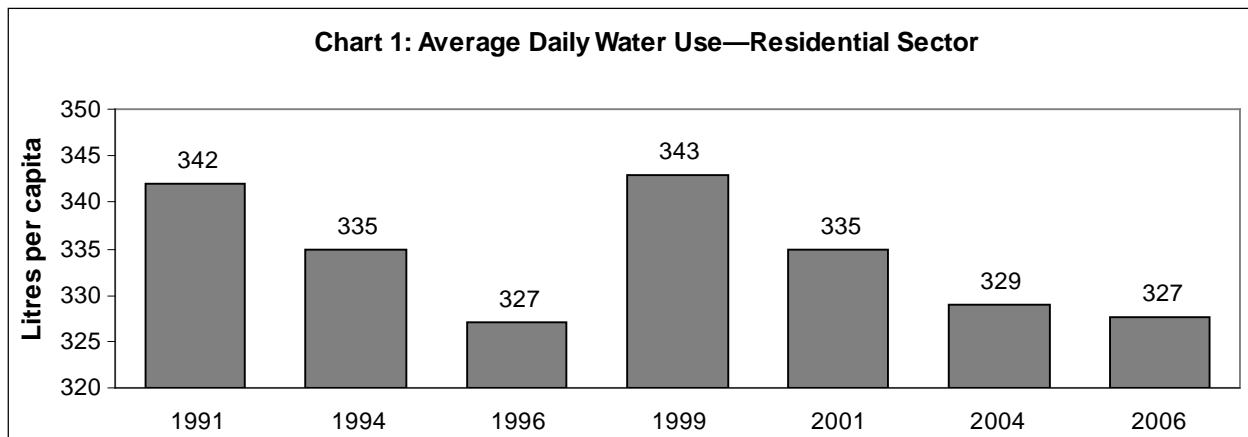
The reader should note that, for the 2001 and earlier survey cycles, no data was collected from rural communities having fewer than 1000 residents. Although the 2004 and 2006 survey cycles did collect data from a sample of municipalities with a population of below 1000, the data is still comparable to statistics from earlier survey cycles because any effect on the aggregate statistics is negligible due to population weighting.

It is also important to note that the sum of the population of surveyed municipalities in many of the provinces and size groups decreased between 2004 and 2006. See Appendix A for a detailed look at the surveyed population and a link to a table of total Canadian population by Statistics Canada.

Survey highlights

Average per capita residential water use has stayed relatively stable over the past decade.

Residential water use can be affected by—in no particular order—temperature and precipitation, behavioural factors, pricing, demand management tools and technology. In spite of heightened awareness of the benefits of efficient water use, little significant change in per capita residential water use has been observed since 1991 and Canadians still rank among the largest consumers of water within the OECD countries. Chart 1 illustrates how per capita residential water use has varied from one survey cycle to another, with the 2006 average residential water use per person recorded at 327 L per day.



The survey's water use results generally indicate that people living in larger population centres use less water than do those living in smaller communities. For example, residential per capita water use ranged from 294 and 298 L per day in municipalities with a population of 500 000 or more and 50 000–500 000, respectively, to 496 L per day in municipalities with a population of between 2000 and 5000 (see Table 1). Per capita residential water use also varies across the provinces and territories. Of the provinces, Prince Edward Island has the lowest per capita average daily residential water use at 199 L/capita/day, and Newfoundland and Labrador has the highest at 504 L/capita/day.

Table 1: Water Use and Metering Rates, by Province/Territory and Municipal Population

Province / Territory	Total Average Daily Flow (litres per capita)	Average Daily Residential Flow (litres per capita)	Percentage of Residential* Clients that Are Metered	Percentage of Business** Clients that Are Metered
Newfoundland & Labrador	813	504	0.02	49.1
Prince Edward Island	503	199	1.5	92.6
Nova Scotia	532	313	92.6	96.8
New Brunswick	620	345	49.1	81.3
Quebec	795	401	16.5	36.6
Ontario	493	267	91.2	97.5
Manitoba	408	236	97.2	97.2
Saskatchewan	499	219	98.2	98.9
Alberta	458	283	84.8	88.6
British Columbia	689	448	32.6	81.7
Yukon	934	647	7.9	100.0
Northwest Territories	440	258	97.3	100.0
Nunavut	134	113	76.1	14.8
Under 1000	923	433	46.4	54.0
1000 – 2000	677	431	44.0	51.0
2000 – 5000	884	496	36.9	49.4
5000 – 50 000	693	423	50.1	68.2
50 000 – 500 000	534	298	59.5	82.8
More than 500 000	569	294	75.5	84.3
Total 2006	591	327	63.1	80.1
Responding Population	25 183 363	25 074 414	25 523 258	21 973 040
Total 2004	609	329	63.3	83.0
Responding Population	25 454 421	25 333 378	25 698 580	20 960 777

Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada.

* "Residential" refers to domestic household water use (indoor and outdoor) from single-family homes on municipal water systems.

** "Business clients" refers to commercial locations such as small stores or offices, with approximately 1" connections to municipal water systems.

Table 2: Residential Water Services, by Province/Territory and Municipal Population

Province / Territory	Number of Responding Municipalities	Total Population of Responding Municipalities	Population Served Water Distribution	As % of Responding Population	Population Served Water Treatment	As % of Responding Population	% of Population Served Water Distribution that Is Also Served Water Treatment*
Newfoundland & Labrador	71	357 996	317 968	88.8	269 825	75.4	84.9
Prince Edward Island	9	64 398	55 117	85.6	44 340	68.9	80.4
Nova Scotia	35	682 464	486 809	71.3	468 980	68.7	96.3
New Brunswick	134	597 520	360 971	60.4	313 136	52.4	86.7
Quebec	390	6 500 418	6 134 338	94.4	5 749 649	88.5	93.7
Ontario	224	11 704 469	10 491 127	89.6	10 351 679	88.4	98.7
Manitoba	65	920 313	819 099	89.0	807 996	87.8	98.6
Saskatchewan	96	656 724	630 749	96.0	619 931	94.4	98.3
Alberta	147	3 021 719	2 768 075	91.6	2 740 559	90.7	99.0
British Columbia	122	3 595 012	3 338 993	92.9	2 997 098	83.4	89.8
Yukon	4	23 920	19 570	81.8	1 128	4.7	5.8
Northwest Territories	7	31 863	28 043	88.0	28 043	88.0	100.0
Nunavut	10	20 523	17 885	87.1	5 770	28.1	32.3
Municipal Population							
Under 1000	81	60 061	39 526	65.8	26 491	44.1	67.0
1000 – 2000	341	483 032	291 728	60.4	199 537	41.3	68.4
2000 – 5000	349	1 130 598	806 200	71.3	543 078	48.0	67.4
5000 – 50 000	458	6 206 104	4 732 151	76.2	4 202 630	67.7	88.8
50 000 – 500 000	75	10 206 234	9 561 411	93.7	9 432 293	92.4	98.6
More than 500 000	10	10 091 310	10 037 730	99.5	9 994 105	99.0	99.6
Total 2006	1 314	28 177 339	25 468 746	90.4	24 398 135	86.6	95.8
Total 2004	1 294	28 381 763	25 714 706	90.6	24 021 797	84.6	93.4

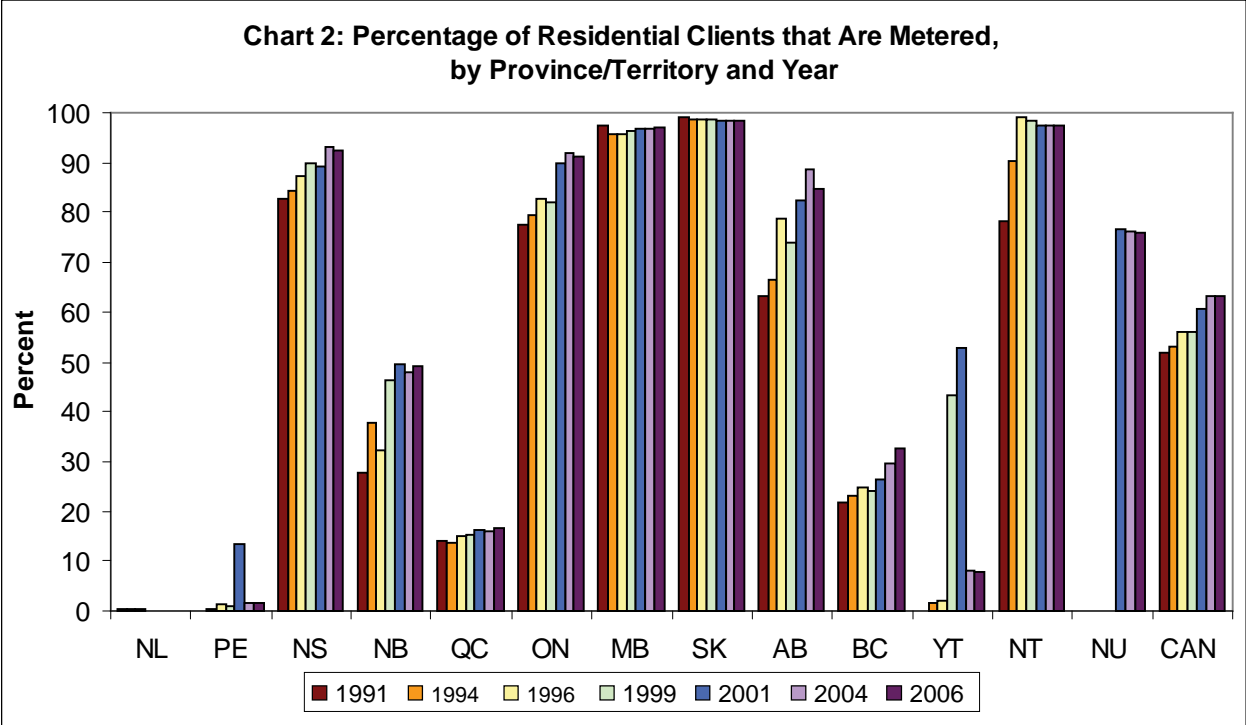
Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada.

* The population served water treatment divided by the population served water distribution (instead of dividing by the total municipal responding population.)

See Appendix A for details on total municipal population changes in all surveyed municipalities between 2006 and 2004.

The percentage of Canadian residences equipped with water meters remains stable.

The installation of water meters in Canadian homes and businesses allows for volume-based water pricing, which encourages water conservation. In 2006, 63.1% of Canadian single-family residences served by municipal water systems were metered, a percentage that only changed by 0.2% between 2004 and 2006 (see Chart 2).



The survey results show that, as in previous years, homes in larger communities are more likely to be equipped with water meters than those in smaller communities (see Table 1). In 2006, the percentage of metered homes ranged from a low of 36.9% in municipalities with 2000 to 5000 people, to a high of 75.5% in municipalities with more than 500 000 people. Both of these values are up a few percentage points from their respective values in 2004.

Table 1 demonstrates that, in general, as the percentage of metered homes in a community increases, water use per capita decreases. In fact, all Municipal Water and Wastewater Surveys since 1991 have indicated that Canadians who are charged a volume-based rate use less water. This analysis is based on a comparison of the per capita residential water use between municipalities with 0% residential metering and those with 100% residential metering. The 0% and 100% metering rates are used as a proxy for the use of flat or assessed water rates versus the use of volume-based water rates; it is assumed that metered households are subject to volume-based water charges and households without water meters are subject to flat rates or assessed water taxes.

The 2006 survey shows that in municipalities with volume-based water charges (using 100% metering as a proxy) the average daily consumption rate was 263 L per person. In municipalities that

charged a flat or assessed rate (using 0% metering as a proxy), the corresponding figure was approximately 76% higher (464 L per person), the same percent difference as between the two values in 2004. These statistics account for 10 458 106 Canadians served water in communities with 100% metering and 4 321 462 Canadians served water in communities with 0% metering.

It is important to note, however, that the difference in water use between metered and unmetered communities cannot be solely explained by the use of water meters or volume-based pricing. While there is strong evidence to suggest that volume-based pricing is associated with lower municipal water use, water use can also be affected by a wide variety of other factors, including location, climate and socio-economic variables (PRI 2004).

The association between metering rates and water use varies by community size and province/territory. In all provinces, the average daily water use per capita is higher in communities on flat or assessed rates compared to those on volumetric rates. However, the variation between provinces is wide—the difference ranges from 6.2% more water use in New Brunswick to 195.1% more in Manitoba for households on flat rates (none of the three territories had enough communities responding to water pricing type to make a valid comparison). When the same comparison is done between municipality size groups, it seems that the association between metering and water use is less prominent in larger communities. Among municipalities with populations of 1000–2000, those with 0% metering use 84.4% more water than those with 100% metering. This difference decreases to 50.7% and 55.8% for municipalities with populations of 5 000–50 000 and 50 000–500 000, respectively. It is interesting to note that there are no responding municipalities with a population of 500 000 that indicated 0% residential metering.

As in previous years, these findings suggest that metering and volume-based pricing can be valuable demand-management tools for promoting the responsible use of water resources.

A larger percentage of commercial establishments have water meters installed than do residential homes.

In 2006, 80.1% of small offices and stores were equipped with water meters, as indicated by the 807 municipalities (representing over 22 million Canadians served water) that responded to the survey question.² Only 63.1% of residences are similarly equipped (according to the 25.5 million Canadians served water in the 1199 municipalities that responded to this question). The higher rate of metering of commercial customers holds true for all provinces, except Nunavut. In Nunavut, however, only 2 municipalities responded to the commercial metering question as opposed to 10 for residential metering, which is likely skewing the comparison.

The proportion of commercial customers that are metered tends to be higher in larger communities. Table 1 shows that fully 84.3% of such buildings are metered in communities of more than 500 000 people, whereas in communities of 2000 to 5000 people, the figure drops to 49.4%.

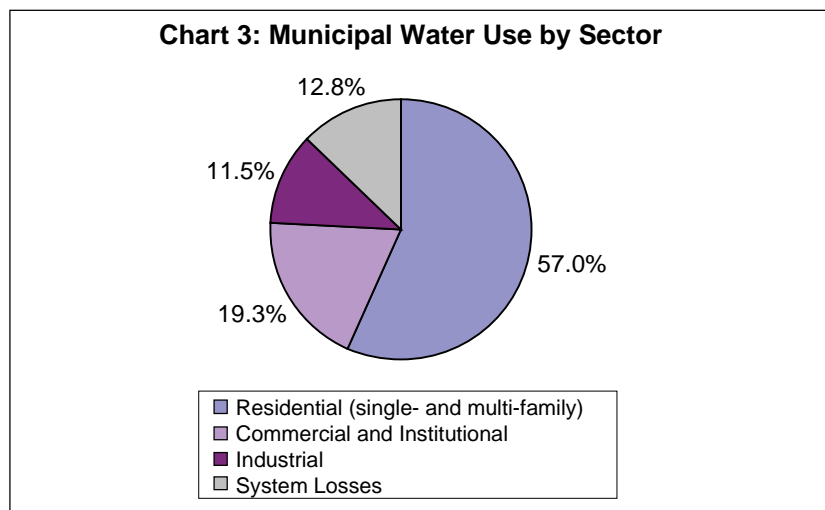
² For the commercial sector, the survey asks: "What percentage of serviced small offices/stores (1" or 25 mm connection) in this system have water meters?" Residential metering, as reported in Table 1, refers to single-family homes only. The percentage of multi-family homes that are metered is also collected by the survey but is not included in this report or the summary tables.

Across Canada, almost 13% of water is lost from the distribution system before reaching consumers.

In 2006, 57.0% of all the water used by responding municipalities (representing some 24 million Canadians) was consumed by households; this figure is only 1% higher than the 2001 and 2004 value. Commercial users accounted for 19.3% and industrial users for 11.5% of the total water used (down 0.2% from the combined commercial/industrial value reported in 2001 and 2004). The remaining 12.8% of water went to other uses—generally leaks in the distribution system infrastructure, although system overflows, system flushing and maintenance and unknown uses are also included in this category.

In many municipalities, a significant portion of the water produced by the water treatment facility is lost in the system—as high as 19.1% in the province of Quebec. Reduction of these water losses could contribute significantly to the goals of the demand-side management approach,³ which challenges us to reduce water demand through increased efficiency, rather than increasing supply by building new, or expanding old, treatment facilities.

The survey results show that the proportion of water used by the residential sector is greater in smaller municipalities. Larger municipalities have a relatively greater proportion of commercial/industrial use and system losses. For example, in municipalities with 1000 to 2000 residents, 70.5% of the water went to residential users, on average, while in municipalities with more than 500 000 residents, the residential share dropped to 53.9% (see Table 3).



The mean value in each sector was calculated separately; therefore, sectors may not add to 100%.

³ See “The Municipal Challenge” on the Water pages of Environment Canada’s Web site, under Water Use and Wise Water Use at www.ec.gc.ca/eau-water/

Table 3: Water Use by Sector (as a Percentage of Total Water Delivered to the Distribution Systems), by Province/Territory and Municipal Population

Province / Territory	Residential (%)	Commercial (%)	Industrial (%)	System Losses (%)	Number of Responding Municipalities	Responding Population as a % of the Total Survey Population
Newfoundland & Labrador	70.4	12.6	13.1	7.1	58	69.5
Prince Edward Island	40.6	25.3	21.3	14.0	6	44.3
Nova Scotia	60.0	19.9	5.1	12.7	30	73.9
New Brunswick	52.7	15.4	22.9	9.8	48	58.6
Quebec	54.6	16.1	11.6	19.1	309	85.5
Ontario	54.6	21.1	12.1	12.0	165	85.8
Manitoba	58.8	18.4	10.0	12.0	52	83.6
Saskatchewan	44.3	31.3	14.2	12.0	86	81.5
Alberta	62.1	20.0	10.8	7.2	129	89.8
British Columbia	65.0	15.8	9.6	9.1	114	89.4
Yukon	67.6	33.5	--	0.0	2	81.9
Northwest Territories	57.3	26.0	5.0	10.8	4	80.2
Nunavut	86.2	--	--	5.9	6	58.4
Municipal Population						
Under 1000	68.8	20.8	10.2	6.4	72	15.2
1000 – 2000	70.5	13.4	7.4	7.1	206	34.3
2000 – 5000	66.6	15.5	13.7	7.0	256	51.1
5000 – 50 000	60.4	17.9	12.8	10.2	398	74.7
50 000 – 500 000	57.6	20.4	10.5	11.9	67	89.5
More than 500 000	53.9	19.2	11.7	15.2	10	100.0
Total 2006	57.0	19.3	11.5	12.8	1 009	85.0
Total 2004	56.4	*	*	12.7	--	78.3

Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada.

* In 2004, response rates did not allow for reporting of Commercial and Industrial percentages separately. The sum of the two was 30.6% of water served.

Note: Sectorial percentages refer to the water from municipal systems and are not reflective of overall Canadian sectoral water use, especially for Industrial. The mean value in each sector was calculated separately; therefore, sectors may not add to 100%.

The number of water distribution systems in Canada carrying filtered water continues to rise.

The percent of the population served by water treatment⁴ continued to rise between 2004 and 2006. Out of the 28.2 million people in the 1314 municipalities that responded in 2006, 90.4% were served by a water distribution system and 95.8% of people on those systems received treated water (Table 2). While the percent on distribution systems has stayed relatively stable since 2004, the percentage of those whose distribution system served them treated water rose from 93.4% in 2004 to 95.8% in 2006 across Canada.

Smaller municipalities were more likely to supply untreated water—32.4% of the population served water in municipalities with populations under 5000 were served untreated water, compared with only 2.9% in municipalities with populations of over 5000.

This section of the survey also indicated that fluoridated water was served to as much as 66.7% of the responding population served water, in 19.8% of municipalities with water distribution systems.

Problems with water availability continue to exist in Canada.

In 2006, 75 of 459 responding municipalities, representing 16% of the 11.8 million people served water in those responding municipalities, indicated that they experienced water supply problems sometime in that year.⁵ Problems at the source (water shortages) accounted for 84% of the water quantity problems—where there was insufficient water available to meet the demand. The other 16% of the water quantity problems indicated that infrastructure problems at a treatment facility or in the distribution system were to blame, such as broken water mains, washouts due to floods and planned or unplanned plant closures.

More data is needed to explore more fully the issue of water availability in Canada's municipal water systems, since the response rates to the questions that were asked only account for a third of the Canadian population.

In general, Canadian municipalities rely heavily on surface water, while groundwater remains an important source for smaller municipalities.

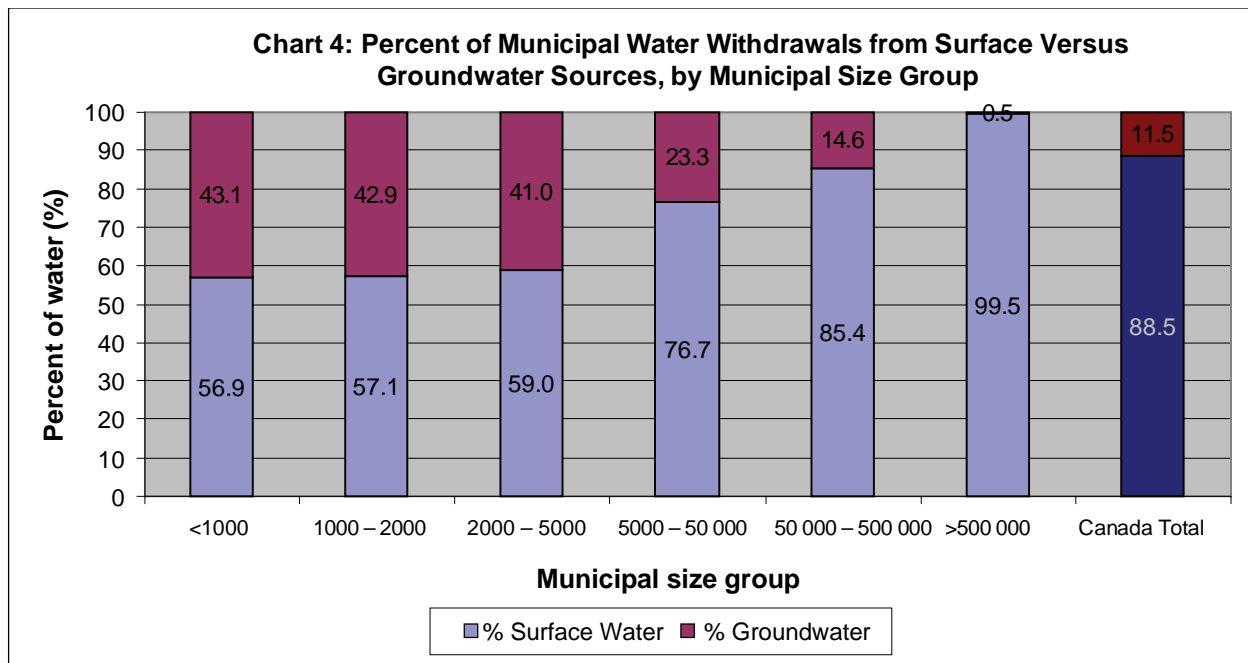
In 2006, 88.5% of the water supplied by municipalities came from surface sources and 11.5% from groundwater (see Chart 4). Smaller communities relied more heavily on groundwater than did larger ones. For example, communities of between 2000 and 5000 people took 41.0% of their water from below ground, whereas those with more than 500 000 people obtained just 0.5% of their water in this way. The 2006 survey also shows that many municipalities rely on some combination of surface and groundwater sources for their water supply.

The MWWS does not collect data on water abstractions, but rather the total amount of raw or treated water that is delivered to each water distribution system. In 2006, a total of 5395 million cubic metres

⁴ For the purposes of this report, water treatment involves at least a filtration process. Simple disinfection is not considered "treatment."

⁵ These values are not comparable to the results in the 2004 Water Use Report, as there they were reported for the 2002 to 2004 period instead of for the single year of the survey. The 2006 survey could not be reported this way as many municipalities responded to the survey after the end of 2007 and therefore included problems from that year, while others either responded before the end of 2007 or were under the impression that 2007 data was not being requested.

(MCM) of water was delivered to the municipal water distribution systems in responding municipalities.



The total volume of water used by responding municipalities according to population size group was:

- 2081 MCM (for populations of over 500 000; responding population of 10.04 million);
- 1807 MCM (for populations of between 50 000 to 500 000; responding population of 9.34 million);
- 1176 MCM (for municipalities of between 5000 to 50 000; responding population of 4.72 million);
- 251 MCM (for populations of between 2000 to 5000; responding population of 0.78 million);
- 66 MCM (for populations of between 1000 to 2000; responding population of 0.27 million);
- 15 MCM (for populations of less than 1000; responding population of 0.04 million).

The total number of Canadians who are served by sewage collection remains stable while those served by wastewater treatment increased.

Out of the responding population, 24.8 million Canadians were served by sewage collection and 24.3 million by wastewater treatment systems in 2006. The responding population in this case is the same as that in Table 2 (28.2 million people representing 1314 municipalities). The population connected to sewage systems (sewers) shows a small decrease from 88.7% in 2004 to 88.3% in 2006, although the fluctuation of this value since 2001 has been within 1 percentage point (88.1% in 2001). In the case of sewage treatment, there has been a slight increase from 85.9% in 2004 to 86.4% in 2006. Similar to the population served by municipal water distribution systems, the percentage of the responding population connected to sewage collection and treatment increased with population size (see Table 4). Also similar to the pattern for water distribution and treatment is the fact that, while the population served by sewer systems has remained relatively stable, the percent of that population also served by sewage treatment has increased from 96.9% in 2004 to 97.8% in 2006.

Table 4: Residential Wastewater Services, by Province/Territory and Municipal Population

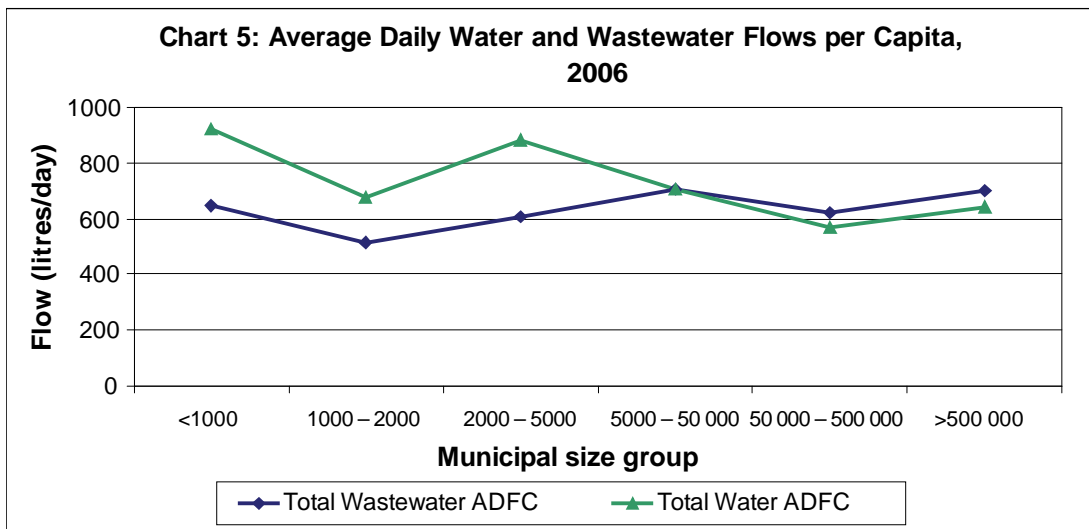
Province / Territory	Number of Responding Municipalities	Total Population of Responding Municipalities	Population Served by Sewers	As % of Responding Population	Population Served Wastewater Treatment	As % of Responding Population	Percent of Population Served Sewers that Is Also Served Wastewater Treatment*
Newfoundland & Labrador	71	357 996	303 287	84.7	108 131	30.2	35.7
Prince Edward Island	9	64 398	59 946	93.1	59 946	93.1	100.0
Nova Scotia	35	682 464	481 271	70.5	225 998	33.1	47.0
New Brunswick	134	597 520	395 240	66.1	392 172	65.6	99.2
Quebec	390	6 500 418	5 755 904	88.5	5 647 263	86.9	98.1
Ontario	224	11 704 469	10 322 342	88.2	10 297 564	88.0	99.8
Manitoba	65	920 313	832 490	90.5	830 275	90.2	99.7
Saskatchewan	96	656 724	627 115	95.5	625 893	95.3	99.8
Alberta	147	3 021 719	2 768 759	91.6	2 750 680	91.0	99.3
British Columbia	122	3 595 012	3 271 189	91.0	3 345 566	93.1	102.3
Yukon	4	23 920	19 637	82.1	17 164	71.8	87.4
Northwest Territories	7	31 863	27 990	87.8	27 990	87.8	100.0
Nunavut	10	20 523	16 571	80.7	16 570	80.7	100.0
Municipal Population							
Under 1000	81	60 061	36 458	60.7	29 010	48.3	79.6
1000 – 2000	341	483 032	282 755	58.5	250 031	51.8	88.4
2000 – 5000	349	1 130 598	777 150	68.7	714 013	63.2	91.9
5000 – 50 000	458	6 206 104	4 505 767	72.6	4 454 767	71.8	98.9
50 000 – 500 000	75	10 206 234	9 385 279	92.0	9 003 059	88.2	95.9
More than 500 000	10	10 091 310	9 894 332	98.0	9 894 332	98.0	100.0
Total 2006	1 314	28 177 339	24 881 741	88.3	24 345 211	86.4	97.8
Total 2004	1 294	28 381 763	25 172 496	88.7	24 386 529	85.9	96.9

Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada.

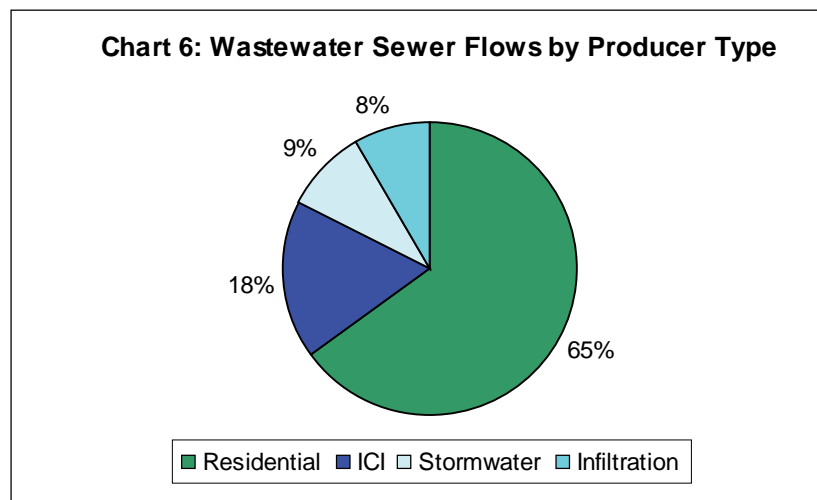
* The population served wastewater treatment divided by the population served by sewers (instead of dividing by the total municipal responding population.)

See Appendix A for details on total municipal population changes in all surveyed municipalities between 2006 and 2004.

In 2006, total wastewater flow was estimated at a daily average of 668 L per person served by sanitary sewers, all producer types combined (see Table 5). This represents 26.1 million Canadians. Total wastewater flow per capita does not display a consistent trend as municipality size gets larger. However, with the exception of the 2000 to 5000 population size group, similarities are evident between daily water flows per capita and daily wastewater flows per capita (see Chart 5).



In 2006, 64.9% of the flow into wastewater systems was from residential sources, according to municipalities representing 15.7 million Canadians served by sanitary sewers. Looking at the remainder, 17.5% was produced by the industrial/commercial sector, 9.3% was stormwater and 8.3% resulted from infiltration caused by groundwater leakage into sewer systems (see Chart 6). In smaller communities, wastewater is primarily produced by the residential sector, whereas in larger communities this percentage decreases (see Table 5). For example, in communities of less than 1000 people, 71.4% of wastewater flow was residential, whereas in those with 50 000 – 500 000 people, only 53.0% was produced by the residential sector.



ICI = Industrial, Commercial and Institutional

Table 5: Wastewater Flows per Capita and by Sector, by Province/Territory and Municipal Population

Province / Territories	Total Wastewater ADFC* (litres)	Total Population Responding to Wastewater Flows	Total Breakout Population on Sewers	Breakout ADFC* (litres)	Breakout Percentages** by Sector			
					Residential % of Flow	ICI*** % of Flow	Storm-water % of Flow	Infiltration % of Flow
Newfoundland & Labrador	768	99 175	14 812	443	75.3	17.0	5.5	2.1
Prince Edward Island	527	64 034	38 295	205	32.8	58.9	4.7	3.6
Nova Scotia	348	697 441	104 559	235	71.2	12.6	9.5	6.6
New Brunswick	770	430 648	184 419	330	64.5	15.4	10.9	9.1
Quebec	1 089	5 657 284	3 406 269	375	77.4	5.2	10.1	7.3
Ontario	517	11 157 832	6 663 089	164	61.5	24.6	6.8	7.0
Manitoba	462	874 932	674 444	159	73.5	11.0	5.1	10.4
Saskatchewan	415	624 687	303 713	153	49.3	40.0	1.1	9.6
Alberta	642	2 928 567	2 288 901	215	47.5	34.2	3.1	15.3
British Columbia	629	3 526 645	2 009 978	207	55.7	16.0	22.5	5.8
Yukon	626	22 634	--	--	--	--	--	--
Northwest Territories	413	31 306	15 895	137	65.2	32.8	0.0	2.0
Nunavut	191	16 647	--	--	--	--	--	--
Municipal Population								
Under 1000	646	31 748	8 561	167	71.4	15.1	2.4	11.1
1000 – 2000	512	262 721	35 308	180	67.4	16.0	6.5	10.1
2000 – 5000	606	835 777	147 798	216	68.0	19.4	5.5	7.1
5000 – 50 000	704	5 343 053	1 680 953	248	60.2	22.3	6.8	10.6
50 000 – 500 000	625	9 567 223	4 412 545	195	53.0	20.8	14.1	12.1
More than 500 000	700	10 091 310	9 419 209	236	70.3	15.3	8.0	6.4
Total 2006	668	26 131 832	15 704 375	225	64.9	17.5	9.3	8.3
Total 2004	651	24 032 053	7 554 644	203	66.0	20.2	5.2	8.6

Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada.

* ADFC = Average Daily Flow per capita.

** Breakout percentages by sector relate to the total average daily flow per capita for the population responding to the survey question on wastewater production by sector and are NOT directly comparable to the average daily flows per capita of the larger group responding to the total flows question in the left columns of the above table.

*** ICI = Industrial, commercial and institutional.

In Canada, most municipal wastewater receives at least secondary-level treatment.

There is a broad variety of wastewater treatment procedures in use in Canada, and not all Canadians are served by the same level of treatment. In 2006, secondary mechanical (conventional) treatment was the most widely used treatment category across Canada. For the responding population served by sanitary wastewater collection systems (956 municipalities representing 22.8 million Canadians), 42.4% are served by secondary mechanical treatment. Of the remaining responding population, 1.6% are served by preliminary treatment, 17.5% by primary treatment, 6.2% by waste stabilization ponds (WSPs), 30.8% by tertiary treatment and 1.6% were not served by wastewater treatment facilities at all (see Table 6).

Within the secondary treatment category, smaller municipalities are more likely to use waste stabilization ponds, while those with populations of over 50 000 are more likely to use secondary mechanical treatment (see Table 6). For example, in municipalities with populations between 1000 and 2000, 57.0% are served by waste stabilization ponds as the highest treatment level, whereas in municipalities with a population of greater than 500 000, this number decreases to zero. When one looks at secondary (WSPs and mechanical) and tertiary combined (“secondary treatment or better” – accounting for 79.3% of the population served sanitary sewers), no discernable relationship to community size is evident (see Table 6). Within this grouping, the WSPs are prevalent in the smaller communities (below 5000 population), while mechanical secondary and tertiary treatment facilities are prevalent in the larger communities (greater than 50 000 population).

The various levels of wastewater treatment indicated by municipalities responding to the survey paints a picture of the wide diversity of treatment types used in Canadian communities.

Table 6: Wastewater Treatment Levels, by Province/Territory and Municipal Population

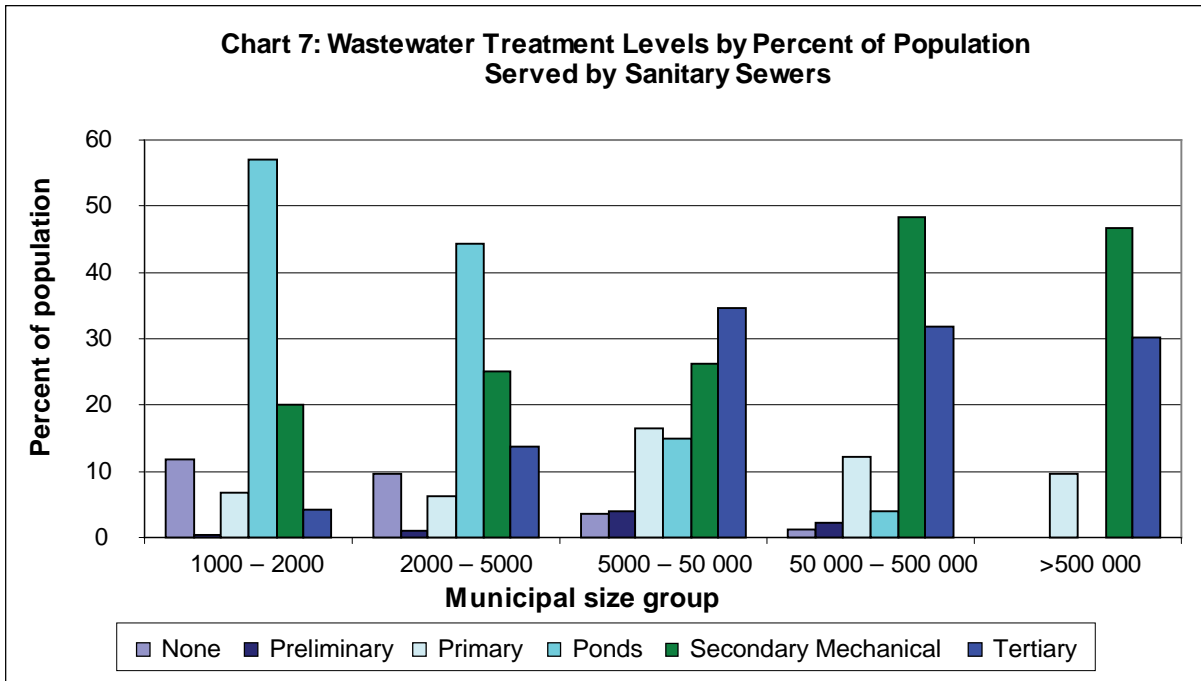
Province / Territories	Treatment Levels* by Responding Population (%)						Secondary Treatment or Better (%) **	Number of Responding Municipalities	Population on Sewers in Responding Municipalities	Population with Ww Treatment Levels Specified***
	0	1	2	3	4	5				
Newfoundland & Labrador	74.6	1.4	2.3	7.4	4.8	9.5	21.7	61	285 530	275 859
Prince Edward Island	0.0	0.0	3.2	31.2	65.6	0.0	96.8	7	56 131	56 131
Nova Scotia	6.5	0.0	4.7	15.5	18.5	54.8	88.8	33	483 283	240 194
New Brunswick	2.5	0.0	23.9	20.7	38.6	14.2	73.6	56	336 079	333 018
Quebec	1.3	1.5	47.5	10.5	27.2	12.0	49.7	251	5 315 096	5 249 727
Ontario	0.0	0.2	4.9	0.8	59.5	34.6	94.9	160	9 731 367	9 195 391
Manitoba	0.5	0.0	3.9	10.0	69.0	16.7	95.6	52	825 770	826 253
Saskatchewan	2.7	0.0	0.4	12.8	48.4	35.7	96.9	71	610 732	610 732
Alberta	0.3	0.6	1.0	9.6	3.3	85.2	98.1	136	2 742 193	2 720 223
British Columbia	1.0	7.4	27.2	5.4	48.8	10.1	64.3	113	3 251 340	3 306 491
Yukon	0.0	0.0	7.0	4.9	0.0	88.1	93.0	3	19 637	17 164
Northwest Territories	0.0	0.0	4.5	95.5	0.0	0.0	95.5	5	24 916	24 916
Nunavut	0.0	0.0	0.0	100.0	0.0	0.0	100.0	8	15 335	15 334
Municipal Population										
Under 1000	25.0	0.0	9.5	50.4	11.9	3.2	65.5	53	34 754	33 950
1000 – 2000	11.8	0.4	6.7	57.0	20.1	4.1	81.2	185	238 285	236 817
2000 – 5000	9.6	1.0	6.3	44.3	25.1	13.7	83.1	254	683 828	674 382
5000 – 50 000	3.7	3.9	16.5	14.9	26.2	34.7	75.8	388	4 363 781	4 352 851
50 000 – 500 000	1.3	2.3	12.3	4.0	48.3	31.8	84.1	66	8 482 431	7 717 450
More than 500 000	0.0	0.0	23.2	0.0	46.6	30.2	76.8	10	9 894 332	9 855 985
Total 2006	1.6	1.6	17.5	6.2	42.4	30.8	79.3	956	23 697 410	22 871 436

Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada

* Treatment Levels are 0) No Treatment; 1) Preliminary Treatment; 2) Primary; 3) Waste Stabilization Ponds or Lagoons; 4) Secondary Mechanical; 5) Tertiary or Advanced Treatment. See the glossary below for details.

** Secondary Treatment or Better includes populations served by at least waste stabilization ponds (WSPs), secondary mechanical or tertiary treatments.

*** The "Population with Ww Treatment Levels Specified" is different than the total population of the responding municipalities because the information about treatment types may have been provided for only some systems in a municipality.



Canadians rely heavily on surface fresh water as a destination for wastewater discharge.

For the 284 municipalities that responded to this question in 2006 (representing 19.1 million Canadians), surface fresh water was the main destination for 91.5% of their effluents. Marine water was a main destination for 5.7% of their effluents, and 2.8% was disposed of using “other” methods or destinations, including infiltration, irrigation, and evaporation processes (see Chart 8). Smaller municipalities are more likely to use “other” discharge destinations and methods (see Table 7).

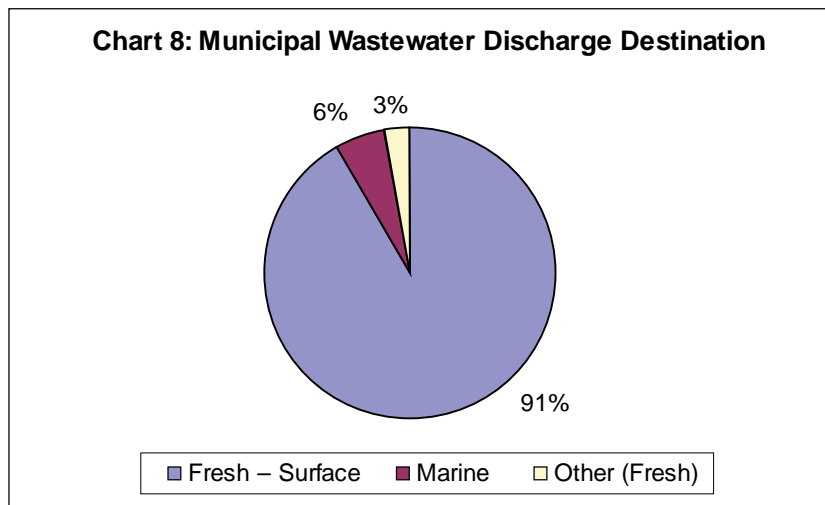


Table 7: Discharge Destination for Wastewater Flows, by Province/Territory and Municipal Population

Province / Territories	Total Population of Responding Municipalities	Number of Responding Municipalities	Responding Ww Flow* (MCM)	Wastewater Flow Destination			Percentage of Responding Ww Flow Accounted for by Discharge Destination (%)
				% Fresh Surface	% Marine	% Other**	
Newfoundland & Labrador	9 688	2***	4.6***	100.0***	0.0***	0.0***	100.0
Prince Edward Island	39 257	2	7.6	5.9	94.1	0.0	100.0
Nova Scotia	189 741	5	23.1	6.8	93.2	0.0	62.4
New Brunswick	230 620	16	69.3	63.4	33.2	3.4	100.0
Quebec	4 318 442	67	1 682.7	98.8	0.7	0.5	99.7
Ontario	8 727 658	79	1 489.3	97.9	0.0	2.1	93.0
Manitoba	685 398	12	107.8	100.0	0.0	0.0	100.0
Saskatchewan	302 998	15	46.4	94.7	0.1	5.2	96.6
Alberta	2 466 343	48	510.0	99.9	0.0	0.0	99.7
British Columbia	2 178 408	38	535.5	29.8	49.4	20.8	99.9
Yukon	0	0	--	--	--	--	--
Northwest Territories	0	0	--	--	--	--	--
Nunavut	0	0	--	--	--	--	--
Municipal Population							
Under 1000	6 610	12	0.9	85.6	11.2	3.3	100.0
1000 – 2000	31 127	20	5.1	61.3	23.5	15.3	100.0
2000 – 5000	155 264	46	24.7	91.0	5.4	3.5	98.5
5000 – 50 000	2 561 197	149	492.9	94.6	3.1	2.3	99.6
50 000 – 500 000	6 303 045	47	1 308.7	86.0	5.2	8.8	98.9
More than 500 000	10 091 310	10	2 644.1	91.9	8.1	0.0	96.0
Total 2006	19 148 553	284	4 476.5	91.5	5.7	2.8	97.9

Source: 2006 Municipal Water and Wastewater Survey. Aggregated to municipal level and imputed for non-response using previous MWWS and MUD surveys. Sustainable Water Management Division, Environment Canada.

* Ww Flow = Total Wastewater Flow (million cubic metres).

** Other discharge types include such things as infiltration, irrigation, or evaporation.

*** Due to the very low response on this question for municipalities in Newfoundland, these figures should not be considered representative of the general situation in that province.

Note: Due to low response rate for the Discharges section of the 2006 survey, these total wastewater flows are not representative of the total wastewater discharged from all treatment facilities in Canada. The percentages, however, are deemed to be representative of the Canadian population.

Conclusions

Environment Canada's Municipal Water and Wastewater Survey (MWWS) results continue to give us insight into the state of water use and management in Canada. The regular reports and extensive data made available to the public provide key information that can help support water management decisions in the broader context of ecosystem management.

Canadians are increasingly concerned about the efficient and sustainable use of our water resources. In this context, the Canadian Council of Ministers of the Environment (CCME) recently released a vision for water (CCME Setting Strategic Directions for Water⁶) that will guide future actions related to water and which underscores the importance of conservation and the wise use of water. Nevertheless, this heightened attention to water efficiency has not been reflected in significant changes in key indicators of sustainable water use and management, such as residential per capita water use and metering rates.

Results from the 2004 and 2006 surveys were quite similar in many ways—many statistics such as the percent of the population served by water distribution systems and sewer systems, residential per capita water use and the rate of residential water metering remained at or near the same level. Furthermore, comparing results from years prior to 2004 shows that, in fact, these statistics have changed relatively little over the past decade. Beyond the national averages, the data present a very wide diversity between different provinces and territories and between different municipal sizes.

The next MWWS survey will collect data for the year 2009 and this data will continue to contribute to understanding how Canadian communities use and value water and therefore help water managers balance the needs of the Canadian economy, Canadian society and the environment.

⁶ www.ccme.ca/assets/pdf/water_backgrounder_e.pdf

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Glossary

Aggregated data – Data created by summing up the separate values of related groups of data.

Data source – The source of information gathered by a survey. Data sources for the Municipal Water Use and Pricing Survey include municipalities, treatment plants and various water-management professionals.

Flat rate pricing – Methods of charging fixed amounts for water or wastewater-related services, in which the charges are unrelated to the amount of water used or wastewater produced by a customer.

Fluoridation – A water treatment that involves adding fluoride (a naturally occurring element found in rocks and minerals) to municipal water to help prevent tooth decay.

Geocoding – Spatially referencing statistical data by linking it to geographical information, such as longitude and latitude.

Imputation – The process of estimating a missing value that a survey respondent failed to provide. The estimate can be "imputed" from the subject's responses to similar surveys in previous years, for example, or calculated using various statistical methods.

Municipality – A municipal-level jurisdiction (in an organizational sense and a spatial sense) as defined by Statistics Canada's Census Subdivisions. For the purpose of the Municipal Water Use and Pricing survey, municipalities may be grouped in some cases.

Municipal Water Use Database – The municipally aggregated database created from municipal water use survey results, using imputed values where necessary.

OECD – Organisation for Economic Co-operation and Development.

Population served – The portion of the responding population receiving a particular water-related municipal service (i.e., water distribution, water treatment, wastewater collection or wastewater treatment, depending on the question).

Proxy – A statistical variable that is similar enough to another to be used as a substitute for it, usually because it can be more readily measured than the original.

Responding municipality – A municipality for which there was a response to a given question in the 2004 survey (for example, "What was the population served water distribution?"). A municipality that fails to respond to a particular survey question can still be considered a responding municipality if its response can be imputed from other available information (see "Imputation" above), or if the information was later acquired through call-backs or Internet searches.

Responding population – The total population of responding municipalities (see "Responding municipality" above), as determined by Statistics Canada.

Total Canadian population served – The real on-the-ground total Canadian population receiving a given water-related municipal service.

Unweighted municipalities responding – The number of municipalities responding to the Municipal Water Use and Pricing Survey or any portion thereof.

Variable description document – A text document that describes the tables and variables in a given database.

Volume-based pricing – Methods of charging for water- or wastewater-related services that take into account the amount of water used or wastewater produced by a customer.

Wastewater Treatment Levels – Classifications of wastewater treatment types to simplify comparison of the many types of wastewater treatment technologies used, specifically:

- 1) Preliminary treatment includes grit removal, screening, bar racks and skimming.
- 2) Primary treatment includes primary sedimentation/clarification, plate/tube settlers and chemical precipitation/flocculation.
- 3) Secondary treatment is defined as treatment for the removal of most of the organic matter or to achieve significant biochemical oxygen demand and suspended solids reductions. This includes two categories:
 - Waste Stabilization Ponds (WSPs): aerated, aerobic, facultative, anaerobic and storage ponds.
 - Secondary – Mechanical: activated sludge (conventional, extended, pure oxygen or other methods), oxidation ditch, trickling filter, rotating biological contactors and sequencing batch reactors.
- 4) Advanced or tertiary treatment is defined as enhanced treatment to remove constituents, such as phosphorus and nitrogen, which may not be satisfactorily reduced from conventional secondary treatment. This includes polishing ponds, ammonia stripping/air stripping, biological nutrient removal (N & P), biological ammonia removal (nitrification only), biological nitrogen removal (nitrification and denitrification), biological phosphorous removal, chemical precipitation of phosphorous and advanced filtration.

Weighting – A statistical technique that takes into account the relative importance, or "weight" of individual elements in a data set instead of treating them all as equal. Calculations using weighted data (a weighted average, for example) often approximate reality more closely than do those using unweighted data.

Appendix A

As mentioned in the Methodology section, when comparing the group of municipalities that were surveyed in 2004 and the group surveyed in 2006, the data shows that the total number of Canadians in surveyed municipalities (responding or not) actually decreased from 30.9 million in 2004 to 30.7 million in 2006, even though 7 more municipalities were part of the survey in 2006 (see Table A). Comparing only the municipalities that responded to the survey in both years (therefore excluding any municipalities added to the survey in 2006 or removed from the survey since 2004, as described in the Methodology section) also shows a drop in population—from 27.9 million in 2004 to 27.3 million in 2006. The total population of Canada as reported by Statistics Canada, which includes Canadians living outside of surveyed municipalities, however, did rise—from 31.9 million in 2004 to 32.6 in 2006.*

Table A: Difference in Surveyed Population between 2006 and 2004

Provinces / Territories	2004		2006		Difference (+/-)	
	Number of Surveyed Municipalities	Total Population of Surveyed Municipalities	Number of Surveyed Municipalities	Total Population of Surveyed Municipalities	Number of Surveyed Municipalities	Total Population of Surveyed Municipalities
Newfoundland & Labrador	144	450 663	143	445 433	-1	-5 230
Prince Edward Island	23	129 590	23	128 095	0	-1 495
Nova Scotia	51	925 231	51	902 191	0	-23 040
New Brunswick	194	707 755	194	687 163	0	-20 592
Quebec	779	7 304 699	796	7 316 522	17	11 823
Ontario	325	12 296 901	322	12 078 574	-3	-218 327
Manitoba	144	1 070 014	142	1 052 341	-2	-17 673
Saskatchewan	304	783 073	301	760 939	-3	-22 134
Alberta	237	3 117 336	236	3 218 914	-1	101 578
British Columbia	161	4 112 988	160	4 023 072	-1	-89 916
Yukon	10	27 195	10	26 612	0	-583
Northwest Territories	14	35 794	14	35 154	0	-640
Nunavut	16	22 504	17	23 648	1	1 144
Municipal Population						
Under 1000	616	283 029	630	298 428	14	15 399
1000 – 2000	618	882 784	612	863 205	-6	-19 579
2000 – 5000	528	1 659 695	519	1 620 416	-9	-39 279
5000 – 50 000	553	7 345 659	562	7 561 079	9	215 420
50 000 – 500 000	76	9 826 585	76	10 264 220	0	437 635
More than 500 000	11	10 985 991	10	10 091 310	-1	-894 681
Canada Total	2 402	30 983 743	2 409	30 698 658	7	-285 085

Source: 2006 Municipal Water and Wastewater Survey. Sustainable Water Management Division, Environment Canada.

* For total annual provincial populations in Canada (not just surveyed municipalities) from 2004 – 2008 see:

www40.statcan.gc.ca/l01/cst01/demo02a-eng.htm

www.ec.gc.ca

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