Catalogue no.16-002-X

EnviroStats

Winter 2008 Vol. 2, no. 4

In this issue:

Latest indicators

Population 2006 to 2007 percentage change	1.0%	Particulate matter ($PM_{2.5}$) 2000 to 2005	No significant trend
Gross domestic product August 2008 percentage change	-0.3%	Ground-level ozone 1990 to 2005 median percent change per year	0.8%
Greenhouse gas emissions 2005 to 2006 percentage change	-1.9%	Natural resource wealth 2006 to 2007 percentage change	8.3%

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EnviroStats

Winter 2008 Vol. 2, no.4

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.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published

Greenhouse gas emissions—a focus on Canadian households

Alison Clark Milito and Gabriel Gagnon, Environment Accounts and Statistics Division

Households contribute to greenhouse gas (GHG) emissions in Canada in two ways. Direct emissions from motor fuel use and residential fuel use account for about one-third of household emissions, while indirect emissions from the production of the goods and services that households consume make up the remainder (see textbox for definitions). Consideration of both types of emissions, direct and indirect, gives a more complete picture of the GHG emissions associated with household activities.

Together, direct and indirect household emissions accounted for 46% of Canada's total GHG emissions in 2004.[1] Overall, these emissions increased 13% between 1990 and 2004, from 285,884 kilotonnes (kt) to 321,727 kt.

Between 1990 and 2004, household GHG emissions intensity decreased by 22% (Chart 1). This was partly due to efficiency gains in the production of goods and services by industry and partly to energy efficiency improvements within Canadian homes. However, spending per capita increased by 25% over the same period. The increase in spending resulted in a 10% increase in indirect GHG emissions from households. This, coupled with the 16% increase in household direct emissions offset most of the gains in efficiency. The end result of these combined effects was an insignificant change in emissions per capita between 1990 and 2004.

How much do Canadian households emit directly via household activities?

Approximately one-third of total household emissions are a result of motor fuel use and fuel use within the home.

Household emissions from motor fuel use increased by 29% between 1990 and 2004, from 55,770 kt to 71,873 kt, while emissions from fuel use in the home remained relatively stable.

1. The remaining 54% of total emissions were the result of industrial production to meet the demand for goods and services from other consumers (for example, exports to foreign countries) and the emissions associated with government activities.

What you should know about this study

The data used to produce this article are derived from Statistics Canada's Material and Energy Flow Accounts (MEFA), which integrates environmental data with the economic data from Canada's System of National Accounts (CSNA).The CSNA is the source of a number of Statistics Canada's most important indicators of economic activity, including gross domestic product (GDP). One of the main components of the CSNA are the input-output (I/O) accounts which produce highly detailed production and consumption statistics for 303 industries, 719 goods and services and 170 categories of final demand.

The MEFA follow the I/O accounting framework to track the use of energy and the generation of emissions by each industry and final demand sector. The flows are linked through the common industrial and commodity classification of the I/O tables. This linkage allows analysis of the interplay between economic activity and greenhouse gas emissions. This article analyses the portion of GHG emissions that are included in the MEFA. Total GHG emissions in the account increased 24% from 571,076 kilotonnes (kt) to 706,660 kt, between 1990 and 2004.

Readers may notice that the emissions estimates in this document differ from the totals that appear in the official Environment Canada submission to the United Nations Framework Convention on Climate Change. This is due to adjustments that have to be made to *National Inventory Report* sectoring and definitions in order to ensure consistency with the requirements of the CSNA.

The accounts used for this analysis also include only the three main greenhouse gases, namely carbon dioxide, methane, and nitrous oxide, and do not include emissions from the decomposition or incineration of waste. Total GHG emissions reported in Environment Canada's *National Inventory Report* increased 25.4% from 592,000 kt to 743,000 kt, between 1990 and 2004.

Emissions factors from Environment Canada are applied to Statistics Canada's energy use account data, which are also based on the CSNA industry and commodity frameworks. The energy use data come mainly from Statistics Canada's Industrial Consumption of Energy Survey, transportation surveys, the *Report on Energy Supply-Demand in Canada* and Natural Resources Canada's Census of Mines. Additional estimates of emissions that are not linked to fossil fuel consumption are taken directly from the Environment Canada greenhouse gas inventory and are applied to the appropriate industries in the CSNA. Chapter 4 of the publication, *Concepts, Sources and Methods of the Canadian System of Environmental and Resource Accounts* (16-505-G, free) describes in detail the conceptual framework, data sources and empirical methods used in this study.

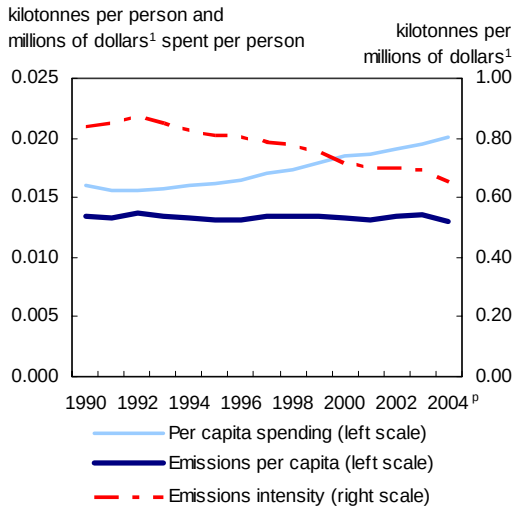
Definitions:

Direct household emissions are the greenhouse gases that are emitted when people drive their vehicles for personal use and use fossil fuels to heat their homes.

Indirect household emissions are the greenhouse gases that are emitted when industries produce the goods and services that people purchase for household use.

Household emissions intensity is total direct plus indirect household emissions divided by total household spending (personal expenditure) in dollars.

Chart 1
Emissions per capita remain stable despite increases in efficiency



1. Chained (1997) dollars.

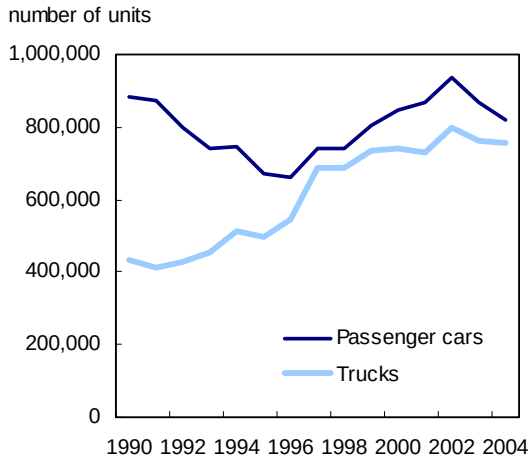
Note(s):
These intensity measures include an estimate of the greenhouse gas emissions from foreign companies due to the production of imported goods purchased by Canadian households. This is done to ensure consistency with total household spending that is used in the calculation. Emissions produced abroad to satisfy demand for imported goods were estimated with the assumption that the technology used to produce imported goods yields the same emissions per unit of output as in Canada.

Source(s):
Environment Accounts and Statistics Division, Material and Energy Flow Accounts, 2008.

The use of motor fuels is the largest source of direct emissions attributable to households. The increase in emissions associated with motor fuel use outpaced the 16% growth in population during this period, reflecting the increased popularity of larger motor vehicles that require more fuel per kilometre driven. Sales of trucks[2] increased 74% from 1990 to 2004 (Chart 2).

Natural gas and heating oil made up 58% of the energy used in Canadian dwellings in 2004, and accounted for 99% of the emissions from fuel use within the home.[3] The latest international comparison showed that Canada ranked third among G8 countries, just behind the United Kingdom and Germany, in direct residential greenhouse gas emissions per capita (Chart 3).

Chart 2
Sales of new trucks up 74% since 1990



Source(s):
Statistics Canada, CANSIM table 079-0003, accessed September 26, 2008.

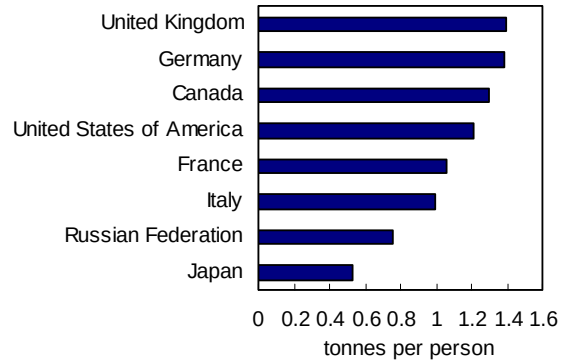
From 1990 to 2004, emissions from the consumption of natural gas rose 22%, while those from the use of heating oil decreased 43% (Chart 4). The 2004 emissions from residential fuel use were 1% lower than in 1990 in spite of a 10% increase in total fuel use over the same period. The switch to more fuel-efficient heating and cooling appliances, and the replacement of oil with less carbon-intensive[4] natural gas help explain the relative stability of emissions from household fuel use.

What are the total indirect emissions related to our purchases?

Close to two-thirds of total household GHG emissions are the result of releases by industry in the production of goods and services purchased by households (Table 1). Greenhouse gases emitted domestically to meet the demand of households for goods and services increased by 11% between 1990 and 2004, from 189,168 kt to 209,249 kt (Chart 5).

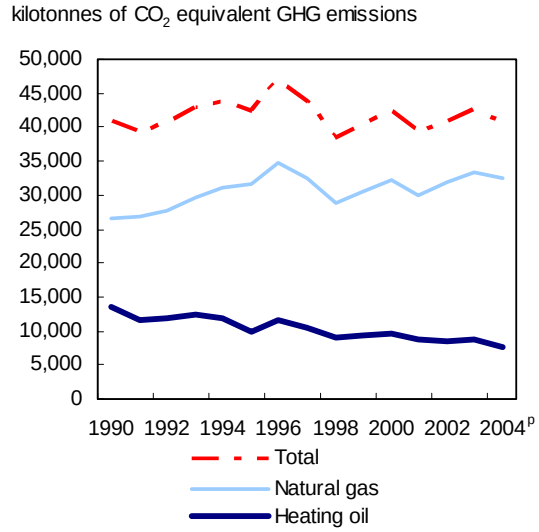
2. Includes light-duty trucks, minivans, and sport-utility vehicles.
3. Electricity represents the remaining 42% of total energy used in the home, but its consumption does not directly result in the release of greenhouse gas emissions. See: Statistics Canada, CANSIM table 153-0032, accessed September 25, 2008.
4. When burned, heating oil releases 47% more carbon dioxide per unit of energy (73.11 tonnes/terajoule) than natural gas (49.68 tonnes/terajoule). See: A.P. Jaques, 1992, *Canada's Greenhouse Gas Emissions: Estimates for 1990*, Environment Canada.

Chart 3
Canadian GHG emissions per capita for residential fuel use—third highest in G8, 2005



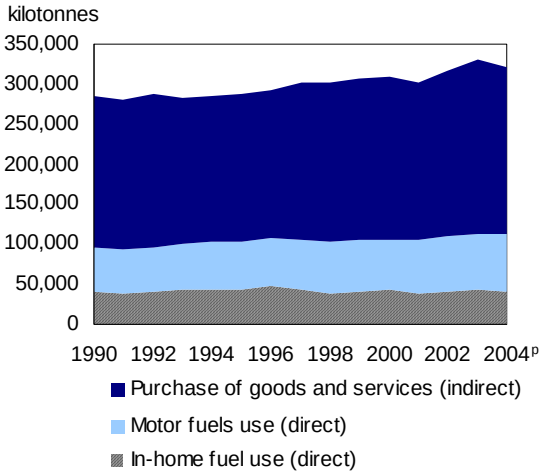
Note(s):
Only includes direct greenhouse gas emissions from fuel use in the home.
Source(s):
United Nations, 2008. *GHG Data from UNFCCC*, http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php (accessed September 26, 2008).
United Nations, 2008, *World Population Prospects Population Database: The 2006 Revision,* http://esa.un.org/unpp/ (accessed September 26, 2008).

Chart 4
Switching from heating oil to natural gas helped stabilize emissions from home fuel use



Source(s):
Environment Accounts and Statistics Division, Material and Energy Flow Accounts, 2008.

Chart 5
Two thirds of household GHG emissions result from spending on goods and services



Source(s):
Environment Accounts and Statistics Division, Material and Energy Flow Accounts, 2008.

In 2004, 66% of total indirect household emissions were linked to the production of goods (137,074 kt) while the remainder was due to the production of services (72,174 kt). This proportion was 72% for goods and 28% for services in 1990.

Goods and services purchases that resulted in the highest indirect GHG emissions in 2004 were electricity; food and non-alcoholic beverages; restaurant meals and accommodations; and motor fuels and lubricants. These four categories represented 54% of the total indirect emissions from households. In contrast, they accounted for just 21% of overall household spending (Table 2).

Electricity purchases

Electricity represents 42% of total energy used in the home, but greenhouse gases are not directly emitted when households turn on their lights. However, greenhouse gases are emitted when electricity is generated using fossil fuels. Approximately one-quarter of electricity in Canada is produced using fossil fuels,[5] such as coal and natural gas. The electric power industry is the top greenhouse gas emitter in Canada.

The use of electricity resulted in the greatest indirect emissions from households in 2004 even though it

5. Statistics Canada, CANSIM table 127-0001, accessed September 24, 2008.

Table 1
Canadian greenhouse gas emissions attributable to household spending and consumption, 2004[p]

	Contribution to total household emissions	
	kilotonnes	percent
Indirect emissions	209,249	65.0
Goods	137,074	42.6
Services	72,174	22.4
Direct emissions	112,478	35.0
In-home fuel use	40,605	12.6
Motor fuels use	71,873	22.3
Total domestic GHG emissions attributable to households	**321,727**	**100.0**

Source(s):
Environment Accounts and Statistics Division, Material and Energy Flow Accounts, 2008.

Table 2
Goods and services purchases resulting in the highest indirect emissions from households, 2004[p]

	Emissions[1]	Contribution to total household indirect emissions	Personal expenditure[2]	Contribution to total spending	Emissions intensity[3]
	kilotonnes	percent	millions of dollars	percent	kilotonnes per millions of dollars
Personal expenditure categories of final demand[4]					
Electricity	41,445	20	13,570	2	3.054
Food and non-alcoholic beverage	39,857	19	67,105	9	0.594
Restaurants and accommodation services	15,716	8	49,505	7	0.317
Motor fuels and lubricants	15,137	7	24,245	3	0.624
Subtotal	**112,155**	**54**	**154,425**	**21**	**…**

1. Domestic industrial emissions associated with producing goods and services to meet household demand.
2. Household spending on consumer goods and services, plus the operating expenses of private non-profit organizations serving households.
3. Domestic industrial emissions per unit of total personal expenditure.
4. Final demand in the Canadian System of National Accounts (CSNA) is broken down into 170 categories, 52 of which are related to personal expenditure by individuals, families and private non-profit organizations. Each of the 719 goods and services in the CSNA is assigned to one of these 52 broad categories of personal expenditure.

Source(s):
Environment Accounts and Statistics Division, Material and Energy Flow Accounts, 2008.
Statistics Canada, CANSIM table 380-0024, accessed November 12, 2008.

represented a small portion (2%) of total household spending. This is due to the high emissions associated with the production of electricity.

Food and non-alcoholic beverage purchases

Household purchases of goods from the food and non-alcoholic beverages category resulted in the second greatest indirect emissions. This reflects the importance of food and non-alcoholic beverages in overall household spending (9% in 2004), as well as the association of these commodities with the agriculture industry, which is one of the most GHG-intensive industries in the economy.

Restaurant and accommodation services

The restaurant and accommodation services category of personal expenditure is the third largest source of indirect emissions. The emissions intensity associated with purchases of restaurants and accommodation services is not particularly high (0.317 kt/millions of dollars), but the category ranks high overall because of the relatively large amount of personal expenditure devoted to it ($50 billion in 2004). Greenhouse gases associated with purchases of restaurant and accommodation services are related primarily to the food and electricity production needed to generate these services.

Motor fuel and lubricant purchases

Emissions released in the production of motor fuels and lubricants to meet household demand are almost equal to emissions from spending on restaurants and accommodations, despite household spending being 51% lower in this category (Table 2). This is due to the higher emissions intensity of motor fuel and lubricant purchases (0.624 kt/millions of dollars).

Canadian participation in an environmentally active lifestyle

Avani Babooram, Canadian Centre for Justice Statistics

Canadians are often exposed to messages about the environment ranging from climate change to resource scarcity, and many Canadians are making the decision to adopt behaviours aimed at reducing, reusing, and recycling. In this study, data on household behaviours are analysed to see how these decisions translate into action on the part of households.

This study focuses on six environmental behaviours at the household level: use of reduced volume toilets; use of low-flow showerheads; use of compact fluorescent light bulbs (CFL); recycling; composting; and lowering temperatures.[1] Households that practiced four to six behaviours were considered very active. Those who engaged in two to three behaviours were moderately active, while those who adopted zero or one behaviour were considered less active.

In 2006, almost half of Canadian households were very active across this range of environmental behaviours (45%). Despite the possible financial and access challenges faced by lower income families and apartment dwellers with respect to environmental behaviour, 35% of households with incomes of $28,000 or less were very active. In the same vein, 22% of renters were also very active. Of income, education and dwelling tenure, dwelling tenure was most strongly associated with a household being very active (see textbox for definitions).

Recycling is the most common behaviour

Of the six behaviours, the participation rate[2] for recycling was highest (Table 1), even though recycling requires ongoing effort. Sustained or repetitive behaviours such as recycling can be more difficult to adopt than single actions such as

What you should know about this study

The Households and the Environment Survey (HES) collects information on a variety of environmental themes. This study uses the 2006 HES environmental and demographic data to identify what types of households are more environmentally active than others.

Definitions

Household composition refers to the age structure of the household. Children are defined as anyone under the age of 18. Working-age householders range from 18 to 64 years of age. Seniors are defined as anyone aged 65 or over.

Income is defined as total annual household income, before tax.

Education refers to the highest level of education completed by any member of the household.

Dwellings are separated into the following groups: apartments; multi-units which include townhouses, row homes and duplexes; and single-detached dwellings.

Dwelling tenure refers to whether a dwelling is owned or rented.

Recycling is defined as use of either paper, plastic, metal or glass recycling services by households with access to these services.

Lowering temperatures refers to programmable or manual thermostats that are set at a lower temperature when the household is asleep than when they are awake, during the heating season.

Methodology

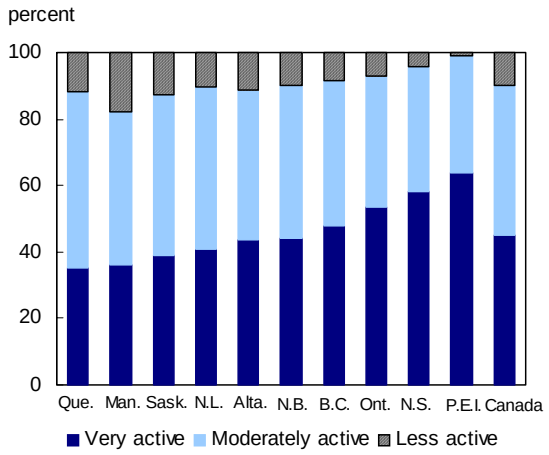
Only households with access to at least one form of recycling, as well as access to the dwelling thermostat were included in the analysis. Households that answered "don't know" or "refusal" were not counted in the numerator, but they were included in the denominator.

Logistic regression was used to determine the strength of the associations between the independent and dependent variables, expressed in terms of odds ratios. Ninety-five percent confidence intervals were calculated for all estimates using the bootstrap weights.

A correlation matrix was used to determine the relationship between the independent variables, and decisions to exclude some independent variables from the model were based on the value of the correlation coefficients.

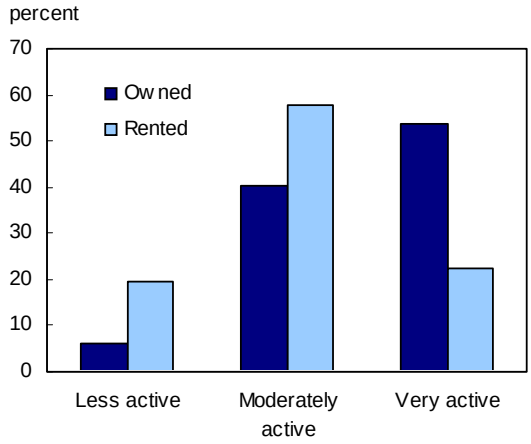
1. These behaviours were selected because they are accessible to a wide range of the Canadian population, and because they represent a variety of environmental issues: energy conservation, water conservation and waste reduction.
2. Participation rates do not necessarily reflect a choice on the part of the household. For example, recycling is mandatory in some municipalities, while fixtures such as reduced volume toilets may be required in new construction in some areas of the country.

Chart 1
Prince Edward Island has the highest proportion of very active households, 2006



Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

Chart 2
Owners are more likely to be very active than renters, 2006



Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

installing reduced volume toilets, because they require a longer term commitment to action.[3] Despite requiring on-going effort, 97% of Canadian households with access to recycling made use of this service.[4]

Composting was the least common behaviour—30% of households composted in 2006. The lower participation rate may be a result of the perceived difficulty of composting, or possibly due to a lack of basic knowledge on how to compost.[5]

Households in Prince Edward Island were the most active

The vast majority of Canadian households were either very active or moderately active. Overall, 45% of households were very active, 45% were moderately active, and only 10% were less active (Chart 1).

Prince Edward Island (P.E.I.) was the most active province, with close to two-thirds of its households (64%) participating in four or more environmental activities (Chart 1). That is almost twice the "very active" participation rates of Quebec and Manitoba, the provinces with the lowest proportion of very active households.

P.E.I. had the highest participation rate for composting and one of the highest recycling rates.[6] However, PEI had one of the lowest participation rates for reduced volume toilets, compared to the other provinces (Table 1).

While Quebec's recycling rate was fairly high at 95%, it had below Canada-level participation rates for CFL, reduced volume toilets and composting. Meanwhile, the participation rates for Manitoba, the province with the highest proportion of less active households, were below the Canada level participation rates for most behaviours[7] (Table 1).

Home owners are more likely to practice four or more environmental behaviours than renters

Apartment dwellers were less likely to be very active than non-apartment dwellers (Table 2). There is a strong relationship between dwelling type and dwelling tenure—the majority of apartment

3. Doug McKenzie-Mohr, 2000, "Promoting sustainable behaviour: An introduction to community-based, social marketing," *Journal of Social Sciences*, Vol. 56, no. 3: 543 to 554.
4. Avani Babooram and Jennie Wang, 2007, "Recycling in Canada," *EnviroStats*, Statistics Canada catalogue no. 16-002-X.
5. McKenzie-Mohr, 2000.
6. Recycling is mandatory in P.E.I.
7. The Manitoba participation rates were significantly lower than the Canada participation rates for all behaviours except for use of reduced volume toilets.

Table 1
Household participation rates for environmental behaviours, by province, 2006

	Low-flow showerhead	Reduced volume toilet	Compact fluorescent light bulbs	Composting	Recycling	Lowering temperatures
	percent[1]					
Newfoundland and Labrador	58	27	53	23	94	62
Prince Edward Island	55	27	59	92	99	59
Nova Scotia	54	30	60	71	99	58
New Brunswick	55	31	61	37	96	48
Quebec	59	29	48	14	95	55
Ontario	60	43	65	38	98	51
Manitoba	46	35	50	23	88	50
Saskatchewan	37	34	53	29	96	63
Alberta	49	41	59	24	96	59
British Columbia	53	35	65	31	99	56
Canada	**56**	**37**	**59**	**30**	**97**	**54**

1. As a percentage of all households that have a thermostat and that have access to at least one recycling program.
Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

Table 2
Environmental activity level, by dwelling type, 2006

	Less active	Moderately active	Very active
	percent		
Apartments	24	59	17
Multi-unit	9	50	41
Single-detached	6	39	55

Note(s):
Other types of dwellings such as mobile homes and camps were excluded from this analysis because they make up a small portion of total dwellings.
Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

dwellers are renters and the majority of those in single-detached dwellings own their residence.

Owners were more likely to be very active than renters (Chart 2). Of income, education and dwelling tenure, dwelling tenure was the variable most strongly associated with being very active. Home owners had more than three times higher odds[8] of being very active than renters.

Renters may have less freedom to change fixtures such as toilets and showerheads. Since the majority of apartment dwellers rent their homes,[9] this may partly explain their lower activity levels relative to other housing types. However, 22% of renters still managed to engage in four or more activities (Chart 2).

The proportion of very active households increases with income and education

Income and education are important indicators of whether a household will own or rent their home, and these factors provide some indication as to why renters were more likely to be less active than owners. On average, Canadians with higher levels

8. Odds ratios can be used to quantify the association between an explanatory variable (X) and a dichotomous outcome (Y). See textbox "Odds ratios" for more information.
9. Statistics Canada, 2007, *2006 Census of Population*, Catalogue no. 97-554-XCB2006026.

Odds ratios

Odds ratios can be used to quantify the association between an explanatory variable (X) and a dichotomous outcome (Y).

In this study, the explanatory variables are dwelling tenure, income and education. The outcome of interest is a household being very active (Y=1). If the household is not very active, then Y=0.

An odds ratio is generated for each category within an explanatory variable, with one category selected as the "reference category" so that each odds ratio within the variable is interpreted relative to the reference category.

Odds ratio = odds for X_{target}/odds for $X_{reference}$ =

(probability Y = 1 for X_{target}/probability Y = 0 for X_{target})
(probability Y = 1 for $X_{reference}$/probability Y = 0 for $X_{reference}$)

If the odds ratio > 1, the odds of the event are higher for the target group.

If the odds ratio < 1, the odds of the event are higher for the reference group.

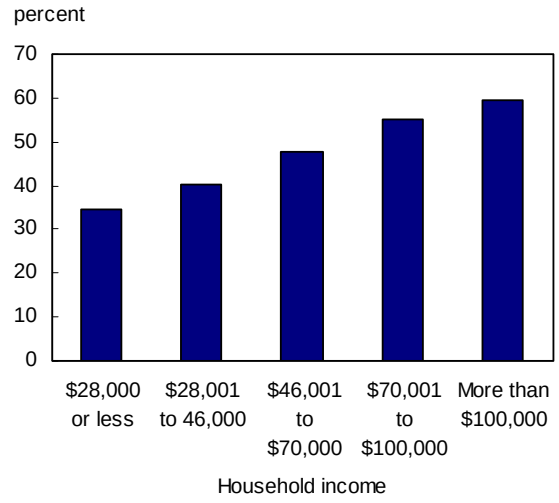
of education will also have higher incomes,[10] and household income affects dwelling tenure.[11]

Income and education have also been linked to environmental behaviour in previous research. For example, according to Kollmuss and Agyeman, persons with higher incomes have the extra resources to engage in activities beyond meeting their basic needs, and persons with higher levels of education have more opportunity to gain knowledge about environmental issues.[12]

The higher the income bracket, the higher the proportion of very active households (Chart 3). Sixty percent of households with incomes greater than $100,000 were very active, compared to 35% of households with incomes of $28,000 or less.

While income was associated with a household practicing four or more environmental behaviours, increasing income did not increase the odds of being very active as much as home ownership. In fact, the odds of a household with an income greater than $100,000 being very active were only one and a half times those of a household in the lowest income group.

Chart 3
The proportion of very active households increases with income, 2006



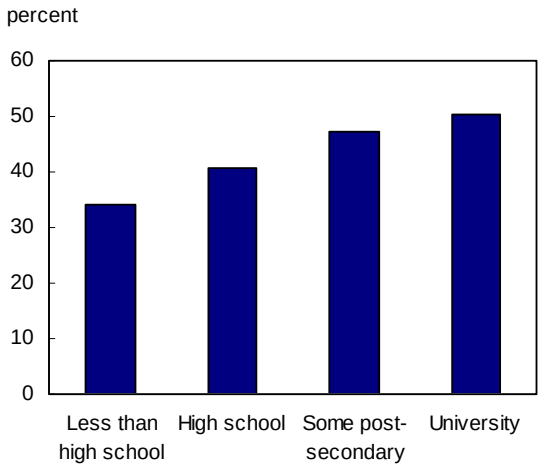
Note(s):
These data are based on those respondents who chose to disclose their income: just over three quarters of the sample. A comparison of the demographic characteristics of those who disclosed their income versus those who did not showed that there was very little difference between the two.
Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

As with income, the proportion of households that were very environmentally active increased with increasing education (Chart 4). Half of households where at least one member had completed university were very active, while just over one-third (34%) of households where no one had completed high school practiced four or more behaviours.

The major difference was between households where at least one person had some post-secondary education compared to households where the highest level of education was high school or less. The odds of a household being very active were 1.2 times higher for households where at least one member had some post-secondary education compared to households where the highest level of completed education was high school or less.

10. Statistics Canada, 2006, *Report of the Pan-Canadian Education Indicators Program, 2005*, Catalogue no. 81-582-G.
11. Statistics Canada, 2006, "Measuring housing affordability," *Perspectives on Labour and Income*, Catalogue no. 75-001-X, November 2006, Vol. 11, no. 11.
12. Anja Kollmuss and Julian Agyeman, 2002, "Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour?," *Environmental Education and Research*, Vol. 8, no. 3: 239 to 260.

Chart 4
The proportion of very active households increases with education, 2006



Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

Household composition not related to activity level

According to Kollmuss and Agyeman, people with more free time tend to participate in more environmental activities as they have the time to dedicate to social issues.[13] Families with children or aging seniors to care for tend to have less free time than other household types[14] and should be less likely to be very environmentally active.

However, results from the Households and the Environment Survey showed that the relationship observed between activity level and household composition was influenced by housing type, rather than household composition.

Summary

The vast majority of Canadian households were either moderately or very active with respect to environmental behaviour. Dwelling tenure was the variable most strongly associated with very active households, while income and education were somewhat less correlated with being "very active."

Regardless of differences in these demographic factors, 45% of Canadian households were very environmentally active. These results indicate that despite challenges with respect to income, education, dwelling type and dwelling tenure, Canadians have adopted environmental behaviours.

13. Kollmuss and Agyeman, 2002.
14. Robert Goodin, et al., 2005, "The time-pressure illusion: discretionary time vs. free time," *Social Indicators Research,* Vol. 73: 43 to 70.

A geographical profile of livestock manure production in Canada, 2006

Nancy Hofmann, Environment Accounts and Statistics Division

Manure[1] is a by-product of raising livestock and is a source of many valuable crop nutrients. Nitrogen and phosphorus, in particular, are important nutrients for crop production. Manure is also a source of organic matter, which can help reduce soil erosion and improve soil's water-holding capacity.

Although manure provides many benefits, it can also become a source of pollution with impacts on the environment and human health. For instance, bacteria found in manure have been found both in municipal and private drinking water supplies.[2] Manure can also be a source of nuisance odour (see textbox "Controlling odour.")

This article profiles manure production in Canada. Linking manure production to environmental quality is beyond the scope of this study—many other factors such as soil type, climate, precipitation, topography and manure management practices would also need to be included in assessments of environmental issues such as water quality.

From 1981 to 2006, total manure production in Canada rose 16%. The intensity of manure production—the amount produced within a given area—rose in about half of the sub-sub-drainage areas (SSDA) studied (see textbox "What you

What you should know about this study?

This study uses livestock data from the Census of Agriculture. The data reflect the number of livestock on farms on Census day, May 16, 2006, assuming constant livestock numbers throughout the year, though in actual fact these numbers do fluctuate.

The study included beef cows, heifers, milk cows, bulls, steers, calves, horses, sheep, lambs, goats, grower/finishing pigs, nursing/weaner pigs, sows, boars, steers, broilers/roasters, laying hens, pullets and turkeys. Other livestock in Canada, such as buffalo, deer, and rabbits, were not included in this analysis because their overall contribution to total manure produced is small and agreement on manure production coefficients has not been reached.

Methodology

Livestock numbers were multiplied by coefficients estimating daily manure production per animal. Agriculture and Agri-Food Canada (AAFC), academics, consultants and non-governmental agencies were consulted in the development of these coefficients. The coefficients used are listed in: www.statcan.gc.ca/pub/21-601-m/21-601-m2006077-eng.pdf. Estimates of manure production tabulated by AAFC in the *National Land and Water Information Systems* are slightly different as a result of rounding of the coefficients.

Census livestock data were allocated to drainage areas in accordance with procedures developed by AAFC in collaboration with Statistics Canada's Agriculture Division. Please see: Definitions, Data sources and methods, 8012, Census of Agriculture: Environmental Geography Aggregations of Census Farm Units or Agriculture and Agri-Food Canada, 2008, *Interpolated Census of Agriculture to Soil Landscapes, Ecological Frameworks and Drainage Areas of Canada,* www.agr.gc.ca/nlwis/index_e.cfm?s1=data_donnees&s2=details&page=ica-ira_plus.

Estimates of manure production are normalized by sub-sub-drainage area (SSDA) land area to permit comparison of manure production totals across drainage areas of different sizes. The resulting manure production intensity estimates, in kilograms per hectare, provide measurements that are comparable across different regions and time. This indicator of manure production intensity has been previously produced for 1996 and 2001, with comparisons made to 1981. Biophysical landscape units such as drainage areas, eco-regions and soil landscape are relevant to assess agri-environmental indicators such as manure production intensity.

Manure production can have impacts not only at the farm level, but may also have an effect in other areas of the same basin, whether that area is used for agriculture, urban or other uses. Moreover, the small size of the SSDA provides valuable localized information, which is a valuable asset for nutrient-balance analysis at the watershed level.

Drainage area framework

The SSDA is the smallest unit in the National Hydrological Network of Canada. Drainage areas, also called watersheds or drainage basins, are areas where all contributing surface waters share the same drainage outlet. In 2006, livestock were found in just under 400 of these SSDAs.

Limitations

One limitation of the analysis is that the application of manure can be more intensive in some SSDAs than others due to the amount of appropriate farmland available. Manure application can be done mechanically or naturally, by livestock while grazing. As well, not all manure is necessarily applied in the SSDA where it was produced—it can be exported to neighbouring SSDAs.

1. For the purposes of this article, manure consists of livestock feces and urine.

2. Government of Saskatchewan, 2007, *Illnesses from Water and Food*, www.health.gov.sk.ca/water-ecoli (accessed September 26, 2006).

How much manure does each animal produce?

Generally all types of cattle produce large amounts of manure: bulls (42 kg/day), beef cows (37 kg/day), steers (26 kg/day), heifers (24 kg/day) and calves (12 kg/day). Milk cows produce the most manure at 62 kg per day, which is about 10% of the weight of an average cow.

In contrast, the different categories of pigs including weaners, sows, boars and market hogs produce much smaller amounts of manure, between 1 and 4 kg per day.

Of all livestock types examined, poultry produce the least amount of manure, with each bird producing less than 1 kg of manure per day.

Source(s):
Statistics Canada, 2006, *A Geographical Profile of Manure Production in Canada, 2001,* Catalogue no. 21-601-M, www.statcan.gc.ca/bsolc/olc-cel/olc-cel?lang=eng&catno=21-601-M2006077 (accessed December 1, 2008).

Table 1
Change in manure production by livestock type, 1981 and 2006

	1981	2006	Difference	Change
	thousands of tonnes			percent
Beef cows	47,195	68,153	20,958	44
Heifers	12,852	21,975	9,123	71
Calves	16,819	22,305	5,486	33
Pigs	10,582	15,793	5,211	49
Horses	2,991	3,789	798	27
Poultry	3,929	4,688	758	19
Sheep	536	750	214	40
Steers	16,961	17,101	141	1
Goats	85	168	83	97
Bulls	4,104	3,775	-329	-8
Milk cows	40,212	22,463	-17,749	-44
Total	**156,265**	**180,960**	**24,694**	**16**

Source(s):
Agriculture and Agri-Food Canada and Statistics Canada, Special tabulation, Census of Agriculture, Census Geographic Component Base, 2006.

should know about this study" for more information on the SSDA framework).

Lots of manure, especially from cattle

In 2006, Canadian livestock produced about half a million tonnes of manure daily. This translated to over 180 million tonnes over the year. Of this total, 38% was produced by beef cows, followed by milk cows (12%), calves (12%), heifers (12%), steers (10%), pigs (9%), poultry (3%), horses (2%), bulls (2%) and sheep (less than 1%).

Manure on the rise: 1981 to 2006

Manure production increased by 16%, or by an estimated 25 million tonnes from 1981 to 2006, largely as a result of increasing number of beef cows on farms. The amount of manure generated by beef cows grew by 44% or 21 million tonnes between 1981 and 2006 (Table 1).

Manure production also increased for other types of livestock as a result of increases in the number of animals. Manure production from heifers rose 9 million tonnes, production from calves rose 5.5 million tonnes and total pig manure rose 5 million tonnes. These increases in manure production were offset by declines in manure from other livestock types, particularly milking cows which experienced a decline of 44% or 18 million tonnes of manure. Productivity improvements allow each milk cow to produce more milk, allowing farmers to reduce the number of milk cows while retaining milk production levels.

Manure production concentrated geographically

Manure production was concentrated in three major clusters in 2006 (Map 1). These clusters are located in central and southern Alberta, south-western Ontario, and south-eastern Quebec. There were smaller clusters of high production in southern Manitoba, southern British Columbia and Prince Edward Island. Average manure production across all SSDAs with livestock was about 1,070 kilograms of manure per hectare of land (kg/ha).

Cattle produced most of the manure in the top manure-producing SSDAs in Alberta, whereas

Controlling odour

Farm-generated odour, particularly from manure, is a frequent source of conflict between farmers and their non-farming neighbours. In Ontario, odour is the cause of more than half of the agricultural complaints received by government and the number of complaints is increasing. Common compounds associated with livestock manure include hydrogen sulphide and ammonia. These compounds are more common in manure from hogs and poultry.

One means of reducing these complaints is by providing adequate distances between livestock facilities and non-farm uses. Various factors influence the actual separation distance including the size and type of livestock operation. In Ontario, for instance, regulatory minimums require that an operation with 1,800 hog per year and a covered manure system would have a separation distance of about 650 metres between its barn and residential or institutional zoned areas. In contrast, a dairy farm with 60 milking cows and an open liquid tank would have a separation distance of 394 metres.

Source(s):

Ontario Ministry of Agriculture, Food and Rural Affairs, 2003, *Odour Control on Livestock and Poultry Farms.* Factsheet no. 03-111, www.omfra.gov.on.ca/english/engineer1facts/03-111.htm (accessed September 23, 2008).

manure was produced by a wide range of livestock including poultry, cattle, milk cows and pigs in the top producing SSDAs in southern Ontario and Quebec. Pigs dominated manure production in southern Manitoba.

Sub-sub-drainage areas in Ontario among the most intensive manure producers

Overall, manure production intensity went up in half of SSDAs with livestock from 1981 to 2006, while the other half experienced a decline in manure production per hectare.

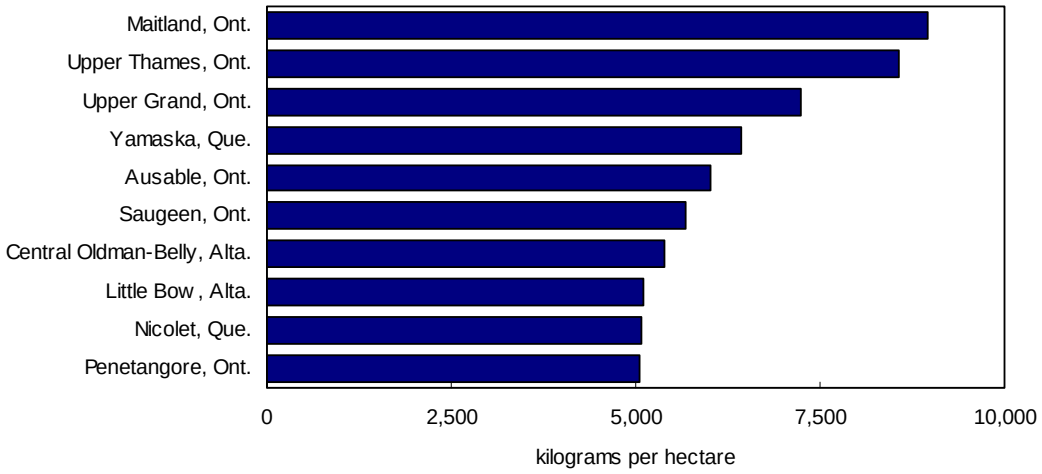
Livestock in Ontario's Maitland SSDA, located east of Lake Huron, produced the most manure per hectare of land, with 8,950 kg/ha (Chart 1). The Upper Thames and Upper Grand, also in Ontario, were the second and third most intensive manure-producing SSDAs respectively.

Ontario was home to several of the most intensive manure-producing SSDAs. For instance, of the five SSDAs across the country with manure production levels over 6,000 kg/ha, four were located in Ontario.

The SSDAs with the largest increases in manure production per hectare between 1981 and 2006 were predominantly found in Alberta. The Little Bow SSDA experienced the largest increase, at about 3,350 kg/ha (from 1750 kg/ha in 1981 to 5100 kg/ha in 2006). Overall, eight SSDAs in Alberta were among the ten SSDAs with the largest increases in manure production intensity (Chart 2).

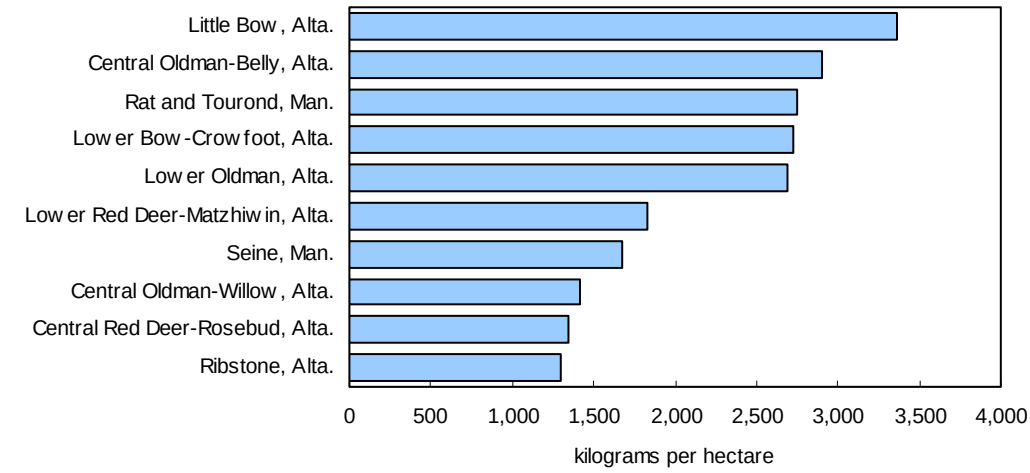
These increases in Alberta were mostly a result of the rise in cattle numbers. In the Little Bow, for instance, 30% of the increase in manure production was due to the increase in steers—and they represent just one type of cattle. Increases in southern Manitoba were the result of larger numbers of pigs.

Chart 1
Ontario prominent among the ten most intensive manure-producing sub-sub-drainage areas in 2006



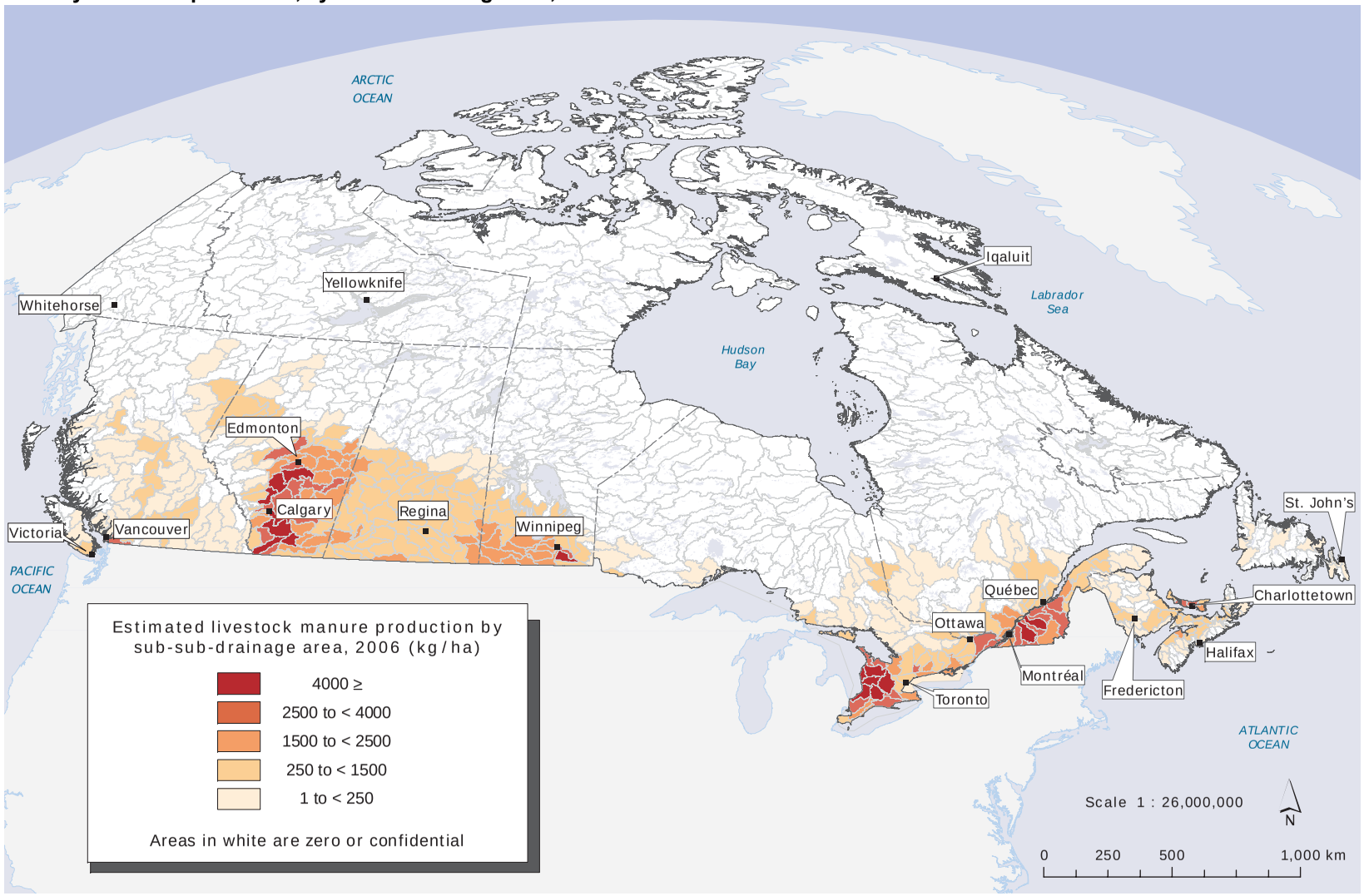
Source(s):
Agriculture and Agri-Food Canada and Statistics Canada, Special tabulation, Census of Agriculture, Census Geographic Component Base, 2006.

Chart 2
Sub-sub-drainage areas in Alberta experienced the greatest increase in manure production per hectare, 1981 to 2006



Source(s):
Agriculture and Agri-Food Canada and Statistics Canada, Special tabulation, Census of Agriculture, Census Geographic Component Base, 2006.

Map 1
Intensity of manure production, by sub-sub-drainage area, 2006



Source(s):
Agriculture and Agri-Food Canada and Statistics Canada, Customized tabulations, Census of Agriculture, Census Geographic Component Base, 2006.

Households' use of water and wastewater services

Terence Nelligan, Environment Accounts and Statistics Division

When it comes to water conservation and other water-related practices, are behaviours the same when comparing households with public water services and those on private systems? Do households with septic tanks maintain them to protect the environment? This study considers these questions using data from the 2006 Households and the Environment Survey.

No difference in behaviour between households with all public and all private water and wastewater services

In 2006, just over three-quarters of Canadian households obtained their water and sewer services from public utilities, while 15% of households had private systems, such as wells and septic systems. A small portion of households used a combination of municipal and private (Table 1).

Some public utilities have water efficiency programs to reduce water demand. For example, rebates are offered for the replacement of older toilets with ones that use less water.[1] It is estimated that toilets (31%) and showers (19%) account for approximately half of the total indoor water consumed.[2] Thus, the use of low-flow shower heads and reduced volume toilets are key water conservation practices. More than two-thirds (69%) of households used these water conservation practices in 2006, regardless of whether they were connected to all public or all private water and wastewater services.[3]

The extent to which households dump paints, and other toxic substances down their drains may also affect a community's sewage quality.[4] In 2006, 3% of households in both groups flushed special wastes such as paints and expired medications.[5]

Most septic system owners performed routine maintenance

Based on Environment Canada estimates, 15,400 tonnes of nitrogen and 1,900 tonnes of phosphorus were released from Canadian septic systems in 1996. These substances can be sources of contamination of groundwater and, ultimately, of surface waters.[6]

Proper installation and maintenance of septic systems can minimize impacts on the environment. According to the Canada Mortgage and Housing Corporation (CMHC), septic tanks should be pumped out every three to five years or when one-third of the tank volume is filled with solids.[7] Nationally, 6% of households reported that they never pumped out or maintained their septic system. The majority, however, reported maintenance frequencies that were in accordance with CMHC's recommendations. One-quarter of households reported maintaining their system every 4 or more years, 43% reported performing maintenance every 2 or 3 years, 17% once a year and 4% more than once a year (Table 2). Frequency of maintenance can also depend on the type of sewage system in place, with holding tanks requiring more frequent pump out than septic systems. The number and type of private sewage systems in Canada vary depending on soil conditions and provincial regulations.

1. City of Toronto, 2008, *WaterSaver Rebate Programs,* www.toronto.ca/watereff/rebate_programs.htm (accessed September 11, 2008).
2. Peter W. Mayer and William B. DeOreo, 1999, *Residential End Uses of Water*, American Water Works Association Research Foundation, Denver.
3. Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.
4. Environment Canada, 2001, *The State of Municipal Wastewater Effluents in Canada*, www.ec.gc.ca/soer-ree/english/SOER/MWWE.pdf (accessed October 22, 2008).
5. Statistics Canada, Households and the Environment Survey, 2006, Special tabulation. Includes flushing waste down the drain, sewer, toilet or into the ground.
6. Environment Canada, 2001, *Nutrients in the Canadian Environment,* www.ec.gc.ca/soer-ree/English/SOER/nutrients.cfm#four_sub1 (accessed September 22, 2008).
7. Canada Mortgage and Housing Corporation, 2008, *Your Septic System*, http://www.cmhc-schl.gc.ca/en/co/maho/gemare/gemare_009.cfm (accessed May 29, 2008).

Table 1
Households and combinations of water and wastewater services

	Use municipal water supply		Use non-municipal water supply	
	Use municipal sewer	Use private septic	Use municipal sewer	Use private septic
	percent			
Newfoundland and Labrador	72	7	F	17
Prince Edward Island	38	F	7[E]	53
Nova Scotia	48	2[E]	9[E]	40
New Brunswick	47	F	9[E]	41
Quebec	75	7[E]	1[E]	15
Ontario	79	4	1[E]	14
Manitoba	72	4[E]	3[E]	17
Saskatchewan	80	3[E]	F	13
Alberta	84	1[E]	F	12
British Columbia	77	9	F	10
Canada	**76**	**5**	**1**	**15**

Note(s):
As a percentage of all households that are not in apartments.
Some respondents specified "Do not know" and "Other." This proportion is not included here so the row totals may not add to 100%
Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

Table 2
Septic system maintenance frequency, 2006

	More than once a year	Once a year	Once every 2 or 3 years	Once every 4 or more years	Never
	percent				
Newfoundland and Labrador	F	F	25	42	17
Prince Edward Island	F	10	44	33	F
Nova Scotia	F	7	36	41	8
New Brunswick	F	F	45	32	F
Quebec	3[E]	19	62	11	F
Ontario	2[E]	10	42	33	6
Manitoba	21[E]	55	16	F	F
Saskatchewan	F	55	17	F	F
Alberta	8[E]	38	31	13	F
British Columbia	F	10	37	33	10[E]
Canada	**4**	**17**	**43**	**25**	**6**

Note(s):
As a percentage of all households that are not in apartments.
Some respondents specified "Do not know" and "Other." This proportion is not included here so the row totals may not add to 100%
Source(s):
Statistics Canada, Households and the Environment Survey, 2006, Special tabulation.

Energy-efficient holiday lights

Chris Birrell, Environment Accounts and Statistics Division

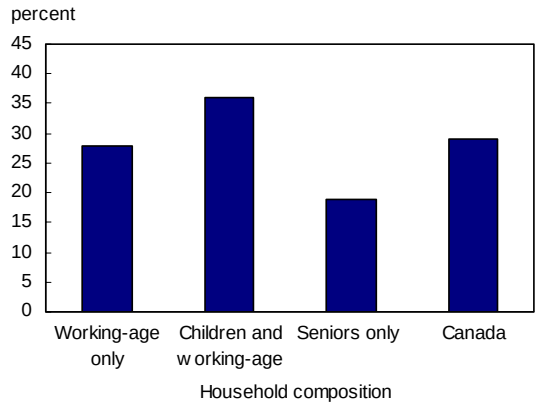
In recent years light-emitting diodes (LEDs) have emerged as an energy-efficient alternative to conventional incandescent lighting. Festive holiday lighting has proven to be particularly well-suited to LED technology.

Provincial power authorities report that LED holiday lights can be up to 90% more efficient[1] than conventional lights, last at least ten times longer, are less prone to breakage, and reduce the risk of fire.[2] Municipal and provincial programs exist across the country which encourage people to exchange their conventional lights with strings of LEDs.[3,4]

Nearly 30% of Canadian households reported they used LED holiday lights in 2007.[5] Household composition makes a difference as to who is using this relatively new technology. Just over one-third of households that are composed of working-age adults and children[6] are lighting up with LEDs (Chart 1).

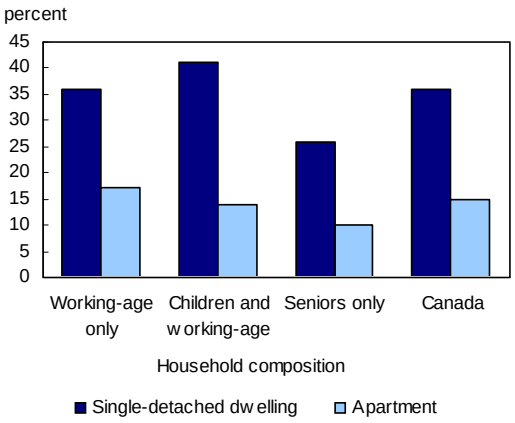
Differences between groups become more distinct when the type of housing is also considered. The 2006 Census reported that slightly more than half of the 12.4 million private dwellings in Canada were single-detached houses and that a little more than one-quarter were apartments.[7] For households composed of working-age adults and children, 41% of those that lived in single-detached dwellings used LED lights for decoration, while 14% that lived in apartments used LEDs (Chart 2).

Chart 1
More LED[1] holiday lights in households with children and working-aged adults, 2007



1. Light-emitting diodes.
Source(s):
Statistics Canada, Households and the Environment Survey, 2007, Special tabulation.

Chart 2
Households with children in single-detached homes most likely to string up LED[1] lights, 2007



1. Light-emitting diodes.
Source(s):
Statistics Canada, Households and the Environment Survey, 2007, Special tabulation.

1. Ontario Power Authority, 2008, *Electricity Efficiency Tips,* www.everykilowattcounts.com/tools-and-tips/ (accessed August 13, 2008).
2. BC Hydro, 2007, *Lighting for the Holiday Season,* www.bchydro.com/etc/medialib/internet/documents/Power_Smart_FACT_sheets/FACTS_Holiday_Lighting.Par.0001.File.FACTS_holiday_lighting.pdf (accessed November 5, 2008).
3. Saint John Energy, 2007, *Saint John Energy launches LED Holiday Lighting Campaign*, www.sjenergy.com/Inside_Saint_John_Energy/newsreleases.htm (accessed August 13, 2008).
4. Government of Newfoundland and Labrador, Natural Resources Environment and Conservation, 2007 *Holiday Lightswitch Officially Launched*, www.releases.gov.nl.ca/releases/2007/nr/1127n08.htm (accessed August 13, 2008).
5. Statistics Canada, Households and the Environment Survey, 2007, Special tabulation. This release is part of the Households and the Environment Survey, 2007, which will be released more fully in early 2009.
6. Children are defined as being less than 18 years old. Working age is 18 to 64 years old and seniors were defined as greater than 64 years old.
7. Statistics Canada, 2007, *2006 Community Profiles, 2006 Census,* Catalogue no. 92-591-X.

Environment and sustainable development indicators

Table 1
Population indicators

	2002	2003	2004	2005	2006	2007
Population (number)[1]	31,372,587	31,676,077	31,995,199	32,312,077	32,649,482	32,976,026
Percentage change	1.1	1.0	1.0	1.0	1.0	1.0
Aged 65 and over (percent of total)	12.7	12.8	13.0	13.1	13.2	13.4
Urban (percent of total)	..	..	..	..	80.2	..
Density (per square kilometre)	3.5	3.5	3.5	3.6	3.6	3.7

1. Population data is based on the Estimates of Population program, except for data on urban population, which is based on the Census of Population.

Source(s):
Statistics Canada, CANSIM table 051-0001, accessed November 5, 2008.
Statistics Canada, 2007, *Population and Dwelling Count Highlight Tables, 2006 Census*, http://www12.statcan.ca/english/census06/data/popdwell/Tables.cfm (accessed November 5, 2008).

Table 2
Economy indicators

	2002	2003	2004	2005	2006	2007
Gross Domestic Product (million chained 2002 dollars)	1,152,905	1,174,592	1,211,239	1,246,064	1,284,819	1,319,681
Percentage change	2.9	1.9	3.1	2.9	3.1	2.7
Per capita (chained 2002 dollars)	36,749	37,081	37,857	38,563	39,352	40,019
Consumer Price Index (2002 = 100)	100.0	102.8	104.7	107.0	109.1	111.5
Unemployment rate (percent)	7.7	7.6	7.2	6.8	6.3	6.0

Source(s):
Statistics Canada, CANSIM tables 380-0017, 051-0001, 326-0021 and 282-0002, accessed November 5, 2008.

Table 3
Social indicators

	2002	2003	2004	2005	2006	2007
Average household spending[1] (current dollars)						
Total	59,439	60,088	62,464	65,575	67,736	..
Water and sewage	185	202	204	211	221	..
Electricity	993	1,026	1,040	1,070	1,111	..
Food	6,553	6,618	6,772	6,978	7,046	..
Gasoline and other motor fuels	1,690	1,665	1,854	2,024	2,079	..
Personal expenditure on consumer goods and services (million chained 2002 dollars)	655,722	675,443	697,566	723,181	754,179	788,224
Residential waste						
Production per capita (kilograms)	358	..	385	..	398	..
Disposal (tonnes)	8,446,766	..	8,961,583	..	9,238,376	..
Disposal per capita (kilograms)	269	..	280	..	283	..
Diversion (tonnes)	2,789,669	..	3,363,803	..	3,744,843	..
Diversion per capita (kilograms)	89	..	105	..	115	..
Diversion rate (percent of waste production)	25	..	27	..	29	..
Distance driven by light vehicles[2] (million kilometres)	290,320	286,803	285,164	289,717	296,871	300,203
Asthma (percent of population age 12 and over)	..	8.4	..	8.3	..	..

1. Data on average household spending is based on the Survey of Household Spending (SHS). For information on the difference between the SHS and personal expenditure data please see: Statistics Canada, 2008, *Guide to the Income and Expenditure Accounts*, Catalogue no. 13-017-X.

2. Distance driven for vehicles weighing less than 4.5 tonnes, excluding the territories.

Source(s):
Statistics Canada, CANSIM tables 203-0001, 203-0003, 203-0002, 203-0007, 380-0017, 153-0041, 153-0042, 051-0001, 405-0063 and 105-0400, accessed November 5, 2008.

Table 4
Energy indicators

	2002	2003	2004	2005	2006	2007
Primary energy availability (terajoules)	11,163,501	11,478,526	11,527,500	11,307,113	11,216,025	..
Primary and secondary energy (terajoules)						
Export	9,491,341	9,444,883	9,810,695	9,641,137	9,786,984	..
Residential consumption	1,286,677	1,338,166	1,313,015	1,296,644	1,250,283	..
Established reserve, closing stock[1]						
Crude bitumen (million cubic metres)	1,840	1,720	1,660	1,620	3,340	3,500
Crude oil (million cubic metres)	606.1	590.0	603.8	752.3	712.6	..
Natural gas (billion cubic metres)	1,529.6	1,469.5	1,497.5	1,553.7	1,577.7	..
Recoverable reserves, closing stock[1]						
Coal (million tonnes)	4,485.3	4,423.1	4,404.2	4,315.6	4,468.8	4,395.1
Uranium (tonnes)	439,000	429,000	444,000	431,000	423,400	..
Total electricity generation (megawatt hours)	578,728,900	564,218,465	571,291,905	597,810,875	585,097,531	603,572,420
Hydro (percent of total)	59.8	59.0	58.7	60.1	60.0	60.6
Nuclear (percent of total)	12.3	12.5	14.9	14.5	15.8	14.6
Generation from fossil fuel and other fuel combustion (percent of total)	27.9	28.5	26.4	25.4	24.2	24.8
Research and development (R&D) expenditures						
Private sector R&D in alternative energy (million constant 1997 dollars)	196	204	..	..	..	..

1. The size of the reserve at year-end.

Source(s):
Statistics Canada, CANSIM tables 128-0009, 153-0012, 153-0013, 153-0014, 153-0017, 153-0018, 153-0019 and 127-0001, accessed November 5, 2008.
Chiru, Radu, 2006, "Research and Development for New Energy Technologies in the Private Sector," *Analysis in Brief,* Statistics Canada Catalogue no. 11-621-M.

Table 5
Environment and natural resources indicators

	2002	2003	2004	2005	2006	2007
Total greenhouse gas (GHG) emissions (megatonnes of carbon dioxide equivalent)	717	741	743	734	721	..
GHG emissions per capita (tonnes)	22.9	23.4	23.2	22.7	22.1	..
GHG emissions by final demand						
Total household[1] (megatonnes of carbon dioxide equivalent)	420	430	418[p]	..	..	..
Total household per capita (tonnes)	13.4	13.6	13.1[p]	..	..	..
Direct household[2] (megatonnes of carbon dioxide equivalent)	110	113	112[p]	..	..	..
Indirect household[3] (megatonnes of carbon dioxide equivalent)	310	317	306[p]	..	..	..
Exports (megatonnes of carbon dioxide equivalent)	268	268	270[p]	..	..	..
Annual temperature departures,[4] Canada (degrees Celsius)	0.6	1.1	0.1	1.7	2.4	0.9
Value of selected natural resources (million current dollars)						
Land	1,013,754	1,095,419	1,227,819	1,358,968	1,506,869	1,675,870
Timber	303,278	297,474	311,771	290,511	275,462	263,459
Subsoil resource stocks	375,276	465,083	566,179	807,913	938,630	1,008,028
Average farm pesticide expenditures (current dollars)	6,228	7,232	7,602	7,792	8,268	..
Air quality[5]						
Ozone (population-weighted, parts per billion)	40	39	35	38	..	..
$PM_{2.5}$ (population-weighted, micrograms per cubic metre)	10	9	9	9	..	..

1. Total household greenhouse gas emissions are the sum of direct plus indirect household greenhouse gas emissions.
2. Direct household greenhouse gas emissions include all greenhouse gas emissions due to energy use in the home and for private motor vehicles.
3. Indirect household greenhouse gas emissions are those business-sector emissions due to the production of the goods and services purchased by households. An estimate of the greenhouse gas emissions from foreign companies due to the production of the imported goods purchased by Canadian households is included.
4. Annual departures from the 1951-1980 temperature normals.
5. Ground-level ozone and fine particulate matter ($PM_{2.5}$) are two key components of smog that have been linked to health impacts ranging from minor respiratory problems to hospitalizations and premature death. Exposure studies indicate that adverse health effects can occur even with low concentrations of these pollutants in the air. Annual data are revised, based on the latest release of the *Canadian Environmental Sustainability Indicators* report.

Source(s):
Statistics Canada, CANSIM tables 153-0046, 051-0001, 378-0005, and 002-0044, accessed November 5, 2008.
Environment Canada, 2008, *Canada's 2006 Greenhouse Gas Inventory: A Summary of Trends,* www.ec.gc.ca/pdb/ghg/inventory_report/2006/som-sum_eng.cfm (accessed November 5, 2008).
Environment Canada, 2006, *Climate Trends and Variations Bulletin,* www.msc-smc.ec.gc.ca/ccrm/bulletin/annual06/national_e.cfm (accessed November 5, 2008).
Environment Canada, Statistics Canada and Health Canada, 2007, *Canadian Environmental Sustainability Indicators*, Statistics Canada Catalogue no. 16-251-X.
Statistics Canada, Environment Accounts and Statistics Division, Material and Energy Flow Accounts.

Updates

New releases

Environmental Protection Expenditures in the Business Sector

This publication will consist of data from the 2006 Survey of Environmental Protection Expenditures. Estimates of environmental protection expenditures, by industry and province, made by Canadian businesses in response to environmental regulations, conventions or voluntary agreements, will be presented. The estimates will include capital and operating expenditures made for pollution abatement and control, pollution prevention, environmental assessments and audits, and environmental monitoring activities.

Released November 17, 2008 (Statistics Canada Catalogue no. 16F0006X)

Human Activity and the Environment—Teacher's kit

The annual publication *Human Activity and the Environment* addresses current environmental issues from a Canadian perspective. Each edition presents a feature article on an environmental issue of concern to Canadians, plus a compendium of maps, tables and charts. A lesson plan related to the 2007 and 2008 feature article, "Climate change in Canada," has been added to Statistics Canada's Learning Resources and will be useful for teachers. The lesson plan is targeted at intermediate and secondary level geography, science and environmental studies classes, and contains four worksheets and five assignments.

Available at: www.statcan.gc.ca/kits-trousses/edu01f_0000-eng.htm

Upcoming releases

Households and the Environment Survey, 2007

Statistics Canada conducts the Households and the Environment Survey every two years to measure household behaviours with respect to the environment. The survey collects information that can be used to measure changes in environmental practices at the household level. The subjects examined include energy and water conservation, drinking water source and treatment, recycling and waste reduction practices, indoor and outdoor air quality, vehicle use, and the use and disposal of potentially hazardous household substances.

To be released shortly (Statistics Canada Catalogue no. 11-526-X)

CANSIM tables and updates

CANSIM is Statistics Canada's key socio-economic database.

The following tables have been added to CANSIM:

CANSIM table 153-0052, Capital and operating expenditures on environmental protection, by North American Industry Classification System (NAICS) and type of activity, Canada

CANSIM table 153-0053, Capital and operating expenditures on environmental protection, by type of activity, Canada, provinces and territories

CANSIM table 153-0054, Distribution of capital expenditures on pollution abatement and control (end-of-pipe) and pollution prevention, by North American Industry Classification System (NAICS) and type of environmental medium, Canada

CANSIM table 153-0055, Distribution of capital expenditures on pollution abatement and control (end-of-pipe) and pollution prevention, by type of environmental medium, Canada, provinces and territories

CANSIM table 153-0056, Capital and operating expenditures on environmental protection, by type of activity and establishment size, Canada

CANSIM table 153-0057, Selected population characteristics, Canada, ecozones and ecoregions with population

CANSIM table 153-0058, Selected agricultural activities, Canada, ecozones and ecoregions with agriculture

New developments

Households and the Environment Survey: Energy Supplement

John Marshall, Environment Accounts and Statistics Division

Collection for the 2007 cycle of the Households and the Environment Survey (HES) took place from October 2007 until February 2008. Information on household environmental behaviours, equipment and practices was collected from about 22,000

households. The results from this cycle of the survey will be published in early 2009.

A new supplement on energy use has been added to the HES. The energy use supplement covered information on dwelling characteristics, household appliances, electrical devices, heating and cooling equipment, and energy (for example, electricity, natural gas, heating oil and propane) use and consumption. This supplement is a joint initiative of Statistics Canada and Natural Resources Canada.