GHG Trends Information from Environment Canada's Greenhouse Gas Division

Canada's Greenhouse Gas Inventory

Overview 1990–2003

October 2005

Environment Canada Environnement Canada

Canada

Canada's Greenhouse Gas Inventory

As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), Canada is obliged to submit an inventory of its greenhouse gas (GHG) emissions to the UNFCCC on an annual basis. Canada's GHG inventory for 2003 was submitted to the UNFCCC on April 15, 2005, as set out in the requirements. The national inventory report is developed, compiled, and reported annually by the Greenhouse Gas Division of Environment Canada in accordance with the UNFCCC requirements, particularly Decisions 3/CP.5, 18/CP.8, and 13/CP.9, which state that Annex 1 Parties should annually submit, by April 15, national inventories in accordance with the UNFCCC Guidelines on annual inventories.

Inventory estimates are determined by methods and models developed in-house by engineering and scientific staff, as well as from published data, data developed by industry, and methods and guidance developed by the Intergovernmental Panel on Climate Change.

The year 2005 marks the 11th year that Canada has published a GHG emissions inventory, and this is the first inventory since the Kyoto Protocol came into force in February 2005.

The GHGs that have been estimated in the national inventory are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs).

The inventory uses an internationally agreed-to reporting format that groups emissions and removals into the following six sectors: Energy, Industrial Processes, Solvent and Other Product Use, Agriculture, Land Use, Land-Use Change and Forestry, and Waste.

This overview document presents the latest information on Canadian GHG emissions and removals derived from the most recent national inventory, using a modified sector approach to facilitate the use of information by the public.

In 2003, Canadians contributed about 740 megatonnes of carbon dioxide equivalent (Mt CO_2 eq) of GHGs to the atmosphere, an increase of 3.0% over the 719 Mt recorded in the year 2002[1]. This increase was primarily due to a colder than average winter, coupled with increases in electricity production, vehicle transport, and mining activity.

Since the beginning of the Kyoto baseline year of 1990, the economy has grown by more than 43% (based on gross domestic product, or GDP), compared with a 24% increase in GHG emissions. As a result, we have seen a decrease in GHG intensity[2] of about 13% since 1990, while total domestic energy consumption increased 23% and population rose 14%.

1 Unless otherwise indicated, all emission estimates given in Mt represent emissions of GHGs in Mt CO_2 eq. For brevity, this has been shortened to Mt. This concept provides a relative measure of the impacts of different GHGs on global warming, with the effect of CO_2 being equal to 1.

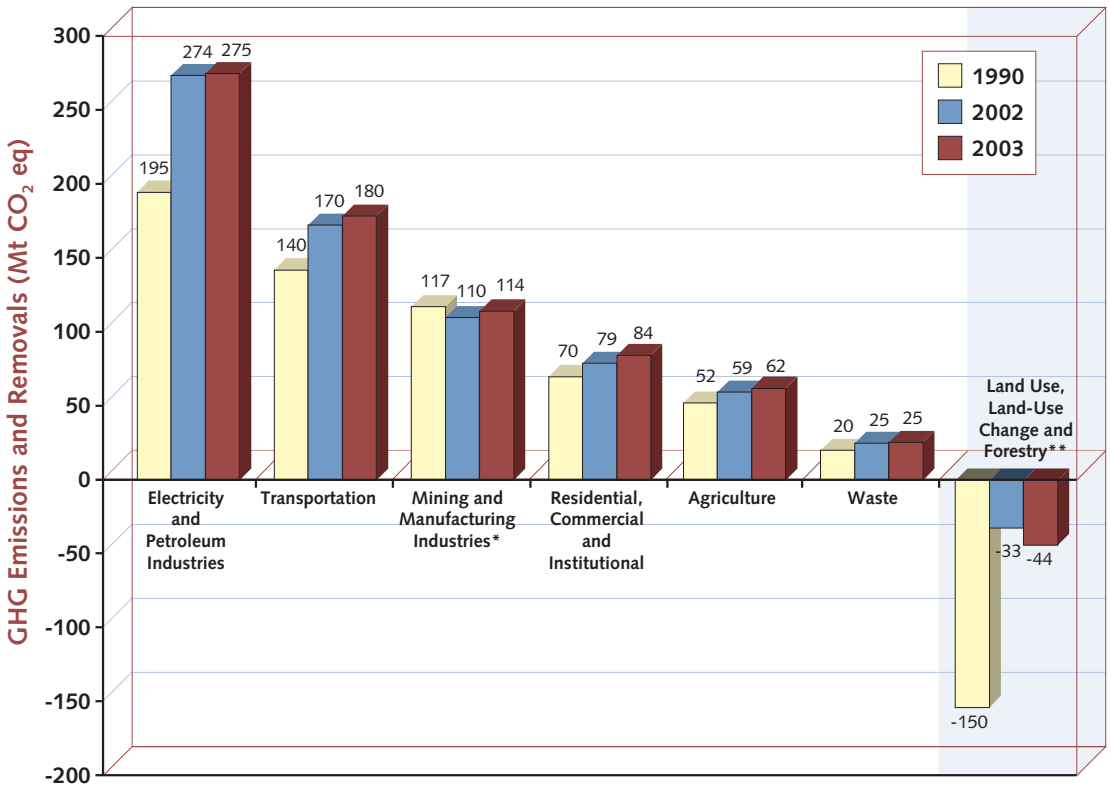
2 GHG intensity is a measure of the amount of GHG emissions per unit of economic activity (total GHG emissions divided by total GDP).

In addition:

- Approximately 74% of total GHG emissions in 2003 resulted from the combustion of fossil fuels. Another 7.3% were from fugitive sources, with the result that over 81% of emissions were from the Energy Sector.
- On an individual GHG basis, CO_2 contributed the largest share of 2003 emissions, at 79% (about 586 Mt), while CH_4 accounted for 13% (94 Mt). N_2O accounted for 6.7% of the emissions (50 Mt), while PFCs, SF_6, and HFCs constituted the remaining 1% (10 Mt).
- The greatest contributions to emissions in 2003 were from the electricity and petroleum industries, which accounted for 37% of total national emissions (275 Mt), and the transportation sector, which contributed 24% (180 Mt). These sectors are also responsible for nearly all of the growth in Canadian emissions since 1990 (Figure 1). This growth is mainly the result of an increase in fossil fuel consumption for electricity generation, a rise in transportation energy consumption, and growth in fossil fuel production (largely for export).
- The Industrial Processes Sector posted a 2.4% decrease in emissions between 1990 and 2003, despite significant increases in sector GDP and production. The decline in emissions is largely a result of declines in process emissions from adipic acid and aluminium production, increased energy efficiency, and fuel substitution.
- Other sectors, such as the residential and commercial/institutional subsectors and the Agriculture and Waste sectors, contributed 21% to total emissions growth over the period.
- Net removals in the Land Use, Land-Use Change and Forestry Sector declined since 1990 to an estimated 44 Mt in 2003, but are not included in the national inventory totals.

FIGURE 1

Canadian GHG Emissions and Removals, 1990, 2002 and 2003



* Value illustrated includes emissions from the Solvent and Other Product Use Sector.
** Emissions from the Land Use, Land-Use Change and Forestry Sector are not included in the national inventory totals.

National Trends

The 3% increase in Canada's GHG emissions from 2002 to 2003 was primarily due to a colder than average winter, coupled with increases in electricity production, vehicle transport, and mining activity. Canada's GDP grew by 1.7% over this period.

Table 1 summarizes Canada's GHG emissions by sector for the period 1990–2003. Total emissions of all GHGs in 2003 (740 Mt) were 24% above the 1990 level of 596 Mt. Although emissions have been rising since 1990, annual emission growth peaked at over 3.5% in 1994 and 2000. Between 2002 and 2003, emissions increased by 3%, following on the previous year's 1% emissions increase. This growth in emissions appears to be mainly the result of increased fossil fuel consumption for transportation, heating in the residential and commercial/institutional subsectors (due to cooler winter temperatures in 2003 compared with 2002), electricity generation (to compensate for decreases in hydroelectric output resulting from lower than normal water levels in reservoirs, lakes, and rivers), and the mining sector. The average annual growth of emissions over the 1990–2003 period was 1.7%.

Figure 2 compares the trends in GHG emissions, GDP, and GHG intensity for Canada and the United States between 1990 and 2003. Both countries experienced a reduction in GHG intensity over the period. For example, Canada's GHG emissions per unit of GDP decreased by 13%, while the United States registered a 17.4% reduction. It must be noted that a reduction in GHG intensity does not necessarily reflect a reduction in emissions; it can also indicate changes in the structure of the economy. A closer examination of the trends in emissions and GDP for the two countries reveals that Canada's emissions are growing faster and our GDP is growing at a slower pace than those of the United States. Factors that affected Canadian emissions growth included increases in fossil fuel consumption for electricity generation, increased energy consumption in the transportation sector, and growth in fossil fuel production (largely for export).

In fact, growth in oil and gas exports (primarily to the United States) contributed significantly to emissions growth between 1990 and 2003 (Table 2). In this period, total energy from crude oil and natural gas production increased 61% and gross energy exported from these sources increased 144%, while emissions associated with those exports increased 149%. Emissions from all oil and gas production, processing, and transmission activities that are attributable to gross exports accounted for over 29% of the total increase in Canada's GHG emissions over the period 1990–2003, increasing from 28 Mt in 1990 to 69 Mt in 2003.

Annual Growth in GHG Emissions and GDP, 1991–2003

Year	Annual Growth in GHG Emissions (%)	Annual Growth in GDP (%)
1991	-1.2%	-2.1%
1992	2.9%	0.9%
1993	0.4%	2.3%
1994	3.5%	4.8%
1995	2.7%	2.8%
1996	2.6%	1.6%
1997	1.8%	4.2%
1998	1.0%	4.1%
1999	2.0%	5.5%
2000	3.5%	5.3%
2001	-1.1%	1.9%
2002	1.0%	3.3%
2003	3.0%	1.7%

Source of GDP data: Statistics Canada, Real Gross Domestic Product (Millions Chained (1997) Dollars), CANSIM, Catalogue No. 13-213, Table 3, Preliminary Estimates.

TABLE 1

Canada's GHG Emissions Summary by Sector, 1990, 2002 and 2003

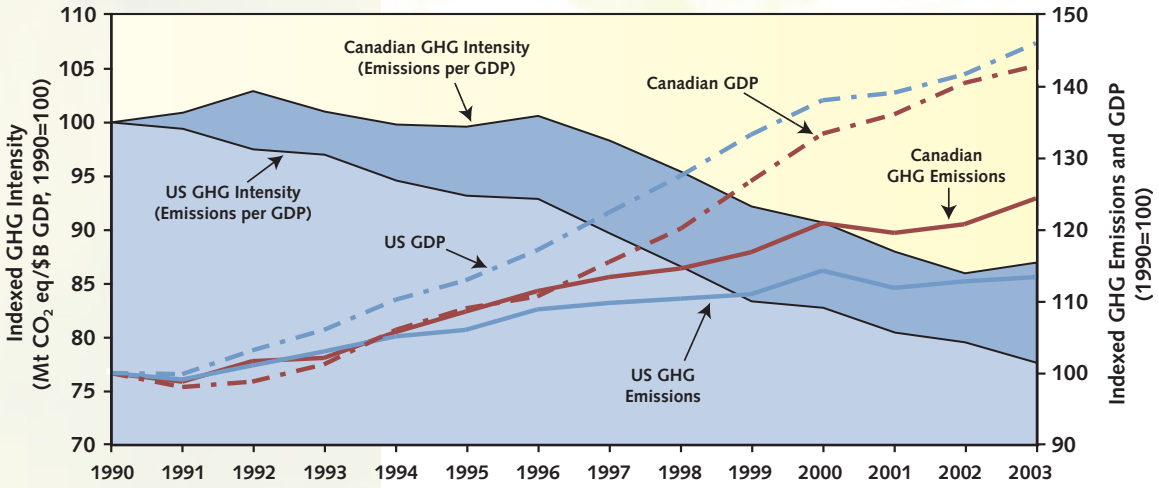
Greenhouse Gas Source/Sink Categories	Mt CO_2 equivalent		
	1990	2002	2003
TOTAL	596	719	740
Electricity & Petroleum Industries	**195**	**274**	**275**
Electricity Generation[1]	97.1	130	136
Upstream Oil and Gas[2]	63	99	96
Upstream—Natural Gas Transmission	11.2	17	15
Petroleum Refining[3]	21	25	25
Downstream—Natural Gas Distribution	2.8	3	3
Transportation	**140**	**170**	**180**
Domestic Aviation	6.4	7	7
Light-Duty Gasoline Vehicles	53.8	50	49
Light-Duty Gasoline Trucks	21.7	41	42
Heavy-Duty Gasoline Vehicles	3.14	4	4
Motorcycles	0.23	0.2	0.2
Light-Duty Diesel Vehicles	0.67	0.7	0.7
Light-Duty Diesel Trucks	0.59	0.8	0.8
Heavy-Duty Diesel Vehicles	24.5	40	42
Propane & Natural Gas Vehicles	2.2	0.9	0.8
Railways	7	6	6
Domestic Marine	5.0	5.5	6.1
Off-Road Gasoline	5	4	4
Off-Road Diesel	10	10	20
Mining and Manufacturing Industries	**117**	**109**	**114**
Mining[4]	6.88	10.8	14.7
Smelting and Refining Industries	16.6	14.4	14.5
Pulp and Paper and Sawmills	13.6	9.21	9.13
Primary & Other Steel Industries	13.5	13.6	13.5
Cement	9.2	11	11
Industrial Chemical Production	28	19	18
Other Manufacturing	25	28	29
Other Industries	4.30	3.35	3.51
Solvent & Other Product Use	**0.42**	**0.47**	**0.48**
Residential, Commercial & Institutional	**70**	**79**	**84**
Commercial & Institutional	25.8	35.4	39.0
Residential	44	44	45
Agriculture	**52**	**59**	**62**
Enteric Fermentation	18.7	22.2	22.4
Manure Management	6.6	7.8	7.8
Agricultural Soils—Direct Sources	22	23	25
Agricultural Soils—Indirect Sources	5	6	7
Waste	**20**	**25**	**25**
Solid Waste Disposal on Land	19	23	24
Wastewater Handling	1.2	1.4	1.4
Waste Incineration	0.32	0.35	0.36
Land Use, Land-Use Change and Forestry[5]	**-150**	**-33**	**-44**
Forest Land	-190	-58	-69
Cropland	23	15	14
Grassland	5	5	5
Wetlands	–	–	–
Settlements	6	6	6

Figures are rounded to reflect the uncertainty in the estimates.

1 Includes both utility and industrial generation and commercial steam generation.
2 Includes combustion, process, and fugitive emissions associated with conventional and unconventional production of oil and gas.
3 Includes combustion and process emissions associated with the refining of crude oil.
4 A small proportion of emissions from the upstream petroleum industry is accounted for in the mining sector due to data limitations.
5 National totals exclude all GHGs from the Land Use, Land-Use Change and Forestry Sector. CO_2 from agricultural soils and non-CO_2 emissions from forest fires, which were previously included in national totals, are now excluded.

FIGURE 2

Trends in GHG Emissions, GDP, and GHG Intensity for Canada and the United States, 1990–2003



Sources:

Canadian GHG Emissions: Environment Canada, *Canada's Greenhouse Gas Inventory 1990–2003*.

Canadian GDP: Statistics Canada, Real Gross Domestic Product (Millions Chained (1997) Dollars), CANSIM, Catalogue No. 13-213, Table 3, Preliminary Estimates.

U.S. GHG Emissions: *U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2003*.

U.S. GDP: Bureau of Economic Analysis, Real Gross Domestic Product Billions of Chained (2000) Dollars.

TABLE 2

Energy Production, Export and GHG Emission Trends, 1990 to 2003

	Year			
	1990	2002	2003	Long-Term Trend (1990–2003)
GHG Emissions[1] (Mt CO_2 eq)	596	719	740	24.2%
GDP[2] - Expense (Millions of 1997$)	765 311	1 074 516	1 092 891	42.8%
Domestic Energy Consumption[3] (PJ)	9 230	11 076	11 363	23%
Energy Production[3] (PJ)	7 746	12 336	12 452	61%
Energy Exported[3] (PJ)	3 063	7 515	7 473	144%
Net Energy Exported[3] (PJ)	1 769	5 294	4 958	180%
Emissions Associated with Exports[4] (Mt CO_2 eq)	28	69	69	149%
Emissions Associated with Net Exports[4] (Mt CO_2 eq)	22	51	46	115%

PJ = petajoule = 10^{15} joules

Sources:

1 Environment Canada, *Canada's Greenhouse Gas Inventory 1990–2003*.

2 Statistics Canada, Real Gross Domestic Product (Millions Chained (1997) Dollars), CANSIM, Catalogue No. 13-213, Table 3, Preliminary Estimates.

3 Statistics Canada, Report on Energy Supply–Demand in Canada, Catalogue No. 57-003.

4 For the year 1990, values were taken from T.J. McCann and Associates (1997) *Fossil Fuel Energy Trade & Greenhouse Gas Emissions: A Quantitative Assessment of Emissions Related to Imports and Exports*, prepared for Environment Canada. Values for the years 2002 and 2003 were extrapolated from the same report.

Sector Trends in Canada's GHG Emissions and Removals: 1990–2003

Electricity and Petroleum Industries

The electricity and petroleum industries contributed 275 Mt, or 37%, of Canada's GHG emissions in 2003. GHG emissions grew by about 41% on a sector basis, with electricity emissions increasing by 40% and petroleum industry emissions increasing by 43% since 1990.

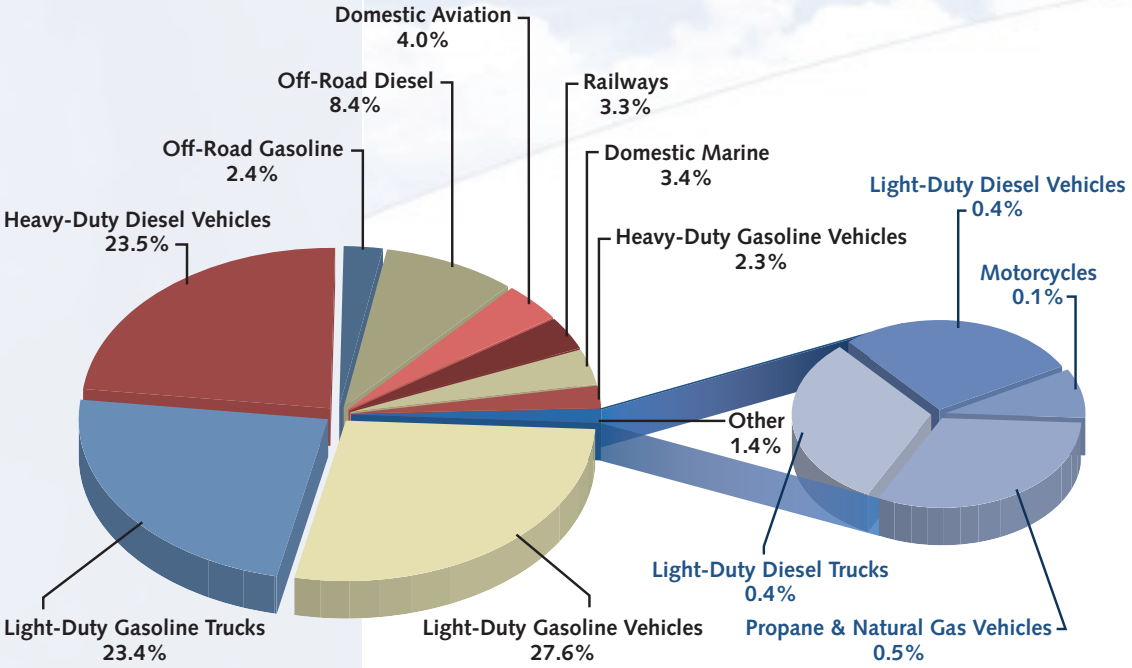
- In 2003, the electricity industry contributed 136 Mt (18%) to Canada's GHG emissions.
  - Since 1990, electricity generation has increased by about 21% and emissions have grown by 40%. This is due to an increase in the percentage of electricity generated by coal and natural gas and a decrease in the amount generated by hydro and nuclear sources in the overall makeup of electricity generation within Canada.
- In 2003, the petroleum industry as a whole contributed 139 Mt (about 19%) of Canada's GHG emissions, of which the upstream and downstream petroleum sectors contributed 111.2 Mt and 28.1 Mt, respectively.
  - The petroleum industry has experienced a 41.7 Mt (43%) increase in GHG emissions since 1990. Increased demand for crude oil and natural gas resulted in 180% growth in net energy exports and 45% growth in GDP.
- Since 1990, the upstream petroleum industry has experienced a 48% growth in GDP and a 50% (37.1 Mt) increase in GHG emissions.
  - Increasing foreign energy demands resulted in a 24.7 Mt increase in GHG emissions from the upstream petroleum industry.
  - Since 1990, emissions from the transmission of natural gas increased by 3.6 Mt (32%), while GDP for this subsector grew by 95%.
- The downstream petroleum industry has experienced a 33% growth in GDP with a 20% increase in GHG emissions since 1990.
  - Refining of petroleum products contributed 24.7 Mt of combustion and process emissions, while fugitive emissions from the distribution of natural gas contributed 3.4 Mt.

Transportation

- The transportation sector (excluding pipelines) represents one of the largest sources of emissions in Canada, accounting for 24.1% of Canada's total emissions in 2003 (180 Mt).
- Emissions increased 26% (40 Mt) between 1990 and 2003. On-road transportation was the largest contributor to emissions in this sector, at 78.3%. Nearly all emissions growth can be attributed to light-duty gasoline trucks, or LDGTs (these include sport utility vehicles, or SUVs, and minivans), which contributed 55% or 20.2 Mt of this sector's growth, and heavy-duty diesel vehicles, which accounted for 48% or 17.5 Mt of the growth. Figure 3 provides a breakdown of emissions from the different modes of transportation.
- The long-term trend (1990–2003) shows an increase in emissions from LDGTs, while emissions from light-duty gasoline vehicles (or cars) are decreasing. This can be explained by the increase in purchases of LDGTs (SUVs, minivans) instead of cars for personal transportation.

FIGURE 3

Canada's GHG Emissions from Transportation Sources in 2003



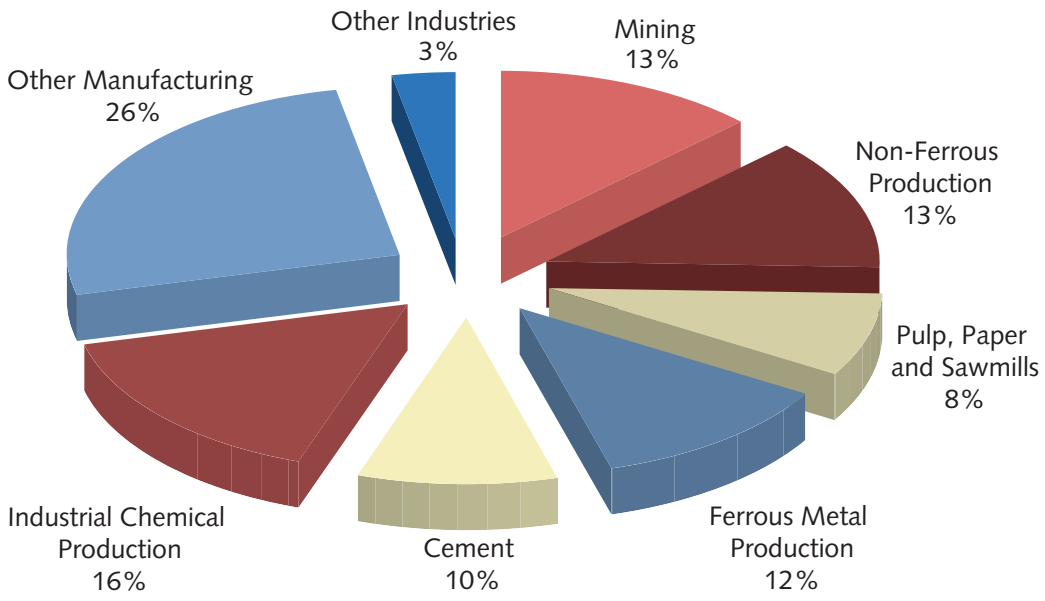
Mining and Manufacturing Industries

- Mining and manufacturing industries together contributed 15% (114 Mt) to Canada's total GHG emissions in 2003. Of these emissions, combustion emissions accounted for almost 58% and process emissions approximately 41%. Fugitive emissions accounted for less than 1% of the emissions from this sector (1.0 Mt).
- As depicted in Figure 4, the other manufacturing subsector accounted for one-quarter (29 Mt) of the total GHG emissions from the mining and manufacturing industries in 2003. This subsector encompasses all manufacturing activities not captured under any of the other specific categories. This includes food manufacturing, plastics and rubber manufacturing, and lime and gypsum products manufacturing, to name just a few. The GHG emissions in this subsector are primarily combustion emissions (70%), with the industrial process emissions making up the balance.
- The mining subsector accounted for 13% (14.7 Mt) of Canada's GHG emissions in 2003. Combustion emissions accounted for 93% of mining-related emissions, while the remainder are attributable to fugitive CH_4 emissions from underground coal mines.

- The non-ferrous metal production (smelting and refining) subsector contributed 13% (14.5 Mt) to mining and manufacturing industry emissions in 2003. The bulk of these emissions are due to the release of gases with high global warming potentials, originating from aluminium and magnesium production processes. Process emissions from this subsector totalled 11.3 Mt, with combustion emissions accounting for the balance.
- In 2003, the ferrous metal production (iron and steel) subsector represented 2% (13.5 Mt) of Canada's total GHG emissions, contributing 12% to mining and manufacturing industry emissions. Stationary fuel combustion and process-related sources accounted for 48% (6.4 Mt) and 52% (7.0 Mt) of the GHG emissions for this subsector, respectively.
- The cement subsector accounted for 10% (11 Mt) of the mining and manufacturing industry GHG emissions in 2003, which represents 1.5% of Canada's total GHG emissions. Approximately two-thirds of the emissions are a result of the clinker production process.
- For 2003, GHG emissions from industrial chemical production are estimated at 18 Mt, or 16% of the mining and manufacturing industry totals. This represents 2.5% of Canada's overall GHG emissions. Process GHG emissions again account for 70% of the total emissions from this subsector, with combustion emissions contributing the balance. Process emissions from this subsector include CO_2 emissions from the steam reforming of natural gas in ammonia production and N_2O generated as a by-product during the production of adipic and nitric acids.
- Overall, the mining and manufacturing industries have experienced a 2.4% (3 Mt) decline in GHG emissions between 1990 and 2003, despite an increase in production and GDP in most of the subsector industries. Process emissions have decreased in large part due to a significant reduction in process emissions from adipic acid production and lower GHG emission intensities through improved energy efficiency and fuel substitution. In this sector, fugitive emissions have decreased by 0.9 Mt (–48%), while fuel combustion emissions have increased by 2.3 Mt (3.5%) since 1990.

FIGURE 4

Breakdown of Canada's 2003 GHG Emissions in the Mining and Manufacturing Industries by Industrial Subsector



Note: Non-ferrous and ferrous production are equivalent to smelting and refining industries and primary and other steel industries, respectively.

Canada's Greenhouse Gas Inventory 1990–2003

Contact the Inquiry Centre at Environment Canada for further information.

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This document is also available on Environment Canada's Green Lane at www.ec.gc.ca/ghg-ges

Solvent and Other Product Use

- The Solvent and Other Product Use Sector is a minor contributor to Canada's total GHG emissions, as it is responsible for less than 1 Mt of GHG emissions. This sector accounts for N_2O emissions from the use of anaesthetics and propellants.

Residential, Commercial and Institutional Subsectors

- The residential and commercial/institutional subsectors contributed 84 Mt or 11% of Canada's GHG emissions in 2003. The residential subsector alone contributed about 45 Mt (6.1%), while the commercial and institutional subsector contributed 39 Mt (5.3%).
- Overall, emissions grew by 14.6 Mt (21%) since 1990. There was a 3% increase in residential and a 51% increase in the commercial/institutional subsectors. Floor space in both residential and commercial subsectors has increased consistently since 1990. This trend was countered by two factors: fuel substitution from refined petroleum products to natural gas and improvements in end-use efficiency. Combined, these factors have reduced energy consumption and emissions within the residential subsector.

Agriculture

- In 2003, GHG emissions from the Agriculture Sector totalled 62 Mt and contributed 8.4% of total national emissions. This sector accounted for 72% of Canada's total emissions of N_2O and 28% of CH_4 emissions.
- On a category basis, agricultural soils contributed 51% of the sector's emissions (32 Mt) in 2003. The balance of emissions in this sector originate from domestic animal enteric fermentation (36% or 22.4 Mt) and manure management (13% or 7.8 Mt).
- Total sector emissions rose 19% between 1990 and 2003. Emissions from manure management increased by 18% and from enteric fermentation by 20%. N_2O emissions from soils rose 19% over the same period.

Land Use, Land-Use Change and Forestry (LULUCF)

- The LULUCF Sector was a net sink in 2003, as it removed an estimated 44 Mt from the atmosphere. This estimate represents the sum of the net CO_2 flux and non-CO_2 (CH_4 and N_2O) emissions.
- The net CO_2 flux alone amounted to a sink of 46 Mt; however, under current international reporting rules, LULUCF emissions/removals are not included in the national inventory totals. If they were included, it would have resulted in a 6% reduction of total Canadian emissions in 2003. Under the terms of the Kyoto Protocol, sources and sinks from some land-use change and forestry activities could be included and accounted for separately during the first commitment period (2008–2012).
- The time series of the net LULUCF flux over the 1990–2003 period is heavily influenced by the high variability in the impact of natural disturbances, notably forest fires. As a result, the LULUCF Sector can be either a source (as in 1995) or a sink (as in 2003).
- Excluding natural disturbances, the trends observed in the LULUCF Sector largely reflect the changing levels of industrial forestry activity during the 1990s. Including the carbon stored in harvested wood products would significantly reduce the apparent impact of industrial activity on LULUCF Sector emissions and removals. Additional uncertainty in net forest removals is introduced by the omission of significant ecosystem carbon pools, notably soil organic carbon and dead biomass.
- Ongoing work involving several government departments and the university research community aims to improve information sources and support the development of a comprehensive monitoring, accounting, and reporting system in the LULUCF Sector.
- The natural variability of forest disturbances will remain a major challenge in the projection of annual emissions and removals in the LULUCF Sector.

Waste

- The Waste Sector contributed 25 Mt or 3.4% to Canada's GHG emissions in 2003. Solid waste disposal on land accounted for more than 93% (24 Mt) of Waste Sector GHG emissions, while wastewater handling and waste incineration accounted for 5% (1.4 Mt) and 1% (0.4 Mt), respectively.
- In 2003, CH_4 captured by landfill gas collection systems contributed to a 23% (6.5 Mt) reduction in direct atmospheric emissions of CH_4 from municipal solid waste. This resulted in a net release of 22 Mt. CH_4 captured by landfill gas collection systems has increased by 48% (2.1 Mt) since 1990.

Provincial and Territorial GHG Emissions

Table 3 provides a summary of GHG emissions by province and territory for 1990 and 2003 by sector (as defined by the UNFCCC). Although the UNFCCC Guidelines on annual inventories require only that national-level detail be reported, it is considered important to provide these details due to the distinct regional differences in emission levels and trends that exist within Canada. Also, it must be noted that provincial and territorial emission estimates do not sum exactly to the national totals. The differences are due to two factors: rounding of the emissions data and suppression of some confidential provincial/territorial activity data.

TABLE 3

Summary of Provincial and Territorial GHG Emissions by Sector, 1990 and 2003

	NL	PE	NS
1990 GHG Emissions by Sector			
Energy	8 840	1 460	17 800
Industrial Processes	76.9	2.82	276
Solvent and Other Product Use	8.7	2.0	14.0
Agriculture	48	380	520
Land Use, Land-Use Change and Forestry*	N/A	N/A	N/A
Waste	360	77	590
Total	**9 340**	**1 930**	**19 200**
2003 GHG Emissions by Sector			
Energy	10 300	1 610	19 600
Industrial Processes	29.3	2.5	316.0
Solvent and Other Product Use	7.8	2.1	14.0
Agriculture	49	380	490
Land Use, Land-Use Change and Forestry*	N/A	N/A	N/A
Waste	450	95	770
Total	**10 900**	**2 090**	**21 200**
Absolute Change in Emissions (kt) 1990–2003	**1 540**	**162**	**1 990**
Relative Change in Emissions (%) 1990–2003	16%	8%	10%
Relative Contribution to Absolute Growth in emissions (%)	**1.1%**	**0.1%**	**1.5%**
2003 GHG Emissions Per Capita[1] (tonnes GHGs/person)	**20.9**	**15.2**	**22.6**
(National average: 23.06 tonnes/person)			
2003 GHG Intensity of GDP[2] (GHG kt CO_2 eq/ Million$GDP)	0.71	0.62	0.84
National value: 0.67			

Sources:

GHG Emissions: *Environment Canada, Canada's Greenhouse Gas Inventory 1990–2003.*

1 Population data: *Statistics Canada, CANSIM II Table 051-0001.*

2 GDP data: *Real Gross Domestic Product, (1997 Chained dollars), Statistics Canada, CANSIM, Catalogue no. 13-213, Table 3, Preliminary Estimates.*

GHG emissions are not distributed evenly across Canada. Regional differences in factors such as climate, resources available for energy production and/or industry, and travel patterns all contribute to different levels and trends of emissions. Figure 5 illustrates the provincial and territorial contributions to Canada's total emissions in 2003. The largest provincial contributors were Alberta, with 31% of Canada's total emissions (224 Mt), and Ontario, which accounted for 28% of the national total (206 Mt). The next largest contribution to national emissions was from Quebec, at 13%, while Saskatchewan and British Columbia contributed 8.9% and 8.7%, respectively. The remainder of the emissions in 2003 were from Manitoba, Nova Scotia, and New Brunswick (each accounting for about 3%). Newfoundland and Labrador added 1.5%, while Prince Edward Island and the territories together contributed less than 1% to total national emissions in 2003.

In terms of emissions growth, all provinces and territories except the Yukon (–8%) experienced an increase in their emissions over the 1990–2003 period. Emissions from Saskatchewan rose 45%, while British Columbia, New Brunswick, and Alberta showed increases ranging between 24% and 34%. During this 13-year period, four provinces were responsible for 86% of the

NB	QC	ON	MB	SK	AB	BC	NT & NU	YT
			kt CO_2 equivalent					
14 700	58 700	134 000	12 400	34 500	143 000	41 400	1 520	504
152	12 400	26 100	470	591	8 800	3 790	0.85	2.88
11.0	110.0	160.0	17.0	15.0	38.0	50.0	0.9	0.4
430	7 300	11 000	5 700	9 400	15 000	2 400	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
500	5 800	7 200	420	500	1 000	3 600	14	7
15 800	**84 300**	**178 000**	**19 100**	**45 000**	**168 000**	**51 300**	**1 530**	**514**
			kt CO_2 equivalent					
19 500	67 600	169 000	12 500	48 900	196 000	52 700	1 730	460
419.0	10 300.0	17 300.0	267.0	1 410.0	8 540.0	2 710.0	5.4	0.7
11.0	110.0	180.0	18.0	15.0	48.0	62.0	1.1	0.5
440	7 200	10 000	7 900	14 000	19 000	2 500	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
640	6 400	9 000	650	650	1 400	5 400	20	9
21 000	**91 500**	**206 000**	**21 300**	**65 200**	**224 000**	**63 400**	**1 760**	**470**
5 220	**7 270**	**27 800**	**2 250**	**20 200**	**56 800**	**12 100**	**223**	**-44**
33%	9%	16%	12%	45%	34%	24%	15%	-8%
3.9%	**5.4%**	**20.5%**	**1.7%**	**14.9%**	**41.9%**	**9.0%**	**0.2%**	**0.0%**
28.0	**12.2**	**16.8**	**18.4**	**65.5**	**71.2**	**15.3**	**24.6**	**15.1**
1.02	0.39	0.45	0.62	2.03	1.75	0.48	0.43	0.40

Notes:

* Non-CO_2 emissions from forest fires were previously included in national totals, and reported for each province/territory. These emissions, as all other GHG emissions or removals in the LULUCF sector, are now excluded from totals and only reported at the national level.

Due to confidentiality and rounding, individual values may not add up to totals (zero values may represent estimated quantities too small to display).

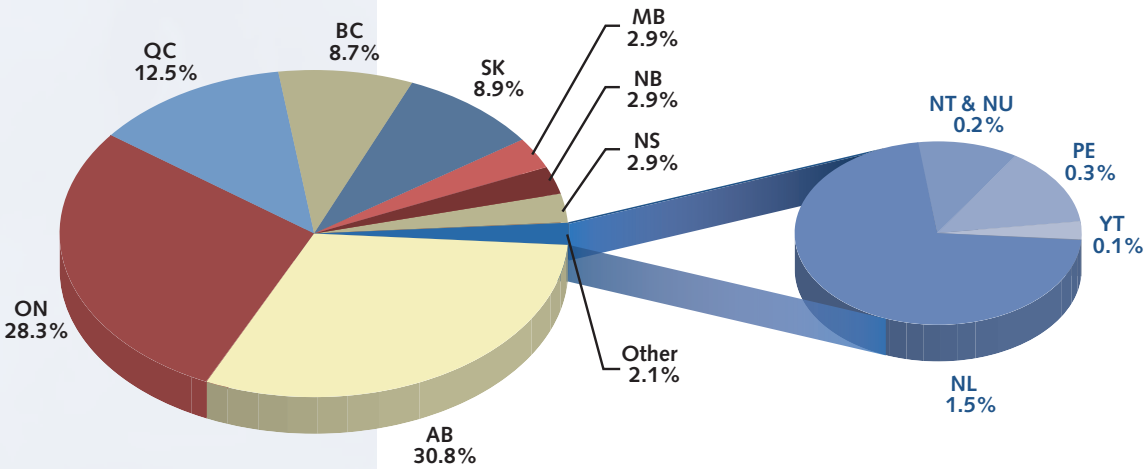
Emissions associated with the use of HFCs, PFCs, amonia, limestone and soda ash are reported in the national total.

N/A: Not Applicable

total national growth in emissions — Alberta accounted for 42% of total growth, while Ontario and Saskatchewan contributed 21% and 15%, respectively, and British Columbia added 9%.

FIGURE 5

Relative Provincial and Territorial Contributions to Canada's GHG Emissions in 2003



Excluding CO_2 emissions from agricultural soils, total emissions from the Agriculture Sector increased by 19% between 1990 and 2003 (from 52 Mt to 62 Mt). On a provincial basis, CH_4 and N_2O emissions increased steadily, from 5.7 to 7.9 Mt in Manitoba, from 9.4 to 14 Mt in Saskatchewan, and from 15 to 19 Mt in Alberta. There has been very little change in CH_4 and N_2O emissions in British Columbia, Ontario, Quebec, and the Atlantic region of Canada. The increased emissions from the Prairie provinces have mainly resulted from livestock expansion and higher synthetic nitrogen fertilizer consumption. Collectively, these provinces have contributed to most of the growth in Canada's non-CO_2 GHG emissions from the Agriculture Sector since 1990. The increased non-CO_2 emissions from the Prairies are partially offset by increasing removals of CO_2 because of increasing storage of soil organic carbon through adoption of no-till and reduction of summer-fallow.

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For a complete summary of provincial and territorial emissions for the years 1990 through 2003 inclusive, consult Environment Canada's Greenhouse Gas Emissions web site at www.ec.gc.ca/ghg-ges

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