Canada's 2004 Greenhouse gas inventory

A Summary of Trends

Background on the National GHG Inventory

As an Annex I Party (Developed Countries) to the United Nations Framework Convention on Climate Change (UNFCCC), Canada is required on an annual basis to prepare and submit a national inventory of anthropogenic sources and sinks of greenhouse gases not included in the Montreal Protocol. Canada has been submitting a complete inventory annually for over a decade, building on 15 years experience. The inventory must meet international reporting guidelines and quality standards and is reviewed annually by a UN Expert Review Team.

In addition, Annex I Parties are required to continuously improve the quality of their national greenhouse gas (GHG) inventory. As new information and data become available, and more accurate methods developed, previous estimates are updated to provide a consistent and comparable trend in emissions and removals.

Explanation of the Changes for 2004

Primary contributors to the revised 1990-2003 national GHG estimates are the following:

- *Studies in upstream oil and gas and oil refining industries*
- *Updates in Statistics Canada's underlying energy data for 2003*
- *Adoption of improved, country-specific methodologies and factors for agricultural soils nitrous oxide emissions, and*
- *Major revision of the estimation model for emissions from landfills*

As a result, total GHG emissions (without Land Use, Land-Use Change and Forestry) previously reported for 1990 have been revised upward from 596[1] Mt to 599 Mt, while emission estimates previously reported for 2003 have been revised upward from 740 Mt to 754 Mt. The overall impact of these changes is that emission growth over the period 1990-2003, previously reported to be 24.2%, is now estimated to be 25.9%.

2004 GHG Emission Trends

- Total GHG emissions in Canada in 2004, expressed as "CO_2 equivalent," (CO_2 eq) were 758 Mt which represents a 0.6 percent increase over the 2003 total of 754 Mt and a 26.6 percent increase over the 1990 total of 599 Mt and 34.6 percent above the Kyoto target of 563 Mt. The increase from 2003 to 2004 was small primarily due to significantly reduced emissions from electricity production (less coal and more nuclear power), and a reduced demand for heating fuel due to warmer weather.
- Between 2003 and 2004, emissions from most sectors were up. Industrial Processes, Solvent and Other Product Use, Agriculture and Waste were up by 8.3 percent, 0.9 percent, 4.5 percent and 0.8 percent, respectively. On the other hand, Energy Sector emissions actually showed a decrease of 0.4 percent, the first since the 1990–1991 period. This minimized overall growth. The Energy Sector decrease was due primarily to lower emissions from electricity, on the basis of increased nuclear availability and reduced coal generation.

[1] *GHG emissions are expressed as megatonnes of carbon dioxide equivalent (CO_2 eq) unless noted.*

- Between 1990 and 2004, significant growth in oil and gas production, much of which has been provided to the United States has resulted in a dramatic increase in the emissions associated with the production and transportation of fuel for export. In 2004, net emissions associated with these exports were 47.8 Mt, a 123 percent increase over the 1990 level of 21.5 Mt.

A summary of the emissions by major sector is provided in the accompanying tables.

Region CANADA
Year 1990

Sectoral Greenhouse Gas Emission Summary

Source Categories	Greenhouse Gases								
	CO_2	CH_4	CH_4	N_2O	N_2O	HFCs	PFCs	SF_6	TOTAL
GWP			21		310				
Unit	kt	kt	kt CO_2 eq	kt	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq
TOTAL[1]	**460 000**	**3 900**	**82 000**	**150**	**45 000**	**-**	**6 540**	**5 000**	**599 000**
ENERGY	**430 000**	**2 000**	**40 000**	**30**	**8 000**	-	-	-	**475 000**
a. Stationary Sources	**277 000**	**200**	**4 000**	**7**	**2 000**	-	-	-	**283 000**
Electricity and Heat Generation	94 700	1.8	38	2	500	-	-	-	95 300
Petroleum Production and Refining	23 000	0.4	9	0.4	100	-	-	-	23 000
Fossil Fuel Production	28 100	80	2 000	0.7	200	-	-	-	30 000
Mining	6 160	0.1	3	0.1	40	-	-	-	6 200
Iron and Steel	6 420	0.2	5	0.2	60	-	-	-	6 490
Non-Ferrous Metals	3 210	0.07	1	0.05	10	-	-	-	3 230
Chemical	7 060	0.15	3.0	0.1	40	-	-	-	7 100
Pulp and Paper	13 400	2	40	0.8	200	-	-	-	13 600
Cement	3 570	0.07	1	0.05	10	-	-	-	3 590
Other Manufacturing	20 700	0.4	9	0.4	100	-	-	-	20 900
Construction	1 860	0.03	0.7	0.05	20	-	-	-	1 880
Commercial & Institutional	25 700	0.5	10	0.5	200	-	-	-	25 800
Residential	41 300	100	2 000	2	500	-	-	-	44 000
Agriculture & Forestry	2 400	0.04	0.8	0.05	20	-	-	-	2 420
b. Transportation	**142 000**	**30**	**600**	**20**	**6 000**	**-**	**-**	**-**	**150 000**
Domestic Aviation	6 220	0.5	10	0.6	200	-	-	-	6 400
Gasoline Automobile	51 600	9.0	190	6.3	2 000	-	-	-	53 800
Light-Duty Gasoline Trucks	20 300	4.0	83	4.2	1 300	-	-	-	21 700
Heavy-Duty Gasoline Vehicles	2 990	0.42	8.8	0.44	140	-	-	-	3 140
Motorcycles	225	0.18	3.8	0.00	1.4	-	-	-	230
Diesel Automobiles	657	0.02	0.4	0.05	10	-	-	-	672
Light-Duty Diesel Trucks	578	0.02	0.3	0.04	10	-	-	-	591
Heavy-Duty Diesel Vehicles	24 300	1	30	0.7	200	-	-	-	24 500
Propane & Natural Gas Vehicles	2 160	2	40	0.04	10	-	-	-	2 200
Railways	6 320	0.3	7	3	800	-	-	-	7 000
Domestic Marine	4 730	0.4	7	1	300	-	-	-	5 000
Off-Road Gasoline	5 000	6	100	0.1	30	-	-	-	5 000
Off-Road Diesel	10 000	0.5	10	4	1 000	-	-	-	10 000
Pipelines	6 700	6.7	140	0.2	60	-	-	-	6 900
c. Fugitives	**11 000**	**1 600**	**33 000**	**0.1**	**30**	**-**	**-**	**-**	**43 300**
Coal Mining	-	90	2 000	-	-	-	-	-	2 000
Oil and Natural Gas	11 000	1 500	31 000	0.1	30	-	-	-	41 400
Oil	1 910	230	4 800	-	-	-	-	-	6 700
Natural Gas	4 200	640	13 000	-	-	-	-	-	18 000
Venting	110	600	13 000	0.1	30	-	-	-	13 000
Flaring	4 340	2.61	54.8	0.00	0.1	-	-	-	4 400
INDUSTRIAL PROCESSES	**30 300**	**-**	**-**	**37.1**	**11 500**	**-**	**6 540**	**5 000**	**53 300**
a. Mineral Production	**8 300**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**8 300**
b. Chemical Industry	**3 900**	**-**	**-**	**37.1**	**11 500**	**-**	**-**	**-**	**15 000**
c. Metal Production	**9 800**	**-**	**-**	**-**	**-**	**-**	**6 540**	**3 170**	**19 500**
d. Consumption of Halocarbons and SF_6	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1 800**	**1 800**
e. Other & Undifferentiated Production	**8 300**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**8 300**
SOLVENT & OTHER PRODUCT USE	**-**	**-**	**-**	**1.3**	**420**	**-**	**-**	**-**	**420**
AGRICULTURE	**-**	**1 000**	**21 000**	**77**	**24 000**	**-**	**-**	**-**	**45 000**
a. Enteric Fermentation	-	877	18 400	-	-	-	-	-	18 400
b. Manure Management	-	120	2 600	13	4 100	-	-	-	6 700
c. Agricultural Soils	-	-	-	63	20 000	-	-	-	20 000
WASTE	**270**	**1 100**	**24 000**	**3**	**1 000**	**-**	**-**	**-**	**25 000**
a. Solid Waste Disposal on Land	-	1 100	23 000	-	-	-	-	-	23 000
b. Wastewater Handling	-	11	220	3	900	-	-	-	1 100
c. Waste Incineration	270	0.4	9	0.4	100	-	-	-	400
LAND USE, LAND-USE CHANGE AND FORESTRY	**- 87 000**	**160**	**3 500**	**7.0**	**2 200**	**-**	**-**	**-**	**- 82 000**
a. Forest Land	-110 000	150	3 200	6.4	2 000	-	-	-	-110 000
b. Cropland	13 000	9	200	0.5	200	-	-	-	14 000
c. Grassland	NE	NE	NE	NE	NE	NE	NE	NE	NE
d. Wetlands	6 000	0.08	2	0.00	0.9	-	-	-	6 000
e. Settlements	8 000	3	60	0.1	30	-	-	-	8 000

Notes:

[1]National totals exclude all GHGs from the Land Use, Land-use Change and Forestry Sector.

NE - Not Estimated

Due to **ROUNDING** values may not sum to totals.

Region CANADA
Year 2003

Sectoral Greenhouse Gas Emission Summary

Source Categories	Greenhouse Gases								
	CO_2	CH_4	CH_4	N_2O	N_2O	HFCs	PFCs	SF_6	TOTAL
GWP			21		310				
Unit	kt	kt	kt CO_2 eq	kt	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq
TOTAL[1]	**593 000**	**5 200**	**110 000**	**130**	**41 000**	**4 400**	**3 030**	**4 200**	**754 000**
ENERGY	**556 000**	**3 000**	**60 000**	**30**	**10 000**	**-**	**-**	**-**	**622 000**
a. Stationary Sources	**361 000**	**200**	**5 000**	**9**	**3 000**	-	-	-	**368 000**
Electricity and Heat Generation	139 000	5.1	110	2	800	-	-	-	139 000
Petroleum Production and Refining	30 000	0.5	10	0.5	100	-	-	-	30 000
Fossil Fuel Production	43 900	100	3 000	1	300	-	-	-	47 000
Mining	15 600	0.3	7	0.3	100	-	-	-	15 700
Iron and Steel	6 310	0.2	5	0.2	60	-	-	-	6 370
Non-Ferrous Metals	3 190	0.07	1	0.05	20	-	-	-	3 200
Chemical	5 780	0.12	2.5	0.1	30	-	-	-	5 820
Pulp and Paper	8 690	2	40	0.9	300	-	-	-	9 010
Cement	4 160	0.08	2	0.05	10	-	-	-	4 180
Other Manufacturing	20 800	0.4	9	0.4	100	-	-	-	20 900
Construction	1 290	0.02	0.5	0.03	9	-	-	-	1 300
Commercial & Institutional	37 700	0.7	10	0.8	200	-	-	-	37 900
Residential	42 900	90	2 000	2	500	-	-	-	45 000
Agriculture & Forestry	2 190	0.04	0.8	0.06	20	-	-	-	2 210
b. Transportation	**179 000**	**30**	**600**	**30**	**8 000**	**-**	**-**	**-**	**190 000**
Domestic Aviation	7 040	0.4	9	0.7	200	-	-	-	7 300
Gasoline Automobile	47 300	3.7	78	6.3	2 000	-	-	-	49 400
Light-Duty Gasoline Trucks	39 200	4.5	94	8.4	2 600	-	-	-	41 900
Heavy-Duty Gasoline Vehicles	3 950	0.56	12	0.59	180	-	-	-	4 140
Motorcycles	221	0.18	3.7	0.00	1.3	-	-	-	226
Diesel Automobiles	706	0.02	0.4	0.05	20	-	-	-	722
Light-Duty Diesel Trucks	778	0.02	0.4	0.06	20	-	-	-	796
Heavy-Duty Diesel Vehicles	41 800	2	40	1	400	-	-	-	42 300
Propane & Natural Gas Vehicles	791	1	30	0.02	5	-	-	-	820
Railways	5 260	0.3	6	2	700	-	-	-	6 000
Domestic Marine	5 840	0.5	10	0.90	300	-	-	-	6 100
Off-Road Gasoline	4 000	5	100	0.09	30	-	-	-	4 000
Off-Road Diesel	13 000	0.7	10	5	2 000	-	-	-	10 000
Pipelines	8 850	8.8	190	0.2	70	-	-	-	9 110
c. Fugitives	**16 000**	**2 400**	**50 000**	**0.1**	**40**	**-**	**-**	**-**	**66 200**
Coal Mining	-	50	1 000	-	-	-	-	-	1 000
Oil and Natural Gas	16 000	2 300	49 000	0.1	40	-	-	-	65 200
Oil	3 630	300	6 400	-	-	-	-	-	10 000
Natural Gas	7 000	990	21 000	-	-	-	-	-	28 000
Venting	160	1 000	22 000	0.1	40	-	-	-	22 000
Flaring	5 580	4.06	85.3	0.00	0.1	-	-	-	5 700
INDUSTRIAL PROCESSES	**36 700**	**-**	**-**	**6.10**	**1 890**	**4 400**	**3 030**	**4 180**	**50 100**
a. Mineral Production	**9 100**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**9 100**
b. Chemical Industry	**5 100**	**-**	**-**	**6.10**	**1 890**	**-**	**-**	**-**	**7 000**
c. Metal Production	**12 000**	**-**	**-**	**-**	**-**	**-**	**3 000**	**2 560**	**17 200**
d. Consumption of Halocarbons and SF_6	**-**	**-**	**-**	**-**	**-**	**4 400**	**30**	**1 600**	**6 000**
e. Other & Undifferentiated Production	**11 000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**11 000**
SOLVENT & OTHER PRODUCT USE	**-**	**-**	**-**	**1.5**	**480**	**-**	**-**	**-**	**480**
AGRICULTURE	**-**	**1 230**	**25 700**	**86**	**27 000**	**-**	**-**	**-**	**53 000**
a. Enteric Fermentation	-	1 080	22 600	-	-	-	-	-	22 600
b. Manure Management	-	150	3 100	16	5 000	-	-	-	8 100
c. Agricultural Soils	-	-	-	70	22 000	-	-	-	22 000
WASTE	**190**	**1 300**	**27 000**	**3**	**1 000**	**-**	**-**	**-**	**29 000**
a. Solid Waste Disposal on Land	-	1 300	27 000	-	-	-	-	-	27 000
b. Wastewater Handling	-	12	240	3	1 000	-	-	-	1 200
c. Waste Incineration	190	0.05	1	0.2	50	-	-	-	240
LAND USE, LAND-USE CHANGE AND FORESTRY	**- 24 000**	**390**	**8 100**	**16**	**5 100**	**-**	**-**	**- -**	**11 000**
a. Forest Land	- 33 000	380	7 900	16	4 900	-	-	- -	20 000
b. Cropland	620	5	100	0.3	100	-	-	-	830
c. Grassland	NE	NE	NE	NE	NE	NE	NE	NE	NE
d. Wetlands	1 000	0.1	3	0.01	2	-	-	-	1 000
e. Settlements	7 000	3	60	0.1	30	-	-	-	7 000

Notes:

[1]National totals exclude all GHGs from the Land Use, Land-use Change and Forestry Sector.

NE - Not Estimated

Due to **ROUNDING** values may not sum to totals.

Region CANADA
Year 2004

Sectoral Greenhouse Gas Emission Summary

Source Categories	Greenhouse Gases								
	CO_2	CH_4	CH_4	N_2O	N_2O	HFCs	PFCs	SF_6	TOTAL
GWP			21		310				
Unit	kt	kt	kt CO_2 eq	kt	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq
TOTAL[1]	**593 000**	**5 200**	**110 000**	**140**	**44 000**	**4 700**	**3 060**	**3 000**	**758 000**
ENERGY	**553 000**	**3 000**	**60 000**	**30**	**10 000**	-	-	-	**620 000**
a. Stationary Sources	**352 000**	**200**	**5 000**	**9**	**3 000**	-	-	-	**360 000**
Electricity and Heat Generation	129 000	4.7	99	2	700	-	-	-	130 000
Petroleum Production and Refining	29 000	0.6	10	0.5	200	-	-	-	29 000
Fossil Fuel Production	46 200	100	3 000	1	400	-	-	-	49 000
Mining	15 300	0.3	6	0.3	100	-	-	-	15 400
Iron and Steel	6 480	0.3	5	0.2	60	-	-	-	6 550
Non-Ferrous Metals	3 220	0.07	2	0.05	20	-	-	-	3 230
Chemical	6 250	0.13	2.7	0.1	30	-	-	-	6 290
Pulp and Paper	8 990	2	40	0.9	300	-	-	-	9 310
Cement	4 310	0.09	2	0.05	20	-	-	-	4 330
Other Manufacturing	21 100	0.4	9	0.4	100	-	-	-	21 200
Construction	1 340	0.02	0.5	0.03	9	-	-	-	1 350
Commercial & Institutional	37 700	0.7	10	0.8	200	-	-	-	37 900
Residential	40 700	90	2 000	2	500	-	-	-	43 000
Agriculture & Forestry	2 080	0.04	0.7	0.06	20	-	-	-	2 100
b. Transportation	**185 000**	**30**	**600**	**30**	**8 000**	**-**	**-**	**-**	**190 000**
Domestic Aviation	7 590	0.4	9	0.7	200	-	-	-	7 800
Gasoline Automobile	47 800	3.5	74	6.0	1 900	-	-	-	49 800
Light-Duty Gasoline Trucks	41 000	4.5	95	8.3	2 600	-	-	-	43 600
Heavy-Duty Gasoline Vehicles	4 010	0.57	12	0.60	190	-	-	-	4 210
Motorcycles	214	0.17	3.6	0.00	1.3	-	-	-	219
Diesel Automobiles	750	0.02	0.4	0.05	20	-	-	-	768
Light-Duty Diesel Trucks	873	0.02	0.5	0.06	20	-	-	-	893
Heavy-Duty Diesel Vehicles	44 400	2	50	1	400	-	-	-	44 900
Propane & Natural Gas Vehicles	837	1	30	0.02	5	-	-	-	870
Railways	5 350	0.3	6	2	700	-	-	-	6 000
Domestic Marine	6 260	0.5	10	1	400	-	-	-	6 600
Off-Road Gasoline	4 000	4	90	0.08	20	-	-	-	4 000
Off-Road Diesel	14 000	0.7	10	5	2 000	-	-	-	20 000
Pipelines	8 280	8.3	170	0.2	70	-	-	-	8 520
c. Fugitives	**16 000**	**2 400**	**50 000**	**0.1**	**40**	**-**	**-**	**-**	**66 500**
Coal Mining	-	50	1 000	-	-	-	-	-	1 000
Oil and Natural Gas	16 000	2 300	49 000	0	40	-	-	-	65 500
Oil	3 650	300	6 300	-	-	-	-	-	9 900
Natural Gas	7 200	1 000	21 000	-	-	-	-	-	28 000
Venting	160	1 000	22 000	0.1	40	-	-	-	22 000
Flaring	5 350	3.91	82.2	0.00	0.06	-	-	-	5 400
INDUSTRIAL PROCESSES	**39 600**	**-**	**-**	**12.7**	**3 920**	**4 700**	**3 060**	**3 020**	**54 300**
a. Mineral Production	**9 500**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**9 500**
b. Chemical Industry	**5 700**	**-**	**-**	**12.7**	**3 920**	**-**	**-**	**-**	**9 600**
c. Metal Production	**12 000**	**-**	**-**	**-**	**-**	**-**	**3 030**	**2 220**	**17 600**
d. Consumption of Halocarbons and SF_6	**-**	**-**	**-**	**-**	**-**	**4 700**	**30**	**800**	**5 500**
e. Other & Undifferentiated Production	**12 000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**12 000**
SOLVENT & OTHER PRODUCT USE	**-**	**-**	**-**	**1.6**	**480**	**-**	**-**	**-**	**480**
AGRICULTURE	**-**	**1 290**	**27 200**	**89**	**28 000**	**-**	**-**	**-**	**55 000**
a. Enteric Fermentation	-	1 140	24 000	-	-	-	-	-	24 000
b. Manure Management	-	150	3 200	17	5 300	-	-	-	8 400
c. Agricultural Soils	-	-	-	72	22 000	-	-	-	22 000
WASTE	**200**	**1 300**	**28 000**	**3**	**1 000**	**-**	**-**	**-**	**29 000**
a. Solid Waste Disposal on Land	-	1 300	27 000	-	-	-	-	-	27 000
b. Wastewater Handling	-	12	250	3	1 000	-	-	-	1 200
c. Waste Incineration	200	0.06	1	0.2	50	-	-	-	250
LAND USE, LAND-USE CHANGE AND FORESTRY	**59 000**	**640**	**14 000**	**27**	**8 400**	**-**	**-**	**-**	**81 000**
a. Forest Land	51 000	640	13 000	27	8 300	-	-	-	73 000
b. Cropland	- 140	5	100	0.3	100	-	-	-	58
c. Grassland	NE	NE	NE	NE	NE	NE	NE	NE	NE
d. Wetlands	1 000	0.1	3	0.01	2	-	-	-	1 000
e. Settlements	7 000	3	60	0	30	-	-	-	7 000

Notes:

[1]National totals exclude all GHGs from the Land Use, Land-use Change and Forestry Sector.

NE - Not Estimated

Due to **ROUNDING** values may not sum to totals.

Region **CANADA**

Sectoral Greenhouse Gas Emission Summary

Source Categories	1990	2003	2004	Short Term Change[2]	Long Term Change[2]
		kt CO_2 eq			
TOTAL[1]	**599 000**	**754 000**	**758 000**	**0.6%**	**26.6%**
ENERGY	**475 000**	**622 000**	**620 000**	**-0.4%**	30.3%
a. Stationary Sources	**283 000**	**368 000**	**360 000**	**-2.3%**	27.0%
Electricity and Heat Generation	95 300	139 000	130 000	-6.6%	36.6%
Fossil Fuel Industries	53 000	77 000	79 000	2.5%	49.0%
Mining	6 200	15 700	15 400	-1.9%	148.6%
Iron and Steel	6 490	6 370	6 550	2.7%	0.9%
Non-Ferrous Metals	3 230	3 200	3 230	1.0%	0.2%
Chemical	7 100	5 820	6 290	8.1%	-11.4%
Pulp and Paper	13 600	9 010	9 310	3.3%	-31.8%
Cement	3 590	4 180	4 330	3.5%	20.7%
Other Manufacturing	20 900	20 900	21 200	1.6%	1.8%
Construction	1 880	1 300	1 350	4.0%	-28.0%
Commercial & Institutional	25 800	37 900	37 900	0.1%	46.8%
Residential	44 000	45 000	43 000	-4.8%	-1.8%
Agriculture & Forestry	2 420	2 210	2 100	-4.9%	-13.2%
b. Transportation	**150 000**	**190 000**	**190 000**	**3.0%**	**29.9%**
Domestic Aviation	6 400	7 300	7 800	7.7%	22.0%
Gasoline Automobile	53 800	49 400	49 800	0.9%	-7.4%
Light-Duty Gasoline Trucks	21 700	41 900	43 600	4.1%	100.9%
Heavy-Duty Gasoline Vehicles	3 140	4 140	4 210	1.6%	34.2%
Motorcycles	230	226	219	-3.0%	-4.8%
Diesel Automobiles	672	722	768	6.3%	14.2%
Light-Duty Diesel Trucks	591	796	893	12.2%	51.2%
Heavy-Duty Diesel Vehicles	24 500	42 300	44 900	6.2%	83.0%
Propane & Natural Gas Vehicles	2 200	820	870	5.7%	-60.7%
Railways	7 000	6 000	6 000	1.7%	-15.3%
Domestic Marine	5 000	6 100	6 600	8.0%	31.3%
Off-Road Gasoline	5 000	4 000	4 000	-12.3%	-24.5%
Off-Road Diesel	10 000	10 000	20 000	3.4%	33.1%
Pipelines	6 900	9 110	8 520	-6.4%	23.5%
c. Fugitives	**43 300**	**66 200**	**66 500**	**0.5%**	**53.4%**
Coal Mining	2 000	1 000	1 000	0.0%	-48.3%
Oil	6 700	10 000	9 900	-0.8%	49.3%
Natural Gas	18 000	28 000	28 000	1.5%	60.0%
Venting	13 000	22 000	22 000	1.0%	71.9%
Flaring	4 400	5 700	5 400	-4.1%	23.5%
INDUSTRIAL PROCESSES	**53 300**	**50 100**	**54 300**	**8.3%**	**1.9%**
a. Mineral Production	**8 300**	9 100	9 500	**5.2%**	**15.3%**
b. Chemical Industry	**15 000**	**7 000**	**9 600**	**37.4%**	**-37.9%**
c. Metal Production	**19 500**	**17 200**	**17 600**	**2.6%**	**-9.5%**
d. Consumption of Halocarbons and SF_6	**1 800**	**6 000**	**5 500**	**-8.4%**	**201.0%**
e. Other & Undifferentiated Production	**8 300**	**11 000**	**12 000**	**10.6%**	**45.0%**
SOLVENT & OTHER PRODUCT USE	**420**	**480**	**480**	**0.9%**	**15.3%**
AGRICULTURE	**45 000**	**53 000**	**55 000**	**4.5%**	**22.6%**
a. Enteric Fermentation	18 400	22 600	24 000	6.1%	30.3%
b. Manure Management	6 700	8 100	8 400	3.9%	26.2%
c. Agricultural Soils	20 000	22 000	22 000	3.0%	14.1%
WASTE	**25 000**	**29 000**	**29 000**	**0.8%**	**15.9%**
a. Solid Waste Disposal on Land	23 000	27 000	27 000	0.8%	16.9%
b. Wastewater Handling	1 100	1 200	1 200	1.1%	14.3%
c. Waste Incineration	400	240	250	5.9%	-36.6%
LAND USE, LAND-USE CHANGE AND FORESTRY	**-82 000**	**-11 000**	**81 000**	**-813.7%**	**-198.9%**
a. Forest Land	-110 000	-20 000	73 000	-459.5%	-166.6%
b. Cropland	14 000	830	58	-93.0%	-99.6%
c. Grassland	N/A	N/A	N/A	N/A	N/A
d. Wetlands	6 000	1 000	1 000	1.0%	-80.6%
e. Settlements	8 000	7 000	7 000	0.3%	-13.4%

Notes:

[1]National totals exclude all GHGs from the Land Use, Land-use Change and Forestry Sector.

[2] Due to **ROUNDING** values may not sum to totals. Percent Change is based on **UNROUNDED** values.

Long Term Comparisons by Sector: 1990-2004

Sector Trends

- Between 1990 and 2004, the net increase in Canada's annual GHG emissions totaled about 159 Mt. Over the same period, emissions from the Energy Industries and Transportation subsector increased by 138 Mt, accounting for most of the overall increase.
- Within these two energy subsectors, the greatest contributors to the overall increase were the 36.6 percent increase in emissions from the Electricity and Heat Generation subsector (34.9 Mt), and a 29.9 percent increase from Vehicles (39.1 Mt). Petroleum industries also contributed significantly, with a total increase in GHG emissions of 58.9 percent between 1990 and 2004. Much of the increase in the petroleum industries sector is attributable to the rapid growth in crude oil and natural gas exports to the United States over the period.
- Industrial Processes, Agriculture and Waste sectors contributed to emissions growth noting increases of 1.0, 10.1, and 4.0 Mt, respectively since 1990.

Energy Industries

- Emissions from Energy Industries (including Fossil Fuel Industries, Electricity and Heat Generation, Mining, fugitive releases and combustion emissions from pipelines) rose by about 94.7 Mt between 1990 and 2004. Almost 37 percent of that increase (34.9 Mt) was in Electricity and Heat Generation, a result of greater electricity demand coupled with continuing increases in the use of coal-fired generation over the period.
- Fugitive releases (e.g. methane leaks from pipelines) contributed just as significantly to GHG emissions. The current estimates show an increase of 23.1 Mt between 1990 and 2004, a growth of about 53.4 percent. Much of this increase is the result of higher crude oil and natural gas exports to the United States.

Transportation Sector

- Emissions in the Transportation sector rose by about 44.5 Mt, or 29.9 percent from 1990 to 2004. Of particular note in this sector is a 21.9 Mt or over 100 percent increase in the emissions from light-duty gasoline trucks, reflecting the growing popularity of sport utility vehicles.
- Emissions from heavy-duty diesel vehicles increased 20.4 Mt over the period, indicative of greater heavy truck transport. Offsetting these increases were reductions in emissions attributed to gasoline and alternatively fueled cars of 4.0 Mt and 1.3 Mt respectively.

Industrial Processes Sector

- Emissions in the Industrial Processes Sector witnessed a modest overall increase of 1.0 Mt, or 1.9 percent from 1990 to 2004. However, though some subsectors within this group did show significant increases (e.g., emissions from use of HFCs in refrigeration and air conditioning, as substitutes to Ozone Depleting Substances, grew by 4.7 Mt and the use of primary and secondary fuel as feedstocks in chemical manufacturing grew 3.5 Mt), there were some significant reductions offsetting these.
- Emissions of N_2O from Canada's sole adipic acid manufacturing plant decreased by 7.6 Mt due to the installation of N_2O abatement technology. Also, process emissions from the aluminium industry decreased by 2.0 Mt, or 21.8% from 1990 to 2004, due to improved PFC emission control technologies.

Agriculture Sector

- In the Agriculture Sector, the expansion of the beef cattle, swine, and poultry industries, along with increases in the application of synthetic nitrogen fertilizer in the Prairies resulted in a long term emission growth of 10.1 Mt (22.6 percent increase for the Agriculture Sector, contributing 6.3 percent to the overall increase)

Waste Sector

- From 1990 to 2004, GHG emissions from Waste increased by about 4.0 Mt, or 15.9 percent, surpassing the population growth of 15.3 percent. This appears largely due to the generation of increasing amounts of land filled waste. This increase would have been larger, had the land fill gas recovery projects and waste diversion programs (composting and recycling) not been implemented in Canada.

Land Use, Land-Use Change and Forestry Sector (not included in national totals)

- The LULUCF Sector reports GHG emissions and removals between the atmosphere and Canada's managed lands (forests, cropland, wetlands and settlements), as well as those associated with land-use changes. According to international guidelines, LULUCF estimates are not added to the national totals. This year, due to major changes in the methodologies, most LULUCF categories present completely revised and improved estimates for the entire time series. As in previous submissions however, the overall trend over time remains uncertain due to the very high inter-annual variability in GHG estimates over the reporting period. In 2004, the net flux from this sector amounted to net emissions of 81 Mt. The net sectoral GHG balance and trend are largely driven by emissions and removals in managed forests, and notably the inter-annual variability due to the immediate impact of wildfires. Such fires alone accounted for annual emissions between 14 and 342 Mt over the 1990–2004 period.
- The Cropland subsector includes the effect of agricultural practices on CO_2 emissions and removals from arable soils and the impact of forest and grassland conversion to cropland. In 2004, C sequestration in arable soils almost exactly offset emissions from lands converted to cropland, for a net flux of 0.06 Mt. The continued adoption of no-till and reduced tillage practices, and the reduction of summer-fallow explain the steady trend of increasing removals in cultivated soils.
- Forest losses to cropland, wetlands, and settlements amount to emissions of about 16 Mt in 2004, down from 27 Mt in 1990. This declining trend differs from the previously reported annual average emissions of 18 Mt, due to improvements in methodologies and completeness. Forest and grassland conversion to cropland shows a steady decrease from 16 Mt in 1990 to 9 Mt in 2004.