

British Columbia Greenhouse Gas Inventory Report 2007 – SUMMARY

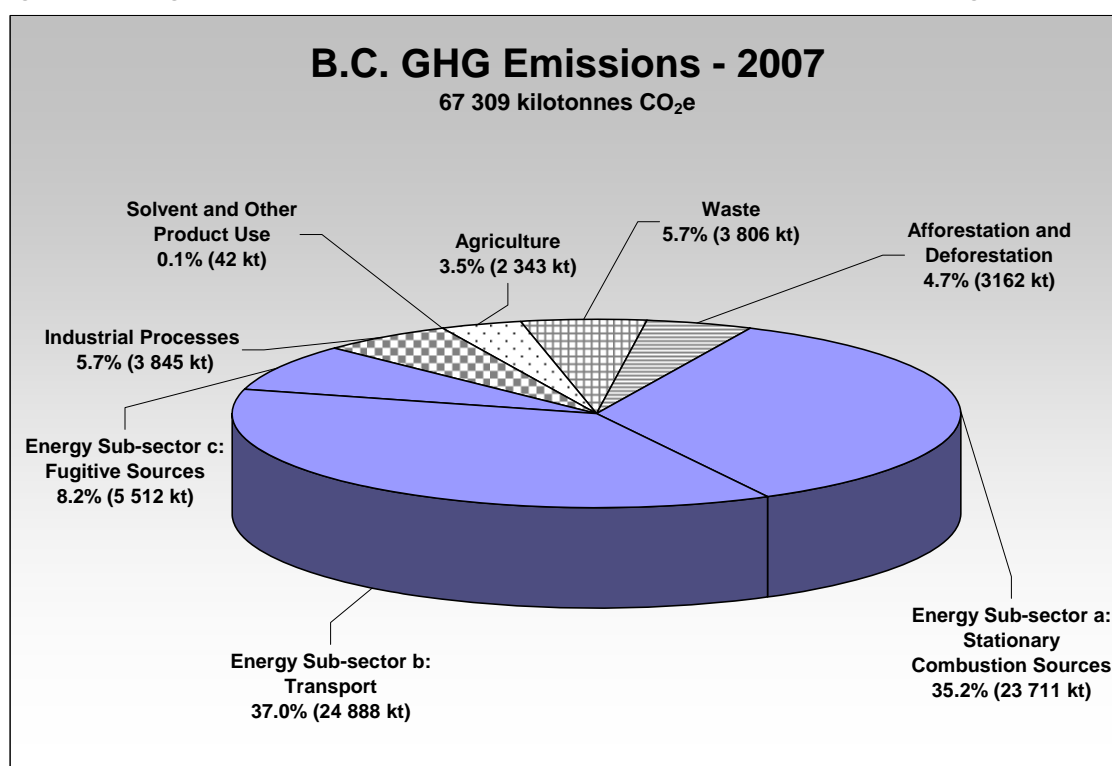
The B.C. GHG inventory report has been prepared by the Ministry of Environment, working with staff in other provincial ministries and with federal counterparts, to determine and report the 2007 GHG emissions level for B.C. The year 2007 was established under the provincial *Greenhouse Gas Reductions Target Act*¹ as the base year for calculation of GHG emissions targets.²

The full report, as well as additional information, is available at the ministry's GHG inventory home-page: www.env.gov.bc.ca/epd/climate/ghg-inventory/index.htm

Comments or questions regarding the report can be sent to: GHGInventory@gov.bc.ca

1. B.C. Greenhouse Gas Emissions 2007

Total greenhouse gas (GHG)³ emissions in British Columbia in 2007 were 67.3 megatonnes CO₂e.⁴



¹ The Act puts into law British Columbia's target of reducing greenhouse gas emissions (GHGs) by at least 33 per cent below 2007 levels by 2020 and includes the long-term target of an 80 per cent reduction below 2007 levels by 2050.

² In keeping with national and international GHG inventory procedures, it is expected that GHG estimates, including the 2007 baseline, will be updated annually or periodically to reflect improved quantification methods and input data, as well as resolution of data anomalies.

³ GHGs trap heat and reflect it back to the Earth's surface, altering the chemical composition of the atmosphere and changing climate. There are four major gases or groups of gases that make up GHGs: carbon dioxide (CO₂); methane (CH₄); nitrous oxide (N₂O); and synthetic (not naturally occurring) fluorinated gases – sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Each GHG has a different potential to contribute to global warming (GWP), measured in terms of "CO₂e" – with carbon dioxide set as the baseline of one. Methane, for example, has a GWP of 21 CO₂e. GHG emissions are reported in common units (CO₂e) by weight – 1 megatonne (1 Mt) is one million tonnes and one kilotonne (1 kt) is one thousand tonnes.

⁴ This figure includes B.C.-specific emissions currently not reported at the provincial level in the National Inventory Report (NIR). As a result, reported emissions are 4.2 Mt (6.7%) higher than the emissions of 63.1 Mt reported for B.C. in the NIR.

GHG emissions are attributed to six defined sectors – energy (with three sub-sectors), industrial processes, solvents and other product use, agriculture, waste, and afforestation and deforestation – following national and international reporting protocols. These sectors, and energy sub-sectors, are described in the table below.

Sector	Description
ENERGY	Emissions from stationary and transport fuel combustion and fugitive emissions from the fossil fuel industry.
Sub-sector a: Stationary Combustion	Emissions from stationary devices that combust solid, liquid or gaseous fuel in order to generate useful heat or electricity (excluding devices used in pipeline transport). Emissions are broken down by the following industrial sectors: electricity and heat generation; fossil fuel industries; mining and oil and gas extraction; manufacturing; construction; commercial and institutional; and residential.
Sub-sector b: Transport	Emissions from mobile devices that combust liquid or gaseous fuels for the purpose of generating useful energy (including stationary devices used in pipeline transport). Emissions are broken down by the following vehicle categories: domestic aviation; road transportation; railways; domestic marine; off-road transportation; and pipelines.
Sub-sector c: Fugitive Emissions	Intentional or unintentional emissions from: the production, processing, transmission, storage and delivery of fossil fuels; and the combustion of fossil fuels not used to generate useful heat or electricity.
INDUSTRIAL PROCESSES	Emissions from chemical reactions used in industry that physically or chemically transform materials (occurring during the production of cement, lime, aluminium, other base metals and hydrogen) and fugitive emissions from the use of halocarbons and sulphur hexafluoride in various applications.
SOLVENT & OTHER PRODUCT USE	Fugitive emissions of nitrous oxide when the gas is used as an anaesthetic or propellant.
AGRICULTURE	Emissions from enteric fermentation (digestive processes of ruminant animals such as cattle), manure management and agricultural soils.
WASTE	Emissions from solid waste decomposition at landfills, wastewater treatment and waste incineration.
AFFORESTATION & DEFORESTATION	Emissions from deforestation (i.e., releases at the time of deforestation ⁵ and the residual decay of dead organic matter) and removals from afforestation (i.e., new trees absorbing and storing CO ₂ from the atmosphere).

2. B.C. GHG Emissions by Sector – 1990 to 2007

The table on the following pages provides a summary of GHG emissions for B.C. by category for key years between 1990 and 2007.⁶ Note that the table includes “Other Land Use” emissions categories. These “memo items” are reported for transparency and GHG accounting purposes but do not contribute to British Columbia total GHG emissions.⁷

⁵ Under current international accounting protocols, all carbon stored in removed biomass is considered to be converted to CO₂ and emitted to the atmosphere immediately.

⁶ Emissions data for all years between 1990 and 2007 can be downloaded in Microsoft Excel spreadsheet format from the ministry’s GHG inventory homepage: www.env.gov.bc.ca/epd/climate/ghg-inventory/index.htm

⁷ Refer to Chapter 1 of the BC Provincial GHG Inventory Report 2007 for additional information regarding GHG emissions accounting and reporting protocols and procedures.

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GHG Source Category	Year	1990	1995	1997	2000	2004	2005	2006	2007
	GHG Emissions (kt CO ₂ e)								
TOTAL EMISSIONS		55 678	62 671	62 557	66 241	68 157	65 682	64 835	67 309
ENERGY		40 517	47 971	47 671	51 365	54 247	51 833	51 280	54 111
a. Stationary Combustion Sources		18 812	20 989	19 149	22 387	23 186	21 639	21 643	23 711
Electricity and Heat Generation		1 183	2 734	1 200	2 513	1 871	1 485	1 539	1 565
Fossil Fuel Industries		3 502	3 516	2 790	3 767	6 521	5 768	5 780	6 289
Mining and Oil & Gas Extraction		255	164	347	318	494	299	1 000	1 039
Manufacturing Industries		6 078	6 387	6 531	7 336	6 614	6 189	5 362	6 939
Construction		306	200	127	76	101	107	111	117
Commercial & Institutional		2 838	3 398	3 319	3 423	3 522	3 399	3 362	3 326
Residential		4 329	4 439	4 566	4 638	3 995	4 325	4 424	4 372
Agriculture & Forestry		321	152	268	315	68	66	66	64
b. Transport		18 385	22 006	23 192	23 705	25 934	24 953	24 314	24 888
Domestic Aviation		1 067	1 228	1 313	1 414	1 505	1 489	1 479	1 397
Road Transportation		11 444	13 183	13 912	14 677	15 733	15 334	15 284	15 574
Light-Duty Gasoline Vehicles		3 850	4 428	4 580	4 453	4 439	4 169	4 096	4 131
Light-Duty Gasoline Trucks		2 200	3 387	3 948	4 473	4 999	4 774	4 709	4 752
Heavy-Duty Gasoline Vehicles		2 042	1 828	1 818	1 672	1 719	1 641	1 629	1 648
Motorcycles		18	13	12	16	26	27	27	27
Light-Duty Diesel Vehicles		26	29	32	38	44	46	45	46
Light-Duty Diesel Trucks		35	63	66	65	57	56	57	58
Heavy-Duty Diesel Vehicles		2 490	2 864	3 054	3 631	4 188	4 428	4 530	4 686
Propane & Natural Gas Vehicles		782	570	400	329	260	194	191	226
Railways		1 441	1 650	1 439	1 268	388	414	400	402
Domestic Marine		1 025	1 232	1 033	1 235	2 656	2 544	2 461	2 566
Other Transportation		3 409	4 713	5 496	5 111	5 652	5 173	4 690	4 948
Off Road		2 553	3 328	4 049	3 457	4 520	4 183	3 916	4 014
Off-Road Gasoline		350	421	461	493	505	451	447	449
Off-Road Diesel		2 203	2 907	3 588	2 964	4 015	3 732	3 469	3 565
Pipelines		856	1 385	1 446	1 655	1 131	989	774	933
c. Fugitive Sources		3 320	4 976	5 330	5 273	5 127	5 241	5 323	5 512
Coal Mining		487	569	657	478	X	X	X	X
Oil and Natural Gas		2 833	4 407	4 673	4 794	X	X	X	X
INDUSTRIAL PROCESSES		3 582	3 883	4 283	4 779	4 087	4 137	3 952	3 845
a. Mineral Products		871	1 023	1 138	1 348	1 407	1 376	1 397	1 418
Cement Production		613	758	861	1 054	1 175	1 149	1 171	1 194
Lime Production		162	192	195	218	191	181	166	162
Limestone and Dolomite Use		75	52	56	49	21	21	35	35
Soda Ash Production and Use		22	21	25	27	20	24	25	28
b. Chemical Industry		-	-	-	-	-	-	-	-
Nitric Acid Production		-	-	-	-	-	-	-	-
Adipic Acid Production		-	-	-	-	-	-	-	-
c. Metal Production		1 507	1 687	1 795	1 820	1 357	1 131	1 015	1 101
Iron and Steel Production		-	-	-	-	-	-	-	-
Aluminium Production		1 507	1 687	1 795	1 820	1 357	1 131	1 015	1 101

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GHG Source Category	GHG Emissions (kt CO ₂ e)							
TOTAL EMISSIONS	55 678	62 671	62 557	66 241	68 157	65 682	64 835	67 309
SF ₆ Used in Magnesium Smelters and Casters ²	–	–	X	X	X	X	X	X
d. Consumption of Halocarbons and SF ₆	427	492	545	822	892	1 073	1 133	1 023
e. Other & Undifferentiated Production	777	681	805	789	431	557	407	303
SOLVENT & OTHER PRODUCT USE	21	27	30	32	27	23	42	42
AGRICULTURE	2 171	2 392	2 455	2 432	2 686	2 639	2 397	2 343
a. Enteric Fermentation	996	1 160	1 166	1 187	1 333	1 298	1 199	1 149
b. Manure Management	315	356	362	377	404	396	377	368
c. Agriculture Soils	860	876	928	867	949	945	821	826
Direct Sources	375	342	376	316	339	346	286	300
Pasture Range and Paddock Manure	198	240	239	260	292	285	261	251
Indirect Sources	288	293	313	291	317	315	273	275
WASTE	3 420	3 761	3 998	3 863	3 788	3 714	3 790	3 806
a. Solid Waste Disposal on Land	3 269	3 590	3 823	3 688	3 612	3 540	3 615	3 629
b. Wastewater Handling	85	98	102	105	107	106	107	109
c. Waste Incineration	66	73	73	70	69	69	68	68
AFFORESTATION & DEFORESTATION	5 967	4 637	4 120	3 770	3 322	3 335	3 374	3 162
a. Afforestation ¹	-14	-14	-14	-14	-15	-16	-15	-16
b. Deforestation	5 980	4 651	4 014	3 784	3 337	3 351	3 390	3 178
MEMO ITEMS	(categories presented for information purposes but not included in B.C. total GHG emissions)							MEMO ITEMS
OTHER LAND USE	-27 464	-41 331	-46 481	-36 116	43 380	28 268	50 021	52 453
a. Forest Land Remaining Forest Land	-27 692	-41 623	-46 800	-36 463	43 025	27 904	49 655	52 095
b. Cropland Remaining Cropland	98	171	216	263	291	303	309	305
c. Wetlands Remaining Wetlands	117	120	103	83	64	60	57	53

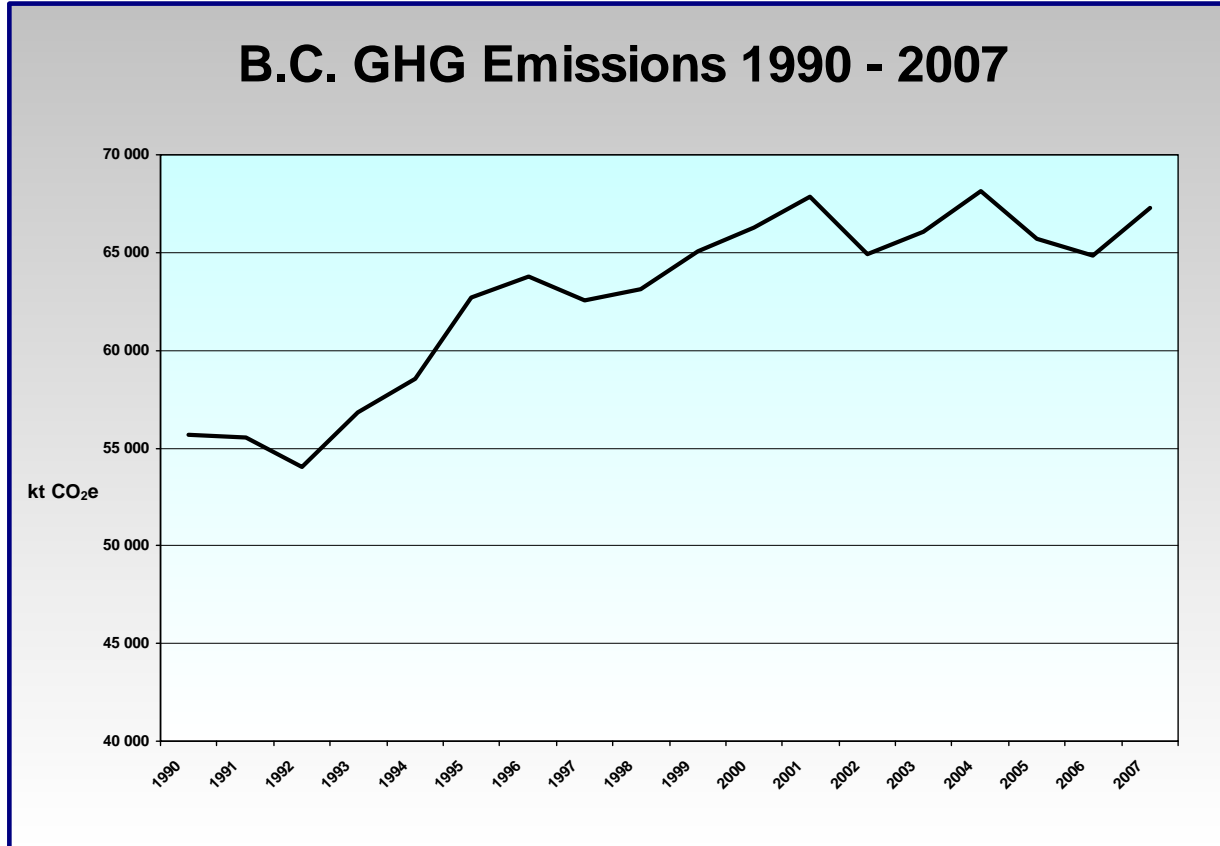
Note: "X" indicates confidential data, "-" indicates no emissions

¹ A negative number indicates that the estimate is a sink (i.e., the activity removes carbon from the atmosphere)

² Information on SF₆ use in casters is confidential – hence, SF₆ emissions for this category are reported (with HFC emissions) under "Consumption of Halocarbons and SF₆"

3. Trends in Emissions

British Columbia's reported GHG emissions increased by 3.8% from 2006 to 2007 – from 64.8 Mt to 67.3 Mt CO₂e.⁸ Total annual GHG emissions in B.C. have decreased by 1.2% between 2004 and 2007 (from 68.2 Mt in 2004) and increased by 7.6% (from 62.6 Mt) over the ten year period from 1997 to 2007.



Trends in Emissions by Sector

Sector	2007 GHG Emissions (kt CO ₂ e)	3-Year Change (2004-2007)	10-Year Change (1997-2007)
ENERGY	54 111	-0.3%	+13.5%
INDUSTRIAL PROCESSES	3 845	-5.9%	-10.2%
SOLVENT & OTHER PRODUCT USE	42	+55.6%	+40.0%
AGRICULTURE	2 343	-12.8%	-4.6%
WASTE	3 806	+0.5%	-4.8%
AFFORESTATION & DEFORESTATION	3 162	-4.8%	-23.3%

⁸ Interpretation of short-term (i.e., year-to-year) changes in emissions should be undertaken with caution due to the influence and variability of annual weather conditions (such as snow pack and heating/cooling degree days), methodological changes and data anomalies on reported emission levels. Longer term comparisons (i.e., three and ten year periods) provide more useful trend information.

Factors Influencing Emissions

Energy Sector– Energy sector emissions increased 5.5% from 2006 to 2007, decreased 0.3% between 2004 and 2007 and increased 13.5% between 1997 and 2007. Emissions are influenced primarily by production levels from the fossil fuel and manufacturing industries, space heating requirements in buildings, use of natural gas for electricity generation and kilometres traveled by on- road vehicles, marine vessels and airplanes. The large increase in emissions between 2006 and 2007 can be attributed largely to emissions from the “manufacturing” sub-sector of the stationary combustion sources category – which increased by 29.3% between 2006 and 2007.⁹

Industrial Processes Sector– Industrial process sector emissions decreased by 2.7% between 2006 and 2007, 5.9% between 2004 and 2007 and 10.2% between 1997 and 2007. Emissions are influenced primarily by production levels of cement, lime, aluminium and other base metals. Reductions in emissions have been influenced by decreases in process emissions from the production of aluminium and the closure of ammonia and methanol plants, mitigated in part by increases in process emissions from cement production.

Solvent and Other Product Use Sector– Solvent and other produce use sector emissions did not change between 2006 and 2007, increased 55.6% between 2004 and 2007 and increased 40.0% between 1997 and 2007. Emissions in this sector are directly related to the quantity of nitrous oxide used as an anaesthetic or propellant.

Agriculture Sector– Agriculture sector emissions decreased by 2.3% between 2006 and 2007, 12.8% between 2004 and 2007 and 4.6% between 1997 and 2007. Emissions are influenced by animal populations (e.g., cattle and hogs), as well as soil management practices. Decreases in agricultural emissions can be attributed for the most part to reductions in cattle and hog populations.

Waste Sector– Waste sector emissions increased 0.4% between 2006 and 2007 and 0.5% between 2004 and 2007. Between 1997 and 2007 emissions decreased by 4.8%. Emissions are influenced primarily by the amount of waste generated and sent to landfills, rates of waste diversion (i.e., recycling and composting) and the capturing and flaring of methane (CH₄) emissions from landfills. Emissions reductions associated with waste diversion and methane capture have been overshadowed by increases in the quantities of waste generated and sent to landfills, resulting in the overall trend of increasing emissions from year to year.

Afforestation and Deforestation – Net afforestation and deforestation sector emissions decreased 4.8% between 2004 and 2007 and 23.3% between 1997 and 2007. Emissions are influenced primarily by the size of deforested area and forest characteristics (i.e., geographic location, growing conditions, tree species, density and age). Decreases in emissions can be attributed to decreases in the area of deforestation from year to year, particularly in the agricultural sector.

Other Land Use (Memo items not included in total B.C. GHG emissions) – Emissions associated with “other land use” categories increased 4.8% between 2006 and 2007 and 20.9% between 2004 and 2007. From 1990 to 2007, “other land use” categories collectively changed from a net sink of GHGs (46.5 megatonnes CO₂e removed from the atmosphere in 1997) to a net source in 2007 (52.5 megatonnes CO₂e emitted to the atmosphere). This transition can be attributed in large part to the impacts of the mountain pine beetle (MPB) outbreak – which attacked living forests that act as a sink for GHGs and resulted in large areas of dead and decomposing trees. Net emissions associated with these categories are also influenced by wildfires, slash burning and wood harvesting.

⁹ The reported data that has led to this increase is currently under review and may be subject to change.