

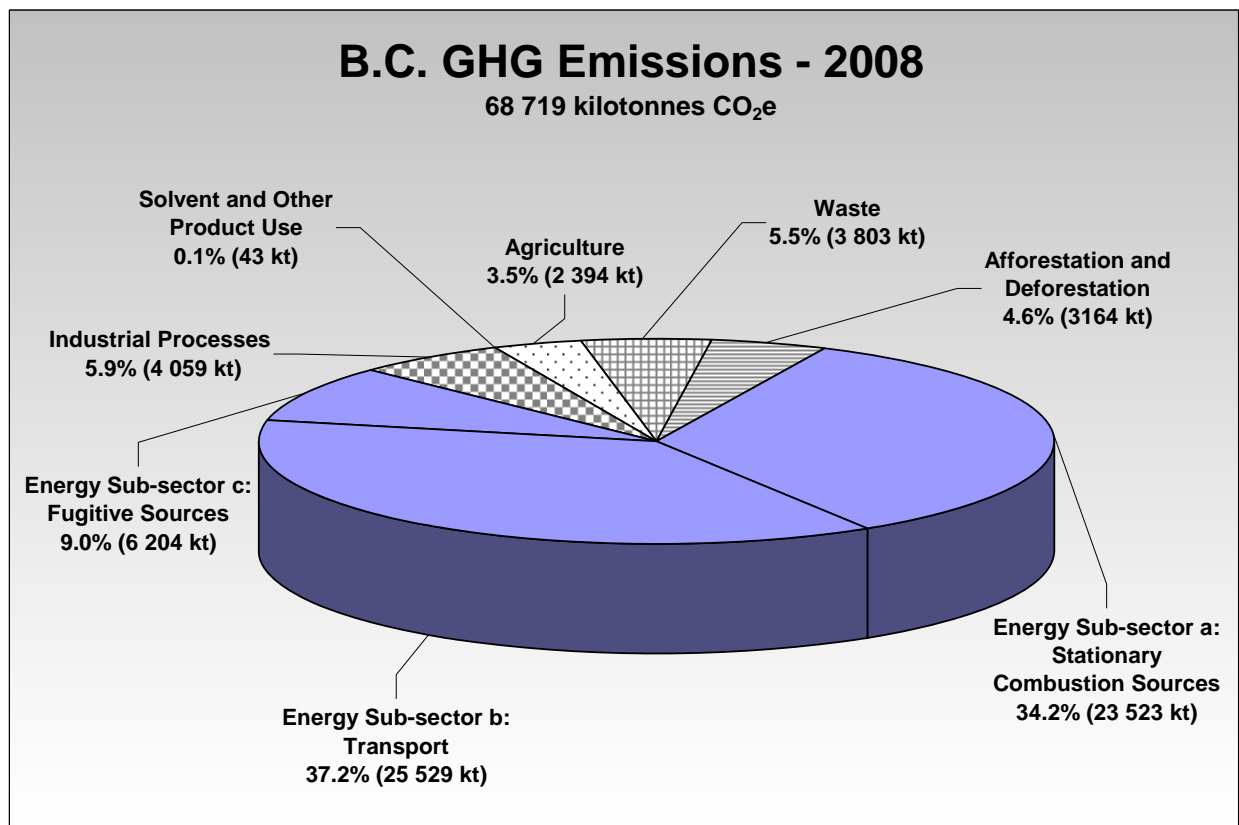
British Columbia Greenhouse Gas Inventory Report 2008 – SUMMARY

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 2008 GHG emissions level for B.C.¹ The full report, as well as additional information, is available at the ministry's GHG inventory homepage: www.env.gov.bc.ca/cas/mitigation/ghg_inventory/index.html

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

1. B.C. Greenhouse Gas Emissions 2008

Total greenhouse gas (GHG)² emissions in British Columbia in 2008 were 68.7 megatonnes CO₂e.³



¹ The year 2007 was established under the provincial *Greenhouse Gas Reductions Target Act*. 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. In keeping with national and international GHG inventory procedures, it is expected that GHG estimates, including the 2007 baseline, will be updated regularly to reflect improved quantification methods and input data, as well as resolution of data anomalies.

² 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.

³ 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 3.6 Mt (5.5%) higher than the emissions of 65.1 Mt reported for B.C. in the NIR.

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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	GHG Emissions (kt CO ₂ e)	% of B.C. Emissions
ENERGY	Emissions from stationary and transport fuel combustion and fugitive emissions from the fossil fuel industry	55 256	80.4%
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)	23 523	34.2%
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)	25 529	37.2%
Sub-sector c: Fugitive Emissions	Intentional or unintentional emissions from the production, processing, transmission, storage, and delivery of fossil fuels; and from the combustion of fossil fuels not used to generate useful heat or electricity	6 204	9.0%
INDUSTRIAL PROCESSES	Emissions from chemical reactions used in industry that physically or chemically transform materials	4 059	5.9%
SOLVENT & OTHER PRODUCT USE	Nitrous oxide emissions when used as an anaesthetic or propellant	43	0.1%
AGRICULTURE	Emissions from enteric fermentation, manure management and non-CO ₂ emissions from agricultural soils	2 394	3.5%
WASTE	Emissions from solid waste disposal, wastewater treatment and waste incineration	3 803	5.5%
AFFORESTATION & DEFORESTATION	Emissions from deforestation and removals from afforestation	3 164	4.6%
TOTAL		68 719	

Note: Totals and percentages may not sum due to rounding protocols.

2. B.C. GHG Emissions by Sector – 1990 to 2008

This two-page table provides a summary of GHG emissions for B.C. by category for key years between 1990 and 2008.⁴ 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.⁵

Year	1990	1995	1998	2000	2005	2006	2007	2008
GHG Source Category	GHG Emissions (kt CO₂e)							
TOTAL EMISSIONS	55 678	62 671	63 107	66 241	65 682	64 835	68 019	68 719
ENERGY	40 517	47 971	48 434	51 365	51 833	51 280	54 651	55 256
a. Stationary Combustion Sources	18 812	20 989	19 606	22 387	21 639	21 643	24 222	23 523
Electricity and Heat Generation	1 183	2 734	1 866	2 513	1 485	1 539	1 461	1 520
Fossil Fuel Industries	3 502	3 516	3 513	3 767	5 768	5 780	6 222	6 238
Mining and Oil & Gas Extraction	255	164	338	318	299	1 000	1 309	1 348
Manufacturing Industries	6 078	6 387	6 145	7 336	6 189	5 362	7 364	6 537
Construction	306	200	101	76	107	111	117	100
Commercial & Institutional	2 838	3 398	2 908	3 423	3 399	3 362	3 326	3 374
Residential	4 329	4 439	4 484	4 638	4 325	4 424	4 361	4 349
Agriculture & Forestry	321	152	250	315	66	66	64	56
b. Transport	18 385	22 006	23 521	23 705	24 953	24 314	24 917	25 529
Domestic Aviation	1 067	1 228	1 300	1 414	1 489	1 479	1 425	1 504
Road Transportation	11 444	13 183	14 771	14 677	15 334	15 284	15 574	15 371
Light-Duty Gasoline Vehicles	3 850	4 428	4 590	4 453	4 169	4 096	4 131	4 046
Light-Duty Gasoline Trucks	2 200	3 387	4 331	4 473	4 774	4 709	4 752	4 678
Heavy-Duty Gasoline Vehicles	2 042	1 828	1 908	1 672	1 641	1 629	1 648	1 634
Motorcycles	18	13	16	16	27	27	27	27
Light-Duty Diesel Vehicles	26	29	36	38	46	45	46	45
Light-Duty Diesel Trucks	35	63	74	65	56	57	58	58
Heavy-Duty Diesel Vehicles	2 490	2 864	3 335	3 631	4 428	4 530	4 686	4 630
Propane & Natural Gas Vehicles	782	570	481	329	194	191	226	253
Railways	1 441	1 650	1 374	1 268	414	400	402	626
Domestic Marine	1 025	1 232	1 006	1 235	2 544	2 461	2 566	2 510
Other Transportation	3 409	4 713	5 069	5 111	5 173	4 690	4 948	5 519
Off Road	2 553	3 328	3 492	3 457	4 183	3 916	4 014	4 624
Off-Road Gasoline	350	421	437	493	451	447	449	352
Off-Road Diesel	2 203	2 907	3 055	2 964	3 732	3 469	3 567	4 272
Pipelines	856	1 385	1 577	1 655	989	774	933	895
c. Fugitive Sources	3 320	4 976	5 307	5 273	5 241	5 323	5 512	6204
Coal Mining	487	569	553	478	543	468	521	507
Oil and Natural Gas	2 833	4 407	4 754	4 794	4 699	4 854	4 991	5 697

⁴ Emissions data for all years between 1990 and 2008 can be downloaded in Microsoft Excel spreadsheet format from the ministry’s GHG inventory homepage: www.env.gov.bc.ca/cas/mitigation/ghg_inventory/index.html

⁵ Refer to Chapter 1 of the BC Provincial GHG Inventory Report 2008 for additional information regarding GHG emissions accounting and reporting protocols and procedures.

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GHG Source Category	Year	1990	1995	1998	2000	2005	2006	2007	2008
	GHG Emissions (kt CO ₂ e)								
TOTAL EMISSIONS		55 678	62 671	63 107	66 241	65 682	64 835	68 019	68 719
INDUSTRIAL PROCESSES		3 582	3 884	4 434	4 776	4 139	3 957	3 950	4 059
a. Mineral Products		871	1 023	1 122	1 348	1 376	1 397	1 411	1 281
Cement Production		613	758	866	1 054	1 149	1 171	1 206	1 086
Lime Production		162	192	195	218	181	166	162	157
Limestone and Dolomite Use		75	52	43	49	22	39	16	15
Soda Ash Production and Use		22	21	19	27	22	23	27	23
b. Chemical Industry		-	-	-	-	-	-	-	-
Nitric Acid Production		-	-	-	-	-	-	-	-
Adipic Acid Production		-	-	-	-	-	-	-	-
c. Metal Production		1 507	1 687	2 062	1 820	1 131	1 015	1 101	1 150
Iron and Steel Production		-	-	-	-	-	-	-	-
Aluminium Production		1 507	1 687	2 062	1 820	1 131	1 015	1 191	1 150
SF ₆ Used in Magnesium Smelters and Casters ²		-	-	-	-	-	-	-	-
d. Consumption of Halocarbons and SF₆		427	493	658	819	1 075	1 138	1 136	1 290
e. Other & Undifferentiated Production		777	681	592	789	557	407	302	338
SOLVENT & OTHER PRODUCT USE		21	27	27	32	23	42	42	43
AGRICULTURE		2 171	2 392	2 308	2 432	2 639	2 397	2 409	2 394
a. Enteric Fermentation		996	1 160	1 134	1 187	1 298	1 199	1 149	1 157
b. Manure Management		315	356	359	377	396	377	368	368
c. Agriculture Soils		860	876	815	867	945	821	892	869
Direct Sources		375	342	302	316	346	286	343	338
Pasture Range and Paddock Manure		198	240	238	260	285	261	251	239
Indirect Sources		288	293	275	291	315	273	298	292
WASTE		3 420	3 761	3 903	3 863	3 714	3 790	3 806	3 803
a. Solid Waste Disposal on Land		3 269	3 590	3 728	3 688	3 540	3 615	3 629	3 626
b. Wastewater Handling		85	98	103	105	106	107	109	109
c. Waste Incineration		66	73	72	70	69	68	68	68
AFFORESTATION & DEFORESTATION		5 967	4 637	4 000	3 770	3 335	3 374	3 162	3 164
a. Afforestation¹		-14	-14	-14	-14	-16	-15	-16	-14
b. Deforestation		5 980	4 651	4 014	3 784	3 351	3 390	3 178	3 178
OTHER LAND USE ("Memo Items")		-26 549	-32 582	-32 748	-30 737	37 397	65 273	52 656	33 126
<i>a. Forest Land Remaining Forest Land</i>		-26 764	-32 873	-33 076	-31 083	37 034	64 907	52 298	32 834
<i>b. Cropland Remaining Cropland</i>		98	171	231	263	303	309	305	252
<i>c. Wetlands Remaining Wetlands</i>		117	120	96	83	60	57	53	40

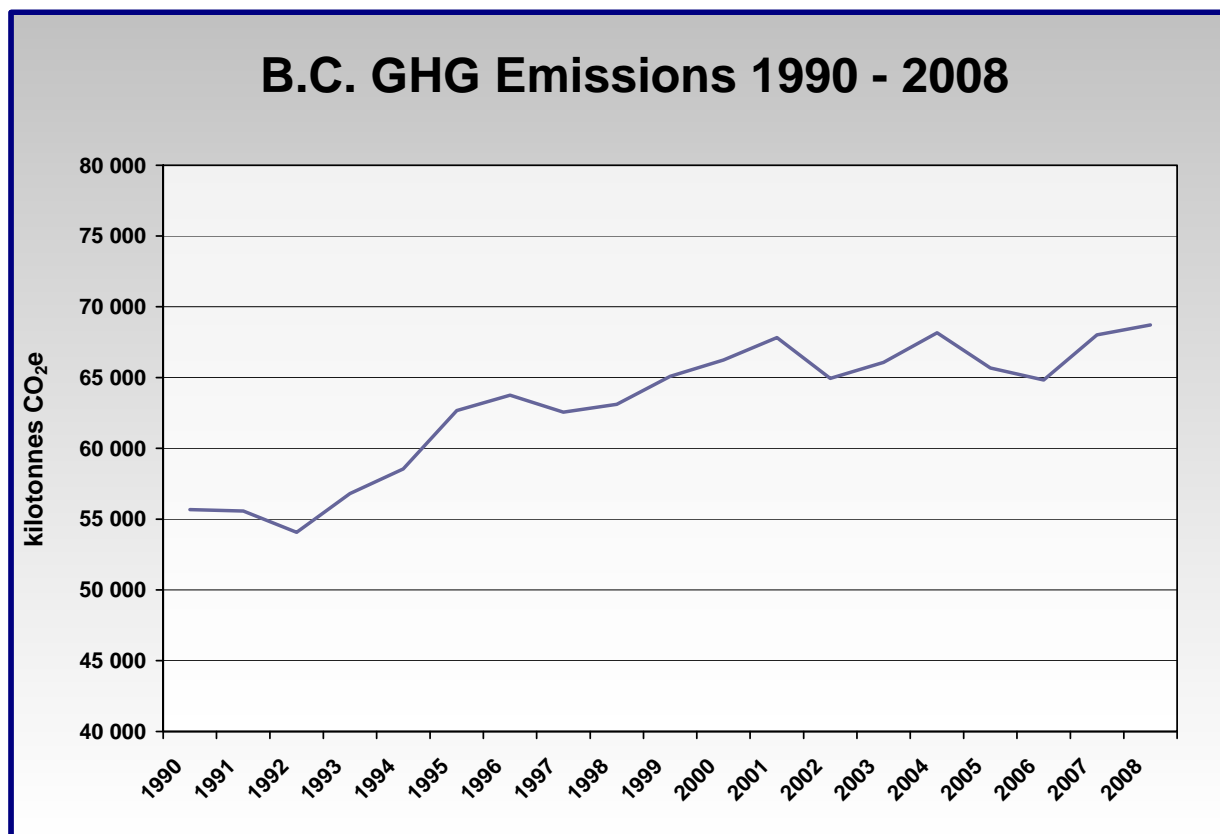
Note: "-" indicates no emissions

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

Total annual GHG emissions in British Columbia increased by 4.6% between 2005 and 2008 (from 65.7 Mt in 2005) and increased by 8.9% (from 63.1 Mt) over the ten year period from 1998 to 2008. From 2007 to 2008 GHG emissions increased by 1.0% (from 68.0 Mt to 68.7 Mt CO₂e).⁶



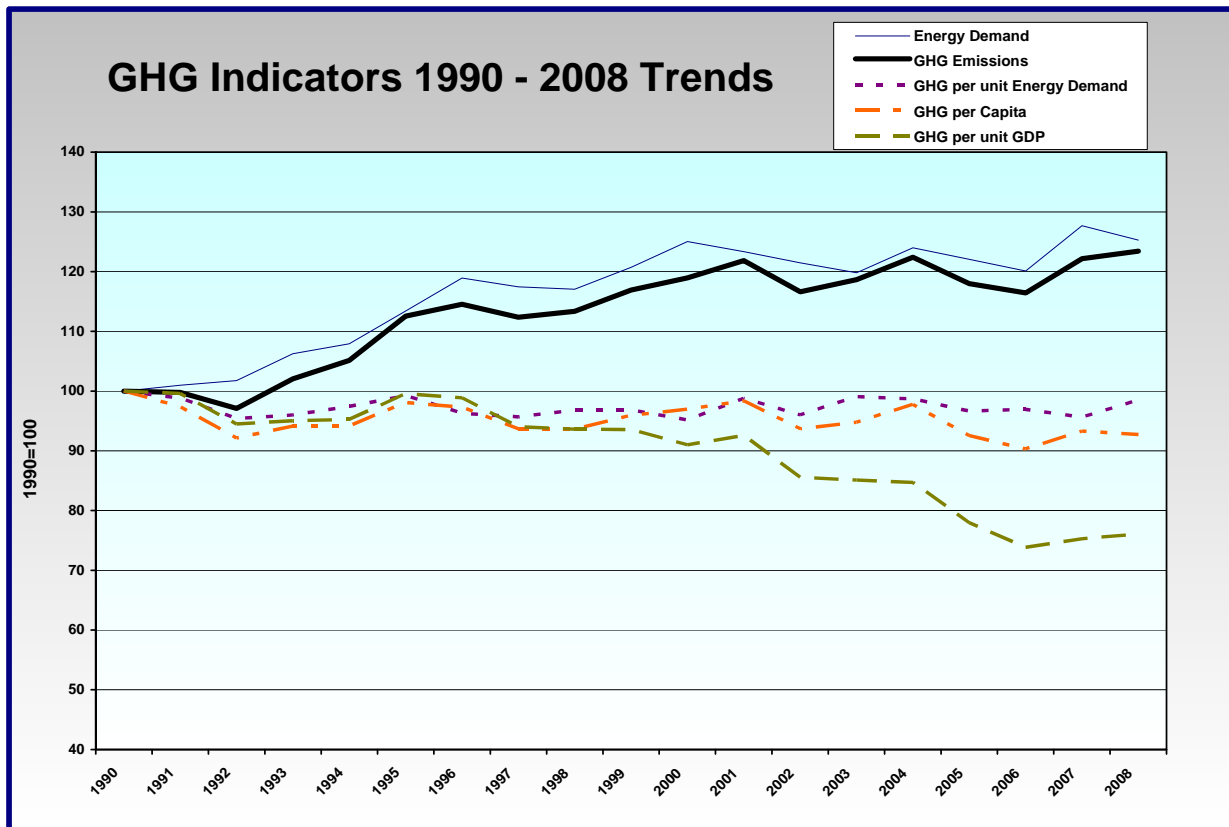
Trends in Emissions by Sector

Sector	2008 GHG Emissions (kt CO ₂ e)	3-Year Change (2005-2008)	10-Year Change (1998-2008)
ENERGY	55 256	+6.6%	+14.1%
INDUSTRIAL PROCESSES	4 059	-1.9%	-8.5%
SOLVENT & OTHER PRODUCT USE	43	+87.0%	+59.3%
AGRICULTURE	2 394	-9.3%	+3.7%
WASTE	3 803	+2.4%	-2.6%
AFFORESTATION & DEFORESTATION	3 164	-5.1%	-20.9%

⁶ Caution should be exercised when interpreting year to year changes in GHG emissions. Some changes may be due to data collection gaps, methodology or error correction refinements. Other changes in emissions figures may be the result of one-time or specific events or actions (such as natural disasters or production disruptions). Changes over three and ten year (or longer) periods provide a better indication of trends in emissions.

In 2008, B.C. emissions were an average of: 15.7 tonnes CO₂e/person; 418 tonnes CO₂e/\$ million of Gross Domestic Product (GDP); and 74.0 tonnes CO₂e/terajoule (TJ) of energy use. As measured in terms of “economic GHG intensity” (the amount of GHG emitted per unit of economic activity), GHG emissions per unit of Gross Domestic Product (GDP) have decreased by about one-fifth between 1998 and 2008. GHG emissions per unit energy use have remained relatively consistent over the last decade.

Per capita emissions have been relatively consistent over the last decade—ranging between 15.3 and 16.6 tonnes CO₂e/person/year. On this basis, B.C. is one of the lowest greenhouse gas emitters in North America. Within Canada, we currently rank fourth lowest after Quebec, PEI and Ontario in our GHG emissions per person, with our 2008 emissions intensity of 15.7 tonnes CO₂e per capita being one-third below the national average of 22.0 tonnes.



Factors Influencing Emissions

Energy Sector – Annual energy sector emissions increased by 6.6% between 2005 and 2008 and by 14.1% over the ten year period from 1998 to 2008. A short-term (2007-2008) increase can be attributed to increased emissions from several categories of the transport sub-sector (including off-road diesel transportation, domestic aviation and railways) and from fugitive sources related to oil and gas. Emissions between 2005 and 2008 increased across all sub-sectors and many categories – with the largest percentage increases in the “mining and oil and gas extraction” category, railways (increased over 50% over the period), propane and natural gas vehicles (30%), oil and natural gas fugitive sources (over 20%) and off-road diesel transportation (15%). Within the energy sector over the three-year period between 2005 and 2008, transport emissions increased at the lowest rate (+2.3%) while emissions from fugitive sources increased by close to 20% and emissions from stationary combustion sources increased by about 9%.

Industrial Processes Sector – Emissions reported under the industrial process category decreased by 1.9% between 2005 and 2008 and by 8.5% between 1998 and 2008. Factors influencing these reductions include decreases in process emissions from the production of aluminium, consumption of halocarbons and SF₆ and decreases in other and undifferentiated production. Overall reductions have been moderated in part by increases in process emissions from cement production.

Solvent and Other Product Use Sector – Annual emissions for this sector increased by 87.0% between 2005 and 2008 and by 59.3% between 1998 and 2008. Changes in emissions reflect increases in the amount of N₂O used for anaesthetic and as propellant.

Agriculture Sector – Annual agriculture sector emissions decreased by 9.3% between 2005 and 2008 however, increased by 3.7% between 1998 and 2008. Changes can be attributed in most part to changes in livestock (e.g., cattle, hog) population. The largest source of agriculture emissions is methane (CH₄) emissions from enteric fermentation.

Waste Sector – Waste sector emissions increased by 2.4% between 2005 and 2008 and decreased by 2.6% between 1998 and 2008. Increases in the quantity of waste generated and sent to landfills have recently tended to overshadow the emissions reductions associated with diversion of wastes and the capture, flaring and beneficial use of CH₄ at landfills.⁷

Afforestation and Deforestation – Net emissions in the afforestation and deforestation sector were approximately 3.2 Mt CO₂e in 2008, 4.6% of total B.C. emissions. This included 3.18 Mt CO₂e of emissions from deforestation and 0.014 Mt CO₂e of removals from afforestation. Net GHG emissions from afforestation and deforestation decreased 5.1% between 2005 and 2008 and 20.9% between 1998 and 2008.

Other Land Use (Memo items not included in total B.C. GHG emissions) – Emissions associated with “other land use” categories decreased by 11.4% between 2005 and 2008. From 1998 to 2008, “other land use” categories collectively changed from a net sink of GHGs (32.7 Mt CO₂e removed from the atmosphere in 1998) to a net source in 2008 (33.1 Mt 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.

⁷ CH₄ emissions from landfills can be captured through piping systems for combustion. Combustion converts the CH₄ to CO₂, a less potent GHG, thus reducing overall GHG emissions from the landfill.