

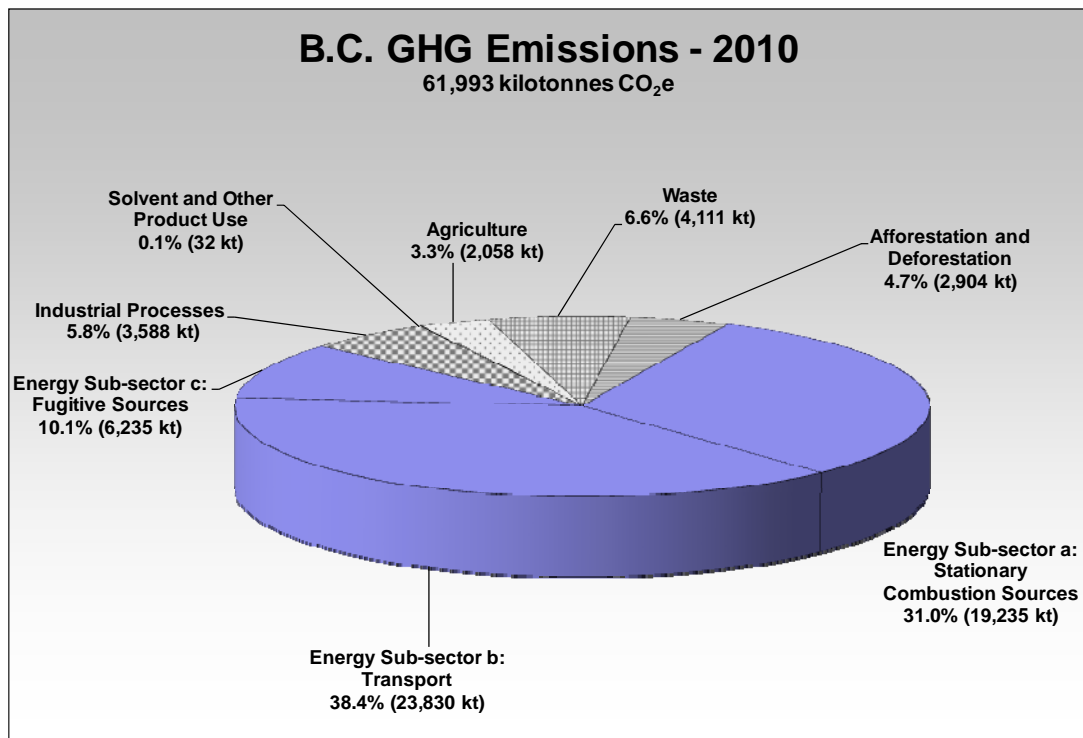
The B.C. GHG inventory report has been prepared by the Ministry of Environment, working with staff in other provincial ministries and with federal counterparts, to determine and report the 2010 GHG emissions level for B.C.<sup>1</sup> The full report, as well as additional information, is available at the ministry's GHG inventory homepage:

[http://www.env.gov.bc.ca/cas/mitigation/ghg\\_inventory/index.html](http://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](mailto:GHGInventory@gov.bc.ca)

## 1. B.C. Greenhouse Gas Emissions 2010

Total greenhouse gas (GHG)<sup>2</sup> emissions in British Columbia in 2010 were 62 megatonnes CO<sub>2</sub>e.<sup>3</sup>



<sup>1</sup> 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.

<sup>2</sup> 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 (CO<sub>2</sub>); methane (CH<sub>4</sub>); nitrous oxide (N<sub>2</sub>O); and synthetic (not naturally occurring) fluorinated gases – sulphur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Each GHG has a different potential to contribute to global warming (GWP), measured in terms of "CO<sub>2</sub>e" – with carbon dioxide set as the baseline of one. Methane, for example, has a GWP of 21 CO<sub>2</sub>e. GHG emissions are reported in common units (CO<sub>2</sub>e) by weight – 1 megatonne (1 Mt) is one million tonnes and one kilotonne (1 kt) is one thousand tonnes.

<sup>3</sup> 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 5.9 Mt (10.5%) higher than the emissions of 56.1 Mt reported for B.C. in the NIR. Also, Environment Canada and Statistics Canada have indicated that the data source used to allocate energy sector fuel usage to subsectors for the 2010 inventory year is under review. Comparison of trends within energy subsectors may give erroneous results due to differing methods being used for different years. Total emissions for the sector for each year are not affected by the reallocation. Revised estimates for the energy sector and subsectors are due to be published in the 1990-2011 NIR.

## British Columbia Greenhouse Gas Inventory Report 2010 – SUMMARY

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 <sub>2</sub> e)	% of B.C. Emissions
<b>ENERGY</b>	Emissions from stationary and transport fuel combustion and fugitive emissions from the fossil fuel industry	49,300	79.5%
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)	19,235	31.0%
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)	23,830	38.4%
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	6,235	10.1%
<b>INDUSTRIAL PROCESSES</b>	Emissions from chemical reactions used in industry that physically or chemically transform materials	3,588	5.8%
<b>SOLVENT &amp; OTHER PRODUCT USE</b>	Nitrous oxide emissions when used as an anaesthetic or propellant	32	0.1%
<b>AGRICULTURE</b>	Emissions from enteric fermentation, manure management and non-CO <sub>2</sub> emissions from agricultural soils	2,058	3.3%
<b>WASTE</b>	Emissions from solid waste disposal, wastewater treatment and waste incineration	4,111	6.6%
<b>AFFORESTATION &amp; DEFORESTATION</b>	Emissions from deforestation and removals from afforestation	2,904	4.7%
<b>TOTAL</b>		<b>61,993</b>	

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

## British Columbia Greenhouse Gas Inventory Report 2010 – SUMMARY

### 2. B.C. GHG Emissions by Sector – 1990 to 2010

This two-page table provides a summary of GHG emissions for B.C. by category for key years between 1990 and 2010.<sup>4</sup> 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.<sup>5</sup>

GHG Source Categories	1990	1995	2000	2005	2007	2008	2009	2010
	GHG Emissions (kt CO <sub>2</sub> e)							
<b>TOTAL (with afforestation and deforestation)</b>	<b>55,518</b>	<b>61,924</b>	<b>65,754</b>	<b>65,554</b>	<b>64,897</b>	<b>65,417</b>	<b>61,522</b>	<b>61,993</b>
<b>ENERGY</b>	<b>41,216</b>	<b>48,197</b>	<b>51,767</b>	<b>52,156</b>	<b>51,186</b>	<b>52,260</b>	<b>48,704</b>	<b>49,300</b>
<b>a. Stationary Combustion Sources</b>	<b>18,940</b>	<b>21,327</b>	<b>22,514</b>	<b>21,676</b>	<b>20,515</b>	<b>20,460</b>	<b>19,465</b>	<b>19,235</b>
Electricity and Heat Generation	803	2,234	1,813	1,552	1,299	1,665	1,558	1,438
Fossil Fuel Industries	3,555	3,773	3,781	5,097	4,990	4,914	4,901	5,202
Mining & Oil and Gas Extraction	328	174	730	635	1,336	1,632	1,574	1,662
Manufacturing Industries	6,461	6,958	7,705	6,138	4,916	4,250	4,017	4,243
Construction	306	200	76	107	117	100	63	81
Commercial & Institutional	2,838	3,398	3,424	3,659	3,318	3,372	2,755	2,499
Residential	4,329	4,439	4,670	4,421	4,475	4,470	4,551	3,803
Agriculture & Forestry	321	152	316	66	64	56	46	306
<b>b. Transportation</b>	<b>18,610</b>	<b>22,040</b>	<b>23,908</b>	<b>25,033</b>	<b>24,906</b>	<b>25,372</b>	<b>23,148</b>	<b>23,830</b>
Domestic Aviation	1,285	1,254	1,482	1,507	1,422	1,331	1,202	1,126
Road Transportation	11,407	13,153	14,754	15,374	15,487	15,398	15,530	15,458
Light-Duty Gasoline Vehicles	3,735	4,331	4,397	4,153	4,060	4,024	4,095	3,933
Light-Duty Gasoline Trucks	2,134	3,330	4,470	4,726	4,636	4,604	4,694	4,515
Heavy-Duty Gasoline Vehicles	2,224	1,985	1,822	1,771	1,772	1,778	1,831	1,776
Motorcycles	19	14	18	29	29	29	30	29
Light-Duty Diesel Vehicles	34	39	51	63	66	71	78	83
Light-Duty Diesel Trucks	40	73	72	58	59	60	63	63
Heavy-Duty Diesel Vehicles	2,438	2,811	3,595	4,381	4,638	4,580	4,540	4,855
Propane & Natural Gas Vehicles	782	570	329	194	226	253	201	204
Railways	1,441	1,650	1,268	414	402	626	444	515
Domestic Marine	1,025	1,232	1,235	2,547	2,586	2,525	2,653	2,704
<b>Others</b>	<b>3,453</b>	<b>4,752</b>	<b>5,169</b>	<b>5,192</b>	<b>5,009</b>	<b>5,492</b>	<b>3,318</b>	<b>4,027</b>
<b>Off Road (sum of gasoline and diesel below)</b>	<b>2,597</b>	<b>3,366</b>	<b>3,514</b>	<b>4,196</b>	<b>4,076</b>	<b>4,597</b>	<b>2,450</b>	<b>3,191</b>
Off-Road Gasoline	350	421	517	447	442	351	255	331
Off-Road Diesel	2,247	2,946	2,997	3,750	3,634	4,246	2,195	2,860
Pipelines	856	1,385	1,655	995	933	895	868	836
<b>c. Fugitive Sources</b>	<b>3,666</b>	<b>4,829</b>	<b>5,345</b>	<b>5,447</b>	<b>5,765</b>	<b>6,428</b>	<b>6,091</b>	<b>6,235</b>
Coal Mining	686	753	669	780	728	701	621	764
Oil and Natural Gas	2,980	4,076	4,677	4,667	5,036	5,727	5,469	5,471

<sup>4</sup> Emissions data for all years between 1990 and 2010 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](http://www.env.gov.bc.ca/cas/mitigation/ghg_inventory/index.html).

<sup>5</sup> Refer to Chapter 1 of the BC Provincial GHG Inventory Report 2010 for additional information regarding GHG emissions accounting and reporting protocols and procedures.

## British Columbia Greenhouse Gas Inventory Report 2010 – SUMMARY

GHG Source Categories	1990	1995	2000	2005	2007	2008	2009	2010
	GHG Emissions (kt CO <sub>2</sub> e)							
<b>TOTAL (with afforestation and deforestation)</b>	<b>55,518</b>	<b>61,924</b>	<b>65,754</b>	<b>65,554</b>	<b>64,897</b>	<b>65,417</b>	<b>61,522</b>	<b>61,993</b>
<b>INDUSTRIAL PROCESSES</b>	<b>2,674</b>	<b>3,058</b>	<b>3,792</b>	<b>3,540</b>	<b>3,772</b>	<b>3,723</b>	<b>3,579</b>	<b>3,588</b>
<b>a. Mineral Products</b>	850	1,009	1,336	1,427	1,404	1,273	1,036	1,164
Cement Production	613	758	1,054	1,189	1,186	1,069	857	956
Lime Production	162	192	218	181	162	157	141	169
Mineral Products Use <sup>1</sup>	76	59	64	57	57	48	38	38
<b>b. Chemical Industry</b>	0	0	0	0	0	0	0	0
Nitric Acid Production	-	-	-	-	-	-	-	-
Adipic Acid Production	-	-	-	-	-	-	-	-
Petrochemical Production	0	0	0	0	-	-	-	-
<b>c. Metal Production</b>	1,507	1,687	1,820	1,131	1,101	1,150	1,148	785
Iron and Steel Production	-	-	-	-	-	-	-	-
Aluminium Production	1,507	1,687	1,820	1,131	1,101	1,150	1,148	785
SF <sub>6</sub> Used in Magnesium Smelters and Casters <sup>2</sup>	-	-	-	-	-	-	-	-
SF <sub>6</sub> used in electrical equipment	60	60	59	50	49	66	61	61
Consumption of Halocarbons and SF <sub>6</sub>	0	65	394	750	781	800	916	1016
<b>d. TOTAL - Consumption of HFC and SF<sub>6</sub></b>	<b>60</b>	<b>125</b>	<b>453</b>	<b>800</b>	<b>831</b>	<b>865</b>	<b>977</b>	<b>1,077</b>
<b>e. Other &amp; Undifferentiated Production</b>	<b>257</b>	<b>237</b>	<b>184</b>	<b>182</b>	<b>436</b>	<b>434</b>	<b>418</b>	<b>562</b>
<b>SOLVENT &amp; OTHER PRODUCT USE</b>	<b>21</b>	<b>27</b>	<b>59</b>	<b>49</b>	<b>43</b>	<b>45</b>	<b>34</b>	<b>32</b>
<b>AGRICULTURE</b>	<b>2,106</b>	<b>2,320</b>	<b>2,373</b>	<b>2,554</b>	<b>2,331</b>	<b>2,255</b>	<b>2,113</b>	<b>2,058</b>
<b>a. Enteric Fermentation</b>	976	1,137	1,177	1,275	1,129	1,081	1,002	947
<b>b. Manure Management</b>	314	354	377	395	367	359	348	339
<b>c. Agriculture Soils</b>	815	829	820	884	835	814	764	773
Direct Sources	369	338	312	338	335	331	315	333
Pasture, Range and Paddock Manure	168	207	226	244	214	203	184	171
Indirect Sources	279	284	282	302	286	280	265	269
Field Burning of Agricultural Residues	0	0	0	0	0	0	0	0
<b>WASTE</b>	<b>3,355</b>	<b>3,685</b>	<b>3,902</b>	<b>3,923</b>	<b>4,059</b>	<b>4,059</b>	<b>4,111</b>	<b>4,111</b>
<b>a. Solid Waste Disposal on Land</b>	3,166	3,465	3,671	3,690	3,821	3,822	3,872	3,870
<b>b. Wastewater Handling</b>	108	129	144	148	153	153	155	157
<b>c. Waste Incineration</b>	81	90	87	85	84	85	84	84
<b>AFFORESTATION AND DEFORESTATION</b>	<b>6,146</b>	<b>4,637</b>	<b>3,860</b>	<b>3,331</b>	<b>3,507</b>	<b>3,075</b>	<b>2,980</b>	<b>2,904</b>
Afforestation	0	1	-3	-9	-13	-14	-16	-18
Deforestation	6,146	4,636	3,863	3,341	3,520	3,089	2,996	2,922
<b>OTHER LAND USE (Not included in total B.C. emissions)</b>	<b>-25,288</b>	<b>-31,313</b>	<b>-30,696</b>	<b>32,227</b>	<b>43,637</b>	<b>27,441</b>	<b>63,661</b>	<b>81,637</b>
Forest Management	-25,488	-31,563	-30,997	31,929	43,349	27,158	63,382	81,366
Cropland Management	96	144	225	242	238	236	234	228
Wetland Management	104	105	75	56	50	47	45	43

Notes:

"-" indicates no emissions

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

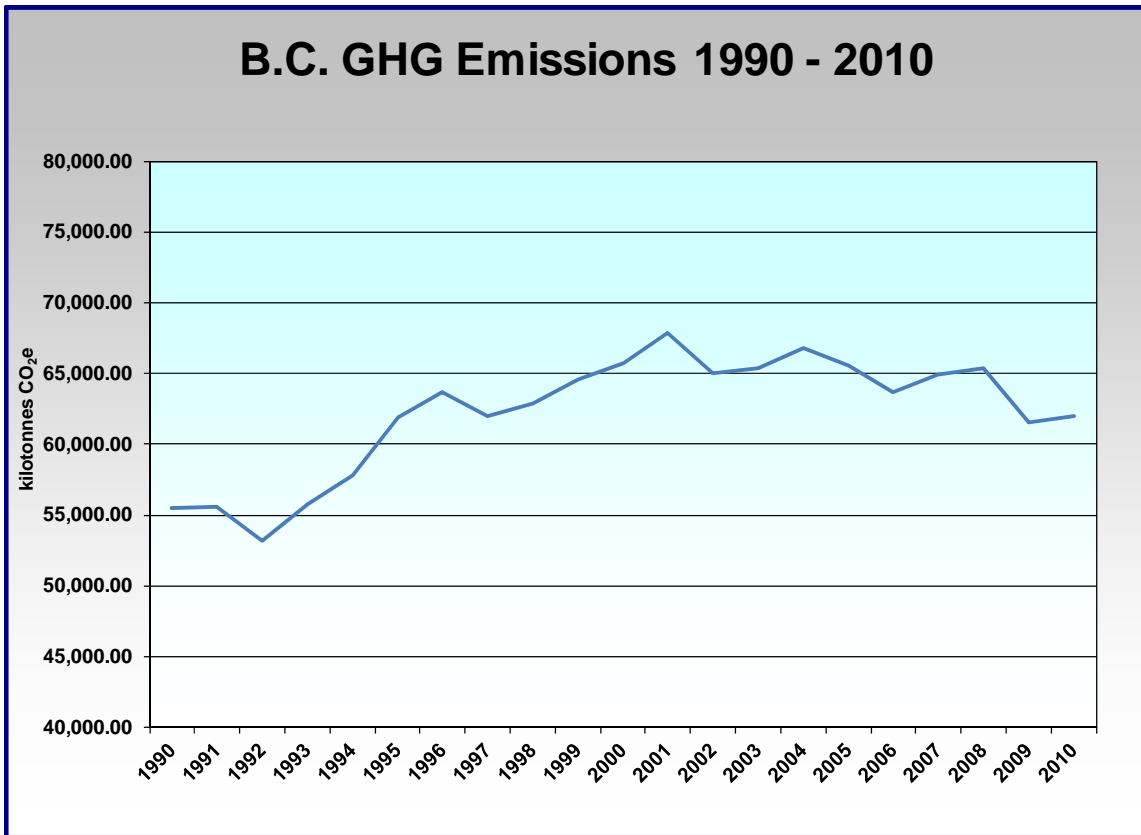
<sup>1</sup> This includes values for "Limestone and Dolomite Use" and "Soda Ash Production and Use"

<sup>2</sup> Information on SF<sub>6</sub> use in casters is confidential – hence, SF<sub>6</sub> emissions for this category are reported (with HFC emissions) under Consumption of Halocarbons and SF<sub>6</sub>

### 3. Trends in Emissions

Total annual GHG emissions in British Columbia increased by 0.8% from 2009 to 2010 (from 61.5 Mt to 62.0 Mt CO<sub>2</sub>e), decreased by 4.5% between 2007 and 2010 (from 64.9 Mt in 2007) and decreased by 5.7% (from 65.8 Mt) over the ten year period from 2000 to 2010.

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 (e.g., precipitation on electricity generation, heating/cooling degree days on building energy use), methodological changes and data anomalies on reported emission levels. Longer term comparisons (i.e., three and ten year periods) provide more useful trend information.



#### *Trends in Emissions by Sector*

Sector	2010 GHG Emissions (kt CO <sub>2</sub> e)	3-Year Change (2007-2010)	10-Year Change (2000-2010)
ENERGY	49,300	-3.7%	-4.8%
INDUSTRIAL PROCESSES	3,588	-4.9%	-5.4%
SOLVENT & OTHER PRODUCT USE	32	-24.8%	-45.7%
AGRICULTURE	2,058	-11.7%	-13.3%
WASTE	4,111	+1.3%	+5.4%
AFFORESTATION & DEFORESTATION	2,904	-17.2%	-24.8%

### ***Factors Influencing Emissions***

**Energy Sector** – Annual energy sector emissions increased by 1.2% from 2009 to 2010, decreased by 3.7% between 2007 and 2010 and decreased by 4.8% over the ten year period from 2000 to 2010. The short-term (2009-2010) 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 2007 and 2010 varied by sub-sector and category. Emissions from mining and oil & gas extraction and railways increased by 24.4% and 28.0%, respectively. In contrast emissions decreased for propane and natural gas vehicles (by 9.8%), construction (by 30.6%), and off-road gasoline and diesel transportation (by 25.2% and 21.3% respectively). Within the energy sector over the three-year period between 2007 and 2010, transport emissions decreased by 4.3%, emissions from fugitive sources increased by 8.2% and emissions from stationary combustion sources decreased by 6.2%.

**Industrial Processes Sector** – Emissions reported under the industrial process category increased by 0.2% between 2009 and 2010, decreased by 4.9% between 2007 and 2010 and decreased by 5.4% between 2000 and 2010. Factors influencing these trends include decreases in process emissions from the production of aluminum, decreases in annual cement production, increased consumption of halocarbons, and changes in other and undifferentiated production.

**Solvent and Other Product Use Sector** – Annual emissions for this sector decreased by 6.8% between 2009 and 2010, by 24.8% between 2007 and 2010 and by 45.7% between 2000 and 2010. Changes in emissions reflect decreases in the amount of N<sub>2</sub>O used for anaesthetic and as propellant.

**Agriculture Sector** – Annual agriculture sector emissions decreased by 2.6% between 2009 and 2010, by 11.7% between 2007 and 2010 and by 13.3% between 2000 and 2010. Changes can be attributed in most part to changes in livestock (e.g., cattle) population. The largest source of agriculture emissions is methane (CH<sub>4</sub>) emissions from enteric fermentation.

**Waste Sector** – Waste sector emissions decreased marginally (by 0.01%) between 2009 and 2010, increased by 1.3% between 2007 and 2010, and increased by 5.4% between 2000 and 2010. Increases in the quantity of waste generated and sent to landfills have recently been balanced by the emissions reductions associated with diversion of wastes and the capture of CH<sub>4</sub> at landfills.

**Afforestation and Deforestation** – Net emissions in the afforestation and deforestation sub-category were approximately 2.9 megatonnes CO<sub>2</sub>e in 2010, 4.7% of total B.C. emissions. This included 2.92 Mt CO<sub>2</sub>e of emissions from deforestation and 0.018 Mt CO<sub>2</sub>e of removals from afforestation. Net GHG emissions from afforestation and deforestation decreased by 17.2% between 2007 and 2010 and by 24.7% between 2000 and 2010.

**Other Land Use (Memo items not included in total B.C. GHG emissions)** – Emissions associated with “other land use” categories increased by 87.1% between 2007 and 2010. From 2000 to 2010, other land use categories collectively changed from a net sink of GHGs (30.7 Mt CO<sub>2</sub>e removed from the atmosphere in 2000) to a net source in 2010 (81.6 Mt CO<sub>2</sub>e 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.