

### 3. Energy

Energy-related activities were the primary sources of U.S. anthropogenic greenhouse gas emissions, accounting for 86.7 percent of total greenhouse gas emissions on a carbon dioxide (CO<sub>2</sub>) equivalent basis<sup>52</sup> in 2009. This included 98, 49, and 13 percent of the nation's CO<sub>2</sub>, methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions, respectively. Energy-related CO<sub>2</sub> emissions alone constituted 81 percent of national emissions from all sources on a CO<sub>2</sub> equivalent basis, while the non-CO<sub>2</sub> emissions from energy-related activities represented a much smaller portion of total national emissions (5.6 percent collectively).

Emissions from fossil fuel combustion comprise the vast majority of energy-related emissions, with CO<sub>2</sub> being the primary gas emitted (see Figure 3-1). Globally, approximately 30,398 Tg of CO<sub>2</sub> were added to the atmosphere through the combustion of fossil fuels in 2009, of which the United States accounted for about 18 percent.<sup>53</sup> Due to their relative importance, fossil fuel combustion-related CO<sub>2</sub> emissions are considered separately, and in more detail than other energy-related emissions (see Figure 3-2). Fossil fuel combustion also emits CH<sub>4</sub> and N<sub>2</sub>O, and mobile fossil fuel combustion was the second largest source of N<sub>2</sub>O emissions in the United States.

Figure 3-1: 2009 Energy Chapter Greenhouse Gas Sources

Figure 3-2: 2009 U.S. Fossil Carbon Flows (Tg CO<sub>2</sub> Eq.)

Energy-related activities other than fuel combustion, such as the production, transmission, storage, and distribution of fossil fuels, also emit greenhouse gases. These emissions consist primarily of fugitive CH<sub>4</sub> from natural gas systems, petroleum systems, and coal mining.

Table 3-1 summarizes emissions from the Energy sector in units of teragrams (or million metric tons) of CO<sub>2</sub> equivalents (Tg CO<sub>2</sub> Eq.), while unweighted gas emissions in gigagrams (Gg) are provided in Table 3-2. Overall, emissions due to energy-related activities were 5,751.1 Tg CO<sub>2</sub> Eq. in 2009, an increase of 9 percent since 1990.

Table 3-1: CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O Emissions from Energy (Tg CO<sub>2</sub> Eq.)

Gas/Source	1990	2000	2005	2006	2007	2008	2009
<b>CO<sub>2</sub></b>	<b>4,903.2</b>	<b>5,781.3</b>	<b>5,939.4</b>	<b>5,842.5</b>	<b>5,938.2</b>	<b>5,752.3</b>	<b>5,377.3</b>
Fossil Fuel Combustion	4,738.4	5,594.8	5,753.2	5,653.1	5,756.7	5,565.9	5,209.0
Electricity Generation	1,820.8	2,296.9	2,402.1	2,346.4	2,412.8	2,360.9	2,154.0
Transportation	1,485.9	1,809.5	1,896.6	1,878.1	1,894.0	1,789.9	1,719.7
Industrial	846.5	851.1	823.1	848.2	842.0	802.9	730.4
Residential	338.3	370.7	357.9	321.5	342.4	348.2	339.2
Commercial	219.0	230.8	223.5	208.6	219.4	224.2	224.0
U.S. Territories	27.9	35.9	50.0	50.3	46.1	39.8	41.7
Non-Energy Use of Fuels	118.6	144.9	143.4	145.6	137.2	141.0	123.4
Natural Gas Systems	37.6	29.9	29.9	30.8	31.1	32.8	32.2
Incineration of Waste	8.0	11.1	12.5	12.5	12.7	12.2	12.3
Petroleum Systems	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Biomass - Wood*	215.2	218.1	206.9	203.8	203.3	198.4	183.8
International Bunker Fuels*	111.8	98.5	109.7	128.4	127.6	133.7	123.1
Biomass - Ethanol*	4.2	9.4	23.0	31.0	38.9	54.8	61.2
<b>CH<sub>4</sub></b>	<b>327.4</b>	<b>318.6</b>	<b>291.3</b>	<b>319.2</b>	<b>307.3</b>	<b>323.6</b>	<b>336.8</b>
Natural Gas Systems	189.8	209.3	190.4	217.7	205.2	211.8	221.2

<sup>52</sup> Estimates are presented in units of teragrams of carbon dioxide equivalent (Tg CO<sub>2</sub> Eq.), which weight each gas by its global warming potential, or GWP, value. See section on global warming potentials in the Executive Summary.

<sup>53</sup> Global CO<sub>2</sub> emissions from fossil fuel combustion were taken from Energy Information Administration *International Energy Statistics 2010* < <http://tonto.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm> > EIA (2010).