

# Fast Facts

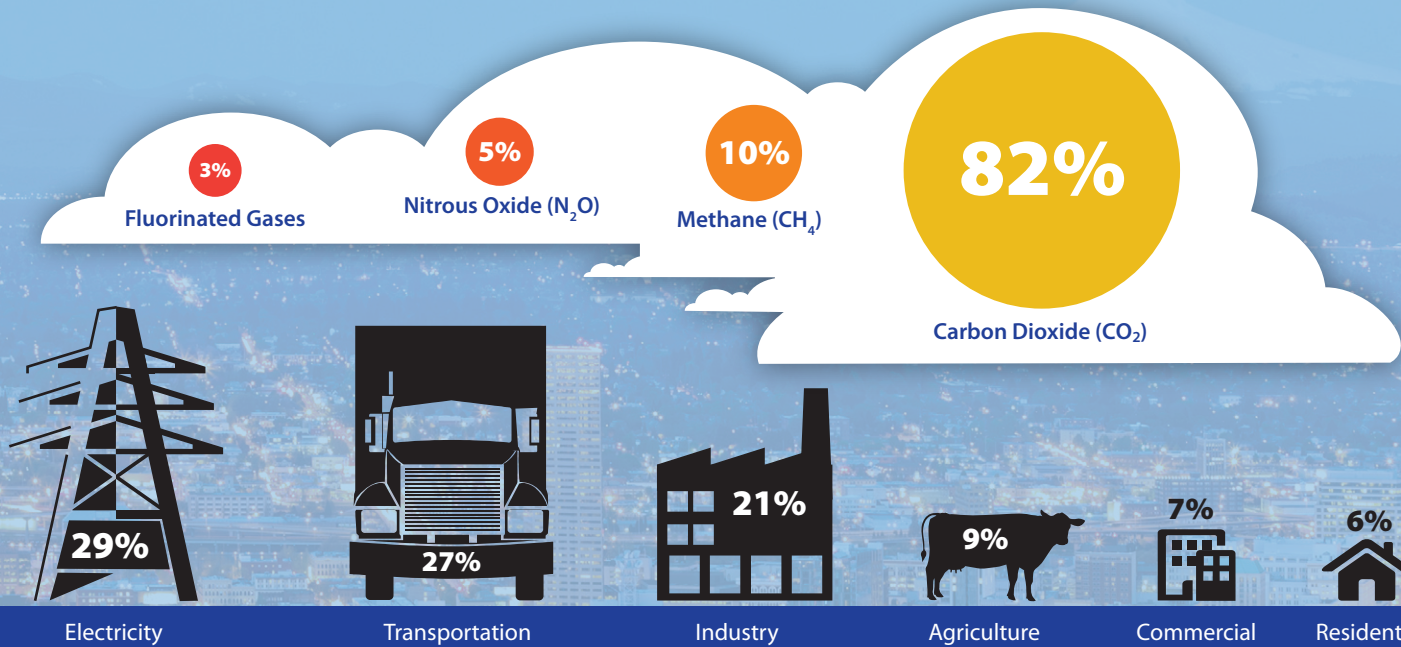
# 1990-2015

U.S. Greenhouse Gas Emissions in 2015

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2015

U.S. Greenhouse Gas Emissions

## National-Level U.S. Greenhouse Gas Inventory



2015			1990 to 2015	
<b>Total Emissions</b>	<b>CO<sub>2</sub> from Fossil Fuel Combustion</b>	<b>CO<sub>2</sub> Removals by Forests and Other Lands</b>	<b>3.5% ↑</b>	<b>6.5% ↑</b>
6,587 million metric tons of CO <sub>2</sub> equivalent	77% of total emissions	11.8% of total emissions	Total emissions	CO <sub>2</sub> emissions from fossil fuel combustion
2.3% ↓ from 2014 levels	2.9% ↓ from 2014 levels		5.6% ↑ Total CO <sub>2</sub> emissions	



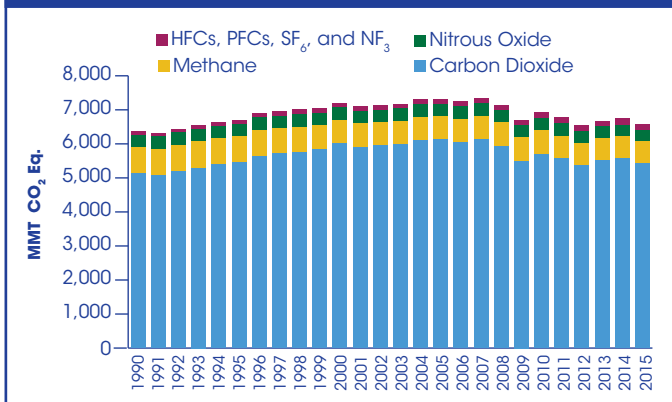
To learn more about the inventory, scan the QR code to the left, visit [www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks](http://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks), or explore the data at [www3.epa.gov/climatechange/ghgemissions/inventoryexplorer](http://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer).



April 2017  
EPA 430-F-17-002

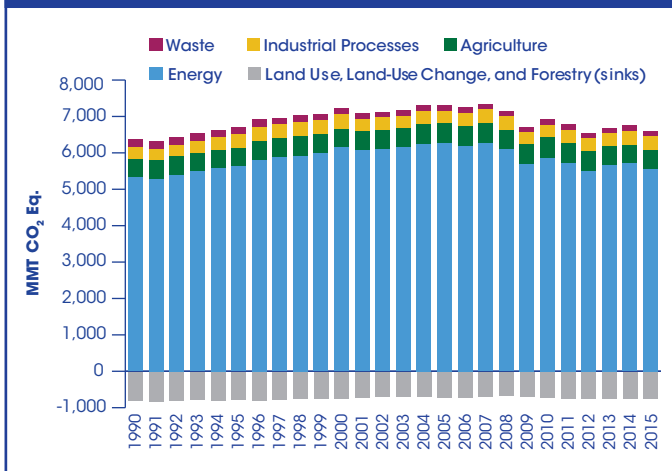
## U.S. Greenhouse Gas Emissions

by Gas



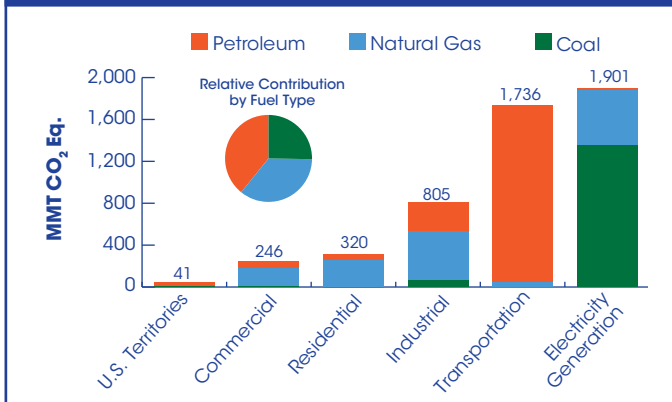
## U.S. Greenhouse Gas Emissions/Sinks

by Chapter/IPCC Sector



## 2015 U.S. CO<sub>2</sub> Emissions

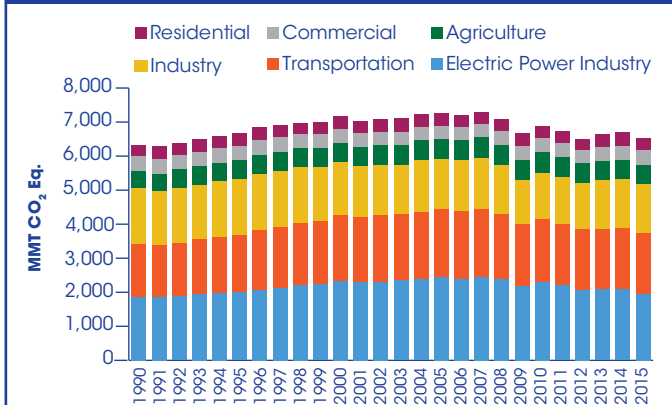
from Fossil Fuel Combustion by Fuel Type and End-Use Sector



Note: Electricity generation also includes emissions of less than 0.5 MMT CO<sub>2</sub> Eq. from geothermal-based electricity generation.

## U.S. Greenhouse Gas Emissions

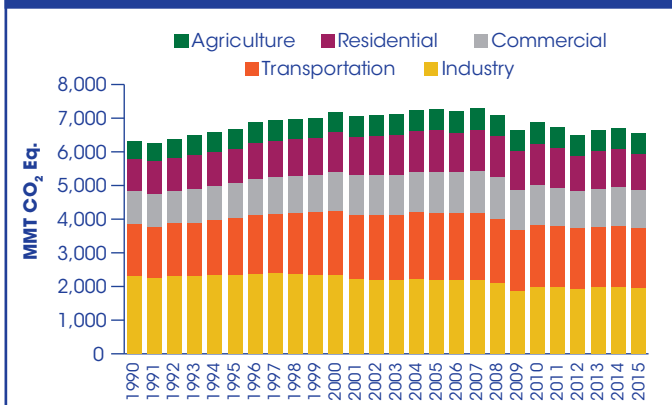
Allocated to Economic Sectors



Note: Does not include U.S. territories.

## U.S. Greenhouse Gas Emissions

with Electricity Distributed to Economic Sectors



Note: Does not include U.S. territories.

+Does not exceed 0.05 MMT CO<sub>2</sub> Eq.

There was a change in methods between 2014 and 2015 for estimating the share of gasoline used in the transportation, industrial, and commercial sectors, creating a break in the time series. See the Energy chapter of the Inventory Report for more information.

Emissions from wood biomass, ethanol, and biodiesel consumption are not included specifically in summing energy sector totals. Net carbon fluxes from changes in biogenic carbon reservoirs are accounted for in the estimates for land use, land-use change, and forestry.

Emissions from international bunker fuels are not included in totals.

Total gross emissions exclude land use, land-use change, and forestry. Net emissions include this category.

Note: Totals may not sum due to independent rounding.

## U.S. Greenhouse Gas Emissions and Sinks (MMT CO<sub>2</sub> Equivalents)

Gas/Source	1990	2005	2011	2012	2013	2014	2015
<b>CO<sub>2</sub></b>	<b>5,123.0</b>	<b>6,131.8</b>	<b>5,569.5</b>	<b>5,362.1</b>	<b>5,514.0</b>	<b>5,565.5</b>	<b>5,411.4</b>
Fossil Fuel Combustion	4740.3	5746.9	5227.1	5024.6	5156.5	5202.3	5049.8
Electricity Generation	1820.8	2400.9	2157.7	2022.2	2038.1	2038.0	1900.7
Transportation <sup>a</sup>	1493.8	1887.0	1707.6	1696.8	1713.0	1742.8	1736.4
Industrial <sup>a</sup>	842.5	828.0	775.0	782.9	812.2	806.1	805.5
Residential	338.3	357.8	325.5	282.5	329.7	345.4	319.6
Commercial <sup>a</sup>	217.4	223.5	220.4	196.7	221.0	228.7	246.2
U.S. Territories	27.6	49.7	40.9	43.5	42.5	41.4	41.4
Non-Energy Use of Fuels	117.6	138.9	109.8	106.7	123.6	119.0	125.5
Iron and Steel Production and Metallurgical Coke Production	101.5	68.0	61.1	55.4	53.3	58.6	48.9
Natural Gas Systems	37.7	30.1	35.7	35.2	38.5	42.4	42.4
Cement Production	33.5	46.2	32.2	35.3	36.4	39.4	39.9
Petrochemical Production	21.3	27.0	26.3	26.5	26.4	26.5	28.1
Lime Production	11.7	14.6	14.0	13.8	14.0	14.2	13.3
Other Process Uses of Carbonates	4.9	6.3	9.3	8.0	10.4	11.8	11.2
Ammonia Production	13.0	9.2	9.3	9.4	10.0	9.6	10.8
Incineration of Waste	8.0	12.5	10.6	10.4	10.4	10.6	10.7
Urea Fertilization	2.4	3.5	4.1	4.3	4.5	4.8	5.0
Carbon Dioxide Consumption	1.5	1.4	4.1	4.0	4.2	4.5	4.3
Liming	4.7	4.3	3.9	6.0	3.9	3.6	3.8
Petroleum Systems	3.6	3.9	4.2	3.9	3.7	3.6	3.6
Soda Ash Production and Consumption	2.8	3.0	2.7	2.8	2.8	2.8	2.8
Aluminum Production	6.8	4.1	3.3	3.4	3.3	2.8	2.8
Ferroalloy Production	2.2	1.4	1.7	1.9	1.8	1.9	2.0
Titanium Dioxide Production	1.2	1.8	1.7	1.5	1.7	1.7	1.6
Glass Production	1.5	1.9	1.3	1.2	1.3	1.3	1.3
Urea Consumption for Non-Agricultural Purposes	3.8	3.7	4.0	4.4	4.0	1.4	1.1
Phosphoric Acid Production	1.5	1.3	1.2	1.1	1.1	1.0	1.0
Zinc Production	0.6	1.0	1.3	1.5	1.4	1.0	0.9
Lead Production	0.5	0.6	0.5	0.5	0.5	0.5	0.5
Silicon Carbide Production and Consumption	0.4	0.2	0.2	0.2	0.2	0.2	0.2
Magnesium Production and Processing	+	+	+	+	+	+	+
Wood Biomass, Ethanol, and Biodiesel Consumption <sup>b</sup>	219.4	230.7	276.4	276.2	299.8	307.1	291.7
International Bunker Fuels <sup>c</sup>	103.5	113.1	111.7	105.8	99.8	103.2	110.8
<b>CH<sub>4</sub></b>	<b>780.8</b>	<b>680.9</b>	<b>672.1</b>	<b>666.1</b>	<b>658.8</b>	<b>659.1</b>	<b>655.7</b>
Enteric Fermentation	164.2	168.9	168.9	166.7	165.5	164.2	166.5
Natural Gas Systems	194.1	159.7	154.5	156.2	159.2	162.5	162.4
Landfills	179.6	134.3	119.0	120.8	116.7	116.6	115.7
Manure Management	37.2	56.3	63.0	65.6	63.3	62.9	66.3
Coal Mining	96.5	64.1	71.2	66.5	64.6	64.8	60.9
Petroleum Systems	55.5	46.0	48.0	46.4	44.5	43.0	39.9
Wastewater Treatment	15.7	16.0	15.3	15.1	14.9	14.8	14.8
Rice Cultivation	16.0	16.7	14.1	11.3	11.3	11.4	11.2
Stationary Combustion	8.5	7.4	7.1	6.6	8.0	8.1	7.0
Abandoned Underground Coal Mines	7.2	6.6	6.4	6.2	6.2	6.3	6.4
Composting	0.4	1.9	1.9	1.9	2.0	2.1	2.1
Mobile Combustion <sup>a</sup>	5.6	2.8	2.3	2.2	2.1	2.1	2.0
Field Burning of Agricultural Residues	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Petrochemical Production	0.2	0.1	+	0.1	0.1	0.1	0.2
Ferroalloy Production	+	+	+	+	+	+	+
Silicon Carbide Production and Consumption	+	+	+	+	+	+	+
Iron and Steel Production and Metallurgical Coke Production	+	+	+	+	+	+	+
Incineration of Waste	+	+	+	+	+	+	+
International Bunker Fuels <sup>c</sup>	0.2	0.1	0.1	0.1	0.1	0.1	0.1
<b>N<sub>2</sub>O</b>	<b>359.5</b>	<b>361.6</b>	<b>364.0</b>	<b>340.7</b>	<b>335.5</b>	<b>335.5</b>	<b>334.8</b>
Agricultural Soil Management	256.6	259.8	270.1	254.1	250.5	250.0	251.3
Stationary Combustion	11.9	20.2	21.3	21.4	22.9	23.4	23.1
Manure Management	14.0	16.5	17.4	17.5	17.5	17.5	17.7
Mobile Combustion <sup>a</sup>	41.2	35.7	22.8	20.4	18.5	16.6	15.1
Nitric Acid Production	12.1	11.3	10.9	10.5	10.7	10.9	11.6
Wastewater Treatment	3.4	4.4	4.8	4.8	4.9	4.9	5.0
Adipic Acid Production	15.2	7.1	10.2	5.5	3.9	5.4	4.3
N <sub>2</sub> O from Product Uses	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Composting	0.3	1.7	1.7	1.7	1.8	1.9	1.9
Incineration of Waste	0.5	0.4	0.3	0.3	0.3	0.3	0.3
Semiconductor Manufacture	+	0.1	0.2	0.2	0.2	0.2	0.2
Field Burning of Agricultural Residues	0.1	0.1	0.1	0.1	0.1	0.1	0.1
International Bunker Fuels <sup>c</sup>	0.9	1.0	1.0	0.9	0.9	0.9	0.9
<b>HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub></b>	<b>99.7</b>	<b>138.9</b>	<b>171.1</b>	<b>169.4</b>	<b>171.7</b>	<b>179.6</b>	<b>184.7</b>
<b>HFCs</b>	<b>46.6</b>	<b>120.0</b>	<b>154.3</b>	<b>155.9</b>	<b>159.0</b>	<b>166.7</b>	<b>173.2</b>
Substitution of Ozone Depleting Substances	0.3	99.7	145.3	150.2	154.6	161.3	168.5
HCFC-22 Production	46.1	20.0	8.8	5.5	4.1	5.0	4.3
Semiconductor Manufacture	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Magnesium Production and Processing	0.0	0.0	+	+	0.1	0.1	0.1
<b>PFCs</b>	<b>24.3</b>	<b>6.7</b>	<b>6.9</b>	<b>6.0</b>	<b>5.8</b>	<b>5.8</b>	<b>5.2</b>
Semiconductor Manufacture	2.8	3.2	3.4	3.0	2.8	3.2	3.2
Aluminum Production	21.5	3.4	3.5	2.9	3.0	2.5	2.0
Substitution of Ozone Depleting Substances	0.0	+	+	+	+	+	+
<b>SF<sub>6</sub></b>	<b>28.8</b>	<b>11.7</b>	<b>9.2</b>	<b>6.8</b>	<b>6.4</b>	<b>6.6</b>	<b>5.8</b>
Electrical Transmission and Distribution	23.1	8.3	6.0	4.8	4.6	4.8	4.2
Magnesium Production and Processing	5.2	2.7	2.8	1.6	1.5	1.0	0.9
Semiconductor Manufacture	0.5	0.7	0.4	0.4	0.4	0.7	0.7
<b>NF<sub>3</sub></b>	<b>+</b>	<b>0.5</b>	<b>0.7</b>	<b>0.6</b>	<b>0.6</b>	<b>0.5</b>	<b>0.6</b>
Semiconductor Manufacture	+	0.5	0.7	0.6	0.6	0.5	0.6
<b>Total Emissions<sup>d</sup></b>	<b>6,363.1</b>	<b>7,313.3</b>	<b>6,776.7</b>	<b>6,538.3</b>	<b>6,680.1</b>	<b>6,739.7</b>	<b>6,586.7</b>
LULUCF Emissions	10.6	23.0	19.9	26.1	19.2	19.7	19.7
LULUCF Carbon Stock Change	(830.2)	(754.0)	(769.1)	(779.8)	(782.2)	(781.1)	(778.7)
LULUCF Sector Net Total	(819.6)	(731.0)	(749.2)	(753.8)	(763.0)	(761.4)	(758.9)
<b>Net Emissions (Sources and Sinks)</b>	<b>5,543.5</b>	<b>6,582.3</b>	<b>6,027.6</b>	<b>5,784.5</b>	<b>5,917.1</b>	<b>5,978.3</b>	<b>5,827.7</b>

## Global Warming Potentials (100-Year Time Horizon)

Gas	GWP
CO <sub>2</sub>	1
CH <sub>4</sub>	25
N <sub>2</sub> O	298
HFC-23	14,800
HFC-32	675
HFC-43-10mee	1,640
HFC-125	3,500
HFC-134a	1,430
HFC-143a	4,470
HFC-152a	124
HFC-227ea	3,220
HFC-236fa	9,810
CF <sub>4</sub>	7,390
C <sub>2</sub> F <sub>6</sub>	12,200
C <sub>3</sub> F <sub>8</sub>	8,830
C <sub>4</sub> F <sub>10</sub>	8,860
c-C <sub>4</sub> F <sub>8</sub>	10,300
C <sub>5</sub> F <sub>12</sub>	9,160
C <sub>6</sub> F <sub>14</sub>	9,300
SF <sub>6</sub>	22,800
NF <sub>3</sub>	17,200

Global warming potential (GWP) is defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas. The GWP-weighted emissions of direct greenhouse gases in the U.S. Inventory are presented in terms of equivalent emissions of carbon dioxide (CO<sub>2</sub>), using units of million metric tons of carbon dioxide equivalents (MMT CO<sub>2</sub> Eq.).

### Conversion:

1 million metric tons = 10<sup>6</sup> metric tons = 10<sup>9</sup> kg  
The molecular weight of carbon is 12, and the molecular weight of oxygen is 16; therefore, the molecular weight of CO<sub>2</sub> is 44 (i.e., 12 + [16 × 2]), as compared to 12 for carbon alone. Thus, the weight ratio of carbon to carbon dioxide is 12/44.

Conversion from gigagrams of gas to million metric tons of carbon dioxide equivalents:

$$\text{MMT CO}_2 \text{ Eq.} = \left( \frac{\text{Gg}}{\text{of gas}} \right) \times (\text{GWP}) \times \left( \frac{\text{MMT}}{1,000 \text{ Gg}} \right)$$

Source:  
IPCC Fourth Assessment Report (2007)

## Carbon Information

### Conversion Factors to Energy Units and Carbon Contents by Fuel Type

The values in this table provide conversion factors from physical units to energy equivalent units and from energy units to carbon contents. These factors can be used as default factors, if local data are not available.

Fuel Type	Heat Content	Carbon (C) Content Coefficients	Carbon Dioxide (CO <sub>2</sub> ) per Physical Unit
<b>Solid Fuels</b>	<b>Million Btu/Metric Ton</b>	<b>kg C/Million Btu</b>	<b>kg CO<sub>2</sub>/Metric Ton</b>
Anthracite Coal	24.88	28.28	2,579.9
Bituminous Coal	26.33	25.44	2,456.1
Sub-bituminous Coal	18.89	26.50	1,835.5
Lignite	14.18	26.65	1,385.6
Coke	25.76	31.00	2,928.1
Unspecified Coal	27.58	25.34	2,562.5
<b>Gas Fuels</b>	<b>Btu/Cubic Foot</b>	<b>kg C/Million Btu</b>	<b>kg CO<sub>2</sub>/Cubic Foot</b>
Natural Gas	1,037	14.46	0.0550
<b>Liquid Fuels</b>	<b>Million Btu/Petroleum Barrel</b>	<b>kg C/Million Btu</b>	<b>kg CO<sub>2</sub>/Petroleum Barrel</b>
Motor Gasoline	5.06	19.46	361.0
Distillate Fuel Oil	5.83	20.17	431.2
Residual Fuel Oil	6.29	20.48	472.3
Jet Fuel	5.67	19.70	409.6
Aviation Gasoline	5.05	18.86	349.2
LPG	3.54	16.83	218.5
Kerosene	5.67	19.96	415.0
Still Gas	6.00	18.20	400.4
Petroleum Coke	6.02	27.85	614.7
Pentanes Plus	4.62	19.10	323.6
Unfinished Oils	5.83	20.31	434.2

Note: For fuels with variable heat contents and carbon content coefficients, this table presents 2015 U.S. average values. All factors are presented in gross calorific values (GCV) (i.e., higher heating values). LPG = liquefied petroleum gases.

## Energy Units

Btu	British thermal unit	1 Btu
MBtu	Thousand Btu	1 × 10 <sup>3</sup> Btu
MMBtu	Million Btu	1 × 10 <sup>6</sup> Btu
BBtu	Billion Btu	1 × 10 <sup>9</sup> Btu
TBtu	Trillion Btu	1 × 10 <sup>12</sup> Btu
QBtu	Quadrillion Btu	1 × 10 <sup>15</sup> Btu

## Unit Conversions

1 pound	= 0.454 kilograms	= 16 ounces	
1 kilogram	= 2.205 pounds	= 35.27 ounces	
1 short ton	= 0.9072 metric tons	= 2,000 pounds	
1 cubic foot	= 0.02832 cubic meters	= 28.3168 liters	
1 cubic meter	= 35.315 cubic feet	= 1,000 liters	
1 U.S. gallon	= 3.78541 liters	= 0.03175 barrels	= 0.02381 barrels petroleum
1 liter	= 0.2642 U.S. gallons	= 0.0084 barrels	= 0.0063 barrels petroleum
1 barrel	= 31.5 U.S. gallons	= 119 liters	= 0.75 barrels petroleum
1 barrel petroleum	= 42 U.S. gallons	= 159 liters	
1 mile	= 1.609 kilometers	= 5,280 feet	
1 kilometer	= 0.6214 miles	= 3,280.84 feet	
1 square mile	= 2.590 square kilometers	= 640 acres	
1 square kilometer	= 0.386 square miles	= 100 hectares	
1 acre	= 43,560 square feet	= 0.4047 hectares	= 4,047 square meters

For more information on calculating CO<sub>2</sub> emissions per kWh, download eGRID at [www.epa.gov/energy/eGRID](http://www.epa.gov/energy/eGRID).

For other related information, see [www.epa.gov/climatechange](http://www.epa.gov/climatechange) and <http://unfccc.int>.