Fast Facts

U.S. Transportation Sector Greenhouse Gas Emissions 1990–2012

EPA United States Environmental Protection Agency

Office of Transportation and Air Quality
EPA-420-F-15-002
March 2015

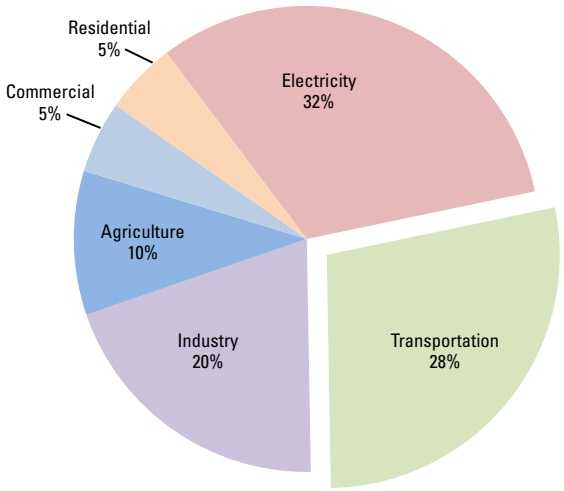
Transportation Emissions of the United States

The transportation sector is one of the largest contributors to U.S. greenhouse gas (GHG) emissions. According to the *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2012* (the Inventory), the national inventory that the U.S. prepares annually under the United Nations Framework Convention on Climate Change (UNFCCC), transportation represented 28% of total U.S. GHG emissions in 2012. Cars, trucks, commercial aircraft, and railroads, among other sources, all contribute to transportation end-use sector emissions. Within the sector, light-duty vehicles (including passenger cars and light-duty trucks) were by far the largest category, with 62% of GHG emissions, while medium- and heavy-duty trucks made up the second largest category, with 22% of emissions. Between 1990 and 2012, GHG emissions in the transportation sector increased more in absolute terms than any other sector (i.e. electricity generation, industry, agriculture, residential, or commercial).

Greenhouse gas emissions from transportation sources include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and various hydrofluorocarbons (HFCs). CO_2, CH_4, and N_2O are all emitted via the combustion of fuels, while HFCs are the result of leaks and end-of-life disposal from air conditioners used to cool people and/or freight.

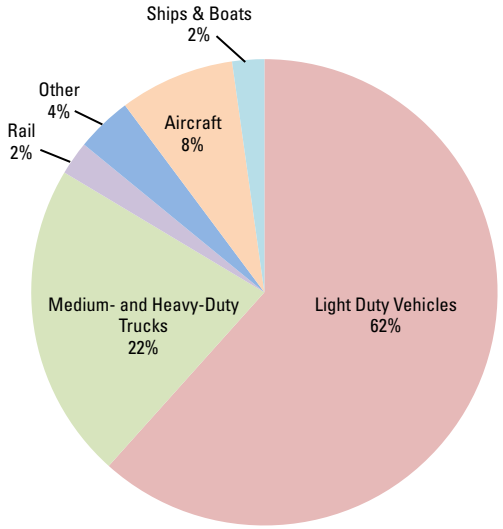
Mobile Sources	
Transportation	**Non-Transportation Mobile**
Highway Vehicles	Agricultural Equipment
Aircraft	Construction & Mining Equipment
Ships & Boats	Lawn & Garden Equipment
Rail	Logging Equipment
Pipelines[1]	Recreational Equipment
Lubricants	

When including emissions from *non-transportation* mobile sources such as agricultural, lawn and garden, and construction equipment, mobile sources constituted nearly a third, or 31%, of total U.S. GHG emissions in 2012.[2] Mobile source emissions have grown 22% since 1990 due in large part to increased demand for travel.



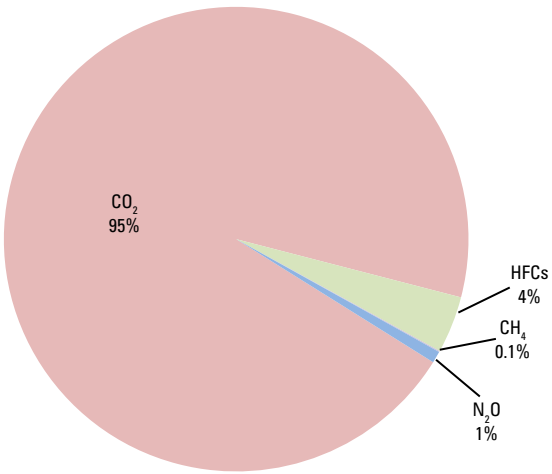
Share of U.S. GHG Emissions by Sector[3,4]

Note: Totals may not add to 100% due to rounding.



Share of U.S. Transportation Sector GHG Emissions by Source[4,5]

Note: Totals may not add to 100% due to rounding.



Share of U.S. Transportation Sector GHG Emissions by Gas[4]

Note: Totals may not add to 100% due to rounding.

[1] Includes only CO_2 from natural gas used to power natural gas pipelines, does not include emissions from electricity use or non-CO_2 gases.

[2] CO_2 emissions from wood biomass and biofuel consumption are not included in this document. Data can be found in the Land Use, Land-Use Change, and Forestry chapter of the Inventory. See page 4 for more information on the Inventory.

[3] For presentation purposes, emissions from territories are not shown in this chart although they are included in the total emissions used to calculate the percentage share of emissions from each sector. The share of agricultural emissions (9.4%) is rounded to 10%. See Table ES-7 in the Executive Summary of the Inventory for official data. See page 4 for more information on the Inventory.

[4] "Transportation" emissions in these pie charts include CO_2, N_2O, CH_4, and HFCs from transportation sources like highway vehicles, aircraft, ships and boats, rail, pipelines and lubricants. They do not include emissions from non-transportation mobile sources such as agriculture and construction equipment.

[5] "Other" sources include buses, motorcycles, pipelines, and lubricants.

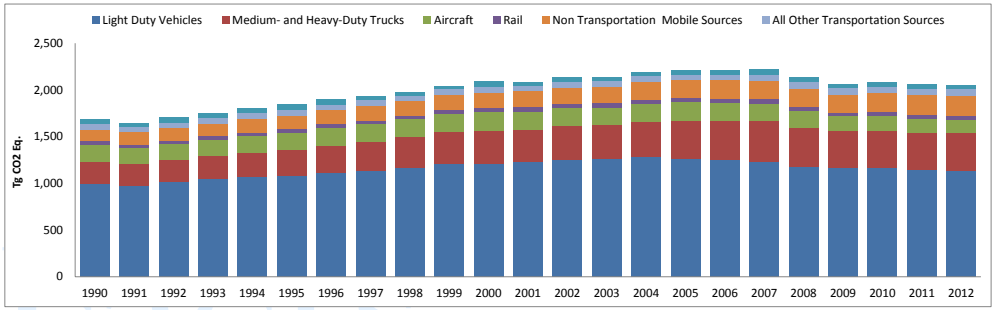
U.S. Transportation GHG Emissions
(Tg CO_2 Equivalent)

Source	1990	1995	2000	2005	2010	2011	2012	Change from 1990 to 2012 Absolute	Change from 1990 to 2012 Percent
On-Road Vehicles[6]	**1,235.2**	**1,371.9**	**1,577.8**	**1,687.7**	**1,587.9**	**1,564.6**	**1,558.4**	**323.2**	**26.2**
Light-Duty Vehicles	993.9	1,083.1	1,210.1	1,265.6	1,164.9	1,141.0	1,132.2	138.3	13.9
Passenger Cars	657.4	646.0	696.6	712.6	805.8	798.0	793.8	136.5	20.8
Light-Duty Trucks	336.6	437.1	513.5	553.1	359.1	343.1	338.4	1.8	0.5
Motorcycles	1.8	1.8	1.9	1.7	3.8	3.7	4.3	2.5	141.1
Buses	8.4	9.2	11.2	12.1	16.3	17.5	18.6	10.2	122.2
Medium- and Heavy-Duty Trucks	231.1	277.8	354.6	408.4	402.9	402.4	403.4	172.2	74.5
Aircraft	**189.2**	**176.7**	**199.4**	**193.7**	**154.8**	**149.9**	**146.5**	**-42.7**	**-22.6**
Commercial Aviation	110.9	116.4	140.7	134.0	114.4	115.7	114.4	3.5	3.1
Military Aircraft	35.3	24.5	22.9	19.5	13.7	11.7	12.2	-23.1	-65.5
General Aviation	43.0	35.8	35.9	40.1	26.7	22.5	19.9	-23.0	-53.6
Ships and Boats	**45.1**	**58.6**	**61.0**	**45.2**	**45.3**	**47.0**	**40.8**	**-4.4**	**-9.7**
Rail	**35.8**	**40.5**	**44.6**	**48.2**	**41.7**	**43.7**	**42.9**	**7.1**	**19.8**
Pipelines[7]	**36.0**	**38.2**	**35.2**	**35.2**	**37.1**	**37.8**	**40.1**	**4.1**	**11.3**
Lubricants	**11.8**	**11.3**	**12.1**	**10.2**	**9.5**	**9.0**	**8.3**	**-3.5**	**-30.0**
Transportation Total	**1,553.2**	**1,697.2**	**1,930.1**	**2,017.2**	**1,876.4**	**1,852.1**	**1,837.0**	**283.8**	**18.3**

U.S. Non-Transportation Mobile GHG Emissions

Non-Transportation Mobile	**128.8**	**146.8**	**158.3**	**190.7**	**204.3**	**207.0**	**209.8**	**81.0**	**62.9**
Agricultural Equipment	31.4	37.0	39.2	47.3	48.2	50.0	51.5	20.1	64.1
Construction Equipment	42.4	49.4	55.8	66.5	73.6	74.8	76.4	34.0	80.3
Other Non-Transportation Mobile	55.0	60.4	63.4	76.9	82.5	82.3	81.8	26.8	48.8
Non-Transportation + Transportation Total	**1,682.0**	**1,844.0**	**2,088.4**	**2,207.9**	**2,080.7**	**2,059.1**	**2,046.8**	**364.8**	**21.7**

Change in GHG Emissions by Sector: 1990-2012



U.S. Transportation GHG Emissions by Gas, 2012
(Tg CO_2 Equivalent)

Source	CO_2	CH_4	N_2O	HFCs	Total	Percent
On-Road Vehicles[6]	**1,473.9**	**1.2**	**12.7**	**70.6**	**1,558.4**	**76.1**
Light-Duty Vehicles	1,061.0	1.1	11.7	58.5	1,132.2	55.3
Passenger Cars	759.8	0.8	8.0	25.2	793.8	38.8
Light-Duty Trucks	301.2	0.3	3.6	33.3	338.4	16.5
Motorcycles	4.2	0.0	0.0	0.0	4.3	0.2
Buses	18.2	0.0	0.0	0.4	18.6	0.9
Medium- and Heavy-Duty Trucks	390.6	0.1	0.9	11.7	403.4	19.7
Aircraft	**145.1**	**0.0**	**1.4**	**0.0**	**146.5**	**7.2**
Commercial Aviation	113.3	0.0	1.1	0.0	**114.4**	**5.6**
Military Aircraft	12.1	0.0	0.1	0.0	12.2	0.6
General Aviation	19.7	0.0	0.2	0.0	19.9	1.0
Ships and Boats	**40.1**	**0.0**	**0.6**	**0.0**	**40.8**	**2.0**
Rail	**40.2**	**0.1**	**0.3**	**2.3**	**42.9**	**2.1**
Pipelines[7]	**40.1**	**0.0**	**0.0**	**0.0**	**40.1**	**2.0**
Lubricants	**8.3**	**0.0**	**0.0**	**0.0**	**8.3**	**0.4**
Transportation Total	**1,747.8**	**1.4**	**14.9**	**72.9**	**1,837.0**	**89.8**

Rail Electricity	3.86	0.00	0.04		3.9	NA

U.S. Non-Transportation Mobile GHG Emissions by Gas, 2012

Non-Transportation Mobile	**207.8**	**0.3**	**1.6**	**0.0**	**209.8**	**10.2**
Agricultural Equipment	51.0	0.2	0.4	0.0	51.5	2.5
Construction Equipment	75.8	0.1	0.6	0.0	76.4	3.7
Other Non-Transportation Mobile	81.1	0.1	0.6	0.0	81.8	4.0
Non-Transportation + Transportation Total	**1,955.6**	**1.7**	**16.5**	**72.9**	**2,046.8**	**100.0**

[6] GHG emissions and vehicle miles traveled (VMT) estimates for on-road vehicles presented in the Inventory are based on FHWA data. FHWA changed its methods for estimating (VMT) and related data in 2011. These methodological changes included how vehicles are classified, moving from a system based on body-type to one that is based on wheelbase. These changes were first incorporated for the 2010 Inventory and apply to the 2007-12 time period. This resulted in large changes in VMT and fuel consumption data by vehicle class, thus leading to a shift in emissions among on-road vehicle classes. For instance, "passenger car" has been replaced by "light duty vehicles short WB" and "other 2-axle 4-tire vehicles" has been replaced by "light duty vehicles long WB."

[7] Includes only CO_2 from natural gas used to power natural gas pipelines, does not include emissions from electricity use or non-CO_2 gases.

2012 Fuel Consumption

	Volume (Billion Gallons)	Energy (Tbtu)	CO_2 (Tg)
MOTOR GASOLINE	**131.5**	**16,343.4**	**1,165.7**
Transportation[8]			
Light-Duty Vehicles	117.6	14,609.0	1,042.2
Passenger Cars	85.2	10,592.2	755.6
Light-Duty Trucks	32.3	4,016.8	286.6
Medium- and Heavy-Duty Trucks	4.5	558.3	39.8
Motorcycles	0.5	58.8	4.2
Buses	0.1	11.3	0.8
Recreational Boats	1.5	181.2	12.9
Non-Transportation[9]			
Agricultural Equipment	0.9	108.7	7.8
Construction Equipment	0.6	78.8	5.6
Other Non-Transportation Mobile	5.9	737.3	52.4
DISTILLATE FUEL	**56.3**	**7,807.1**	**577.4**
Transportation[8]			
Light-Duty Vehicles	1.7	234.3	17.3
Passenger Cars	0.4	56.2	4.2
Light-Duty Trucks	1.3	178.1	13.2
Buses	1.6	219.9	16.3
Medium- and Heavy-Duty Trucks	34.1	4,734.9	350.2
Recreational Boats	0.4	50.1	3.7
Ships and Boats	0.7	103.5	7.7
Rail	3.9	544.0	40.2
Non-Transportation[9]			
Agricultural Equipment	4.2	584.1	43.2
Construction Equipment	6.8	948.5	70.1
Other Non-Transportation Mobile	2.8	387.9	28.7
RESIDUAL FUEL OIL	**1.4**	**211.1**	**15.8**
Ships and Boats	1.4	211.1	15.8
JET FUEL	**14.7**	**1,985.2**	**143.4**
Commercial Aircraft	11.9	1,610.9	113.3
General Aviation Aircraft	1.7	224.0	18.0
Military Aircraft	1.1	150.3	12.1

	Volume (Billion Gallons)	Energy (Tbtu)	CO_2 (Tg)
AVIATION GASOLINE	**0.2**	**25.1**	**1.7**
General Aviation Aircraft	0.2	25.1	1.7
NATURAL GAS	**—**	**777.2**	**41.2**
Buses	—	20.5	1.1
Pipelines	—	756.7	40.1
LPG	**—**	**33.7**	**2.1**
Light-Duty Trucks	—	23.6	1.5
Medium- and Heavy-Duty Trucks	—	10.1	0.6
Buses	—	0.0	0.0
LUBRICANTS	**—**	**123.2**	**8.3**
Total	**204.1**	**27,305.9**	**1,955.6**

Biodiesel[10]	*0.9*	*114.2*	*0.0*
Ethanol[10]	*12.3*	*1,044.3*	*0.0*

[8] Fuel consumption, energy, and CO_2 emissions from transportation sources exclude biofuels.

[9] Non-transportation mobile fuel consumption, energy, and CO_2 are estimated based on EPA's NONROAD model (see epa.gov/otaq/nonrdmdl.htm, last accessed 10/23/14). Because the fuel composition in the NONROAD model is intended to reflect real-world usage, these estimates may include low-level ethanol blends. Note that these estimates are presented here and in Annex 3.2 of the Inventory for informational purposes, but that non-transportation mobile sources are officially accounted for in other energy sectors in the Inventory (e.g., the industrial sector) and the CO_2 estimates for those energy sectors do not include emissions from biofuels.

[10] Biofuels are presented as line items below the total for informational purposes only, in line with IPCC methodological guidance and UNFCCC reporting obligations. CO_2 emissions from the combustion of biofuels are not directly included in the energy sector contribution (which includes the contribution of transportation and non-transportation mobile sources) to U.S. totals in the Inventory; instead, net carbon fluxes from changes in biogenic carbon reservoirs are accounted in the estimates for Land Use, Land-Use Change, and Forestry in the Inventory. See page 4 for more information on the Inventory.

Additional Information

Data Sources for This Document

The source for all data in this document is the *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2012* (the Inventory) (EPA 2014). The U.S. Environmental Protection Agency prepares the national emissions inventory annually to fulfill the U.S. commitment under the United Nations Framework Convention on Climate Change (UNFCCC), using calculation methods that are consistent with guidelines from the Intergovernmental Panel on Climate Change (IPCC). Complete information on this inventory is available at: www.epa.gov/climatechange/ghgemissions/usinventoryreport.html. The inventory methods and assumptions related to transportation and non-transportation mobile sources are available in the main body of the Inventory as well as Annex 3.2 of the Inventory.

Inventory Definitions of Selected Transportation Categories[11]

Light-Duty Vehicles: passenger cars and light-duty trucks

Passenger Cars:[12] automobiles used primarily to transport 12 people or less. In 2012, passenger cars traveled a total of 2,063,357 million vehicle miles.

Light-Duty Trucks:[12] vehicles used primarily for transporting light-weight cargo or which are equipped with special features such as four-wheel drive for off-road operation. In the U.S., this category also includes many vehicles that primarily transport passengers such as sport utility vehicles (SUVs) and minivans. The gross vehicle weight rating (GVWR) normally ranges around 8,500 pounds or less. GVWR is the maximum weight a vehicle is designed to carry when passengers, fuel, cargo, and any other additions to the vehicle are accounted for. In 2012, light-duty trucks traveled a total of 601,088 million vehicle miles.

Medium- and Heavy-Duty Trucks:[12] vehicles with GVWR of more than around 8,500 pounds. In the Inventory, single unit trucks and combination trucks represent the medium- and heavy-duty truck category, including tractor-trailers and box trucks used for freight transportation. In addition, this category includes some vehicles that are not typically used for freight movement such as service and utility trucks. In 2012, medium- and heavy-duty trucks traveled a total of 283,073 million vehicle miles.

Pipelines: systems that transport liquids, gases, or slurries through either above or below ground pipes. In the Inventory, the pipelines category includes emissions from the combustion of natural gas used to power pumps and other distribution equipment, while leaks and other emission sources from pipelines are assigned to the natural gas systems category.

Emissions Metrics

A teragram (Tg) is equal to 1 million metric tons.

Greenhouse gas (GHG) emissions are measured in this document in terms of teragrams of "carbon dioxide equivalent" (CO_2 Eq); an "equivalent" refers to the Global Warming Potential (GWP) of a greenhouse gas. GWP values are determined based on the chosen time horizon and properties of the gas, such as its ability to absorb radiation and its atmospheric lifetime. CO_2 has a GWP of "1"; all other greenhouse gases have GWP values relative to that of CO_2. For example, methane (CH_4) has a radiative forcing value[13] or GWP of 21, which means that releasing one ton of CH_4 is equivalent to releasing 21 tons of CO_2.

The data in this document is based on the 100-year time horizon GWP values from the Intergovernmental Panel on Climate Change's (IPCC's) Second Assessment Report, in accordance with UNFCCC reporting guidelines for national GHG inventories. More information on greenhouse gases and GWP is available at: www.epa.gov/climatechange/ghgemissions/gases.html.

[11] The data used to estimate emissions for specific transportation categories may not directly align with the Inventory's definition of the categories; both the data and Inventory definitions may also differ from EPA's regulatory definitions for the same categories.

[12] GHG emissions and vehicle miles traveled (VMT) estimates for on-road vehicles presented in the Inventory are based on FHWA data. FHWA changed its methods for estimating (VMT) and related data in 2011. These methodological changes included how vehicles are classified, moving from a system based on body-type to one that is based on wheelbase. These changes were first incorporated for the 2010 Inventory and apply to the 2007-12 time period. This resulted in large changes in VMT and fuel consumption data by vehicle class, thus leading to a shift in emissions among on-road vehicle classes. For instance, "passenger car" has been replaced by "light duty vehicles short WB" and "other 2-axle 4-tire vehicles" has been replaced by "light duty vehicles long WB."

[13] Radiative forcing is a measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism (www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf).