Fast Facts

U.S. Transportation Sector Greenhouse Gas Emissions 1990–2020

EPA United States Environmental Protection Agency

Office of Transportation and Air Quality EPA-420-F-22-018
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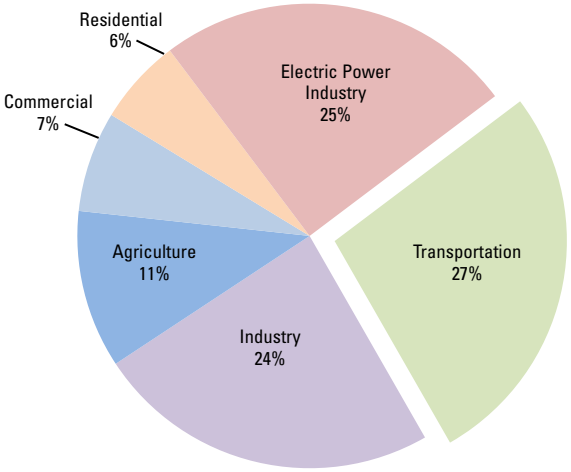
Transportation Emissions of the United States

The transportation sector is one of the largest contributors to anthropogenic greenhouse gas (GHG) emissions in the United States. According to the *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2020* (the Inventory), the national inventory that the U.S. prepares annually under the United Nations Framework Convention on Climate Change (UNFCCC), the transportation sector accounted for the largest portion (27%) of total U.S. GHG emissions in 2020. 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 57% of GHG emissions, while medium- and heavy-duty trucks made up the second largest category, with 26% of emissions. Between 1990 and 2020, GHG emissions in the transportation sector increased more in absolute terms than any other sector (i.e., electricity generation, industry, agriculture, residential, commercial), due in large part to increased demand for travel.

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 HFC emissions are the result of leaks and end-of-life disposal from air conditioners used to cool people and/or freight.[2]

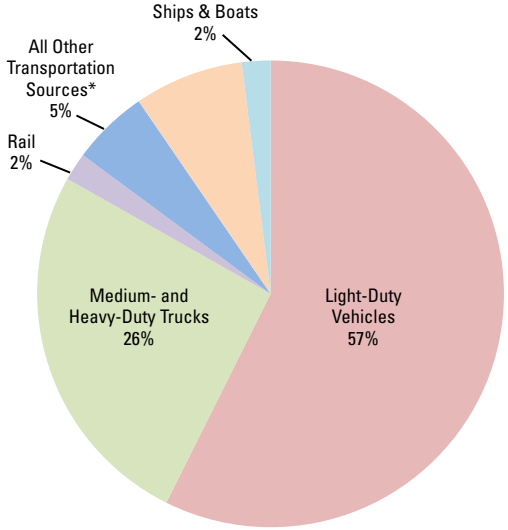
Mobile Sources	
Transportation	**Non-Transportation Mobile**
Highway Vehicles	Agricultural Equipment
Aircraft	Construction & Mining Equipment
Ships & Boats	Lawn & Garden Equipment
Rail	Logging Equipment
Lubricants	Recreational Equipment
Pipelines[1]	

When including emissions from non-transportation mobile sources such as agricultural, lawn and garden, and construction equipment, mobile sources constituted 31% of total U.S. GHG emissions in 2020.



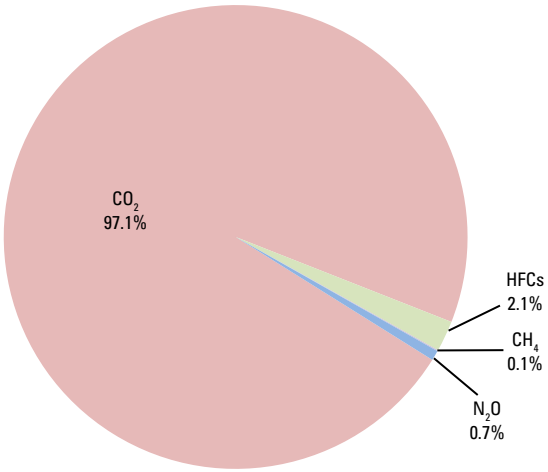
Share of U.S. GHG Emissions by Economic Sector, 2020[3,4]

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



Share of U.S. Transportation Sector GHG Emissions by Source, 2020[4,5]

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



Share of U.S. Transportation Sector GHG Emissions by Gas, 2020[4]

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

[1] Pipeline emissions in the transportation sector include only CO_2 from the combustion of natural gas at compressor stations that power natural gas pipelines, not emissions from electricity use, non-CO_2 gases, or other types of pipeline equipment. Not that natural gas pipeline compressor stations are stationary equipment that are included in the transportation sector, but are not considered mobile sources.

[2] 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.

[3] For presentation purposes, emissions from territories which constitute less than 1% of the total U.S. GHG emissions, 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. See Table ES-6 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 domestic transportation sources like highway vehicles, aircraft, ships and boats, rail, pipelines and lubricants. They do not include emissions from international bunker fuel use by aircraft and ships or 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	2005	2016	2017	2018	2019	2020	Change from 1990 to 2020 Absolute	Percent
On-Road Vehicles[6]	**1,206.8**	**1,647.4**	**1,533.0**	**1,538.8**	**1,561.4**	**1,551.7**	**1,377.6**	**170.7**	**14.1**
Passenger Cars	639.6	691.7	763.2	760.6	770.2	763.1	617.7	-21.9	-3.4
Light-Duty Trucks	326.7	537.7	330.0	324.3	325.6	323.7	315.8	-10.9	-3.3
Motorcycles	1.7	1.6	3.9	3.8	3.9	3.7	3.3	1.6	93.4
Buses	8.5	12.3	19.0	20.5	21.8	21.7	18.0	9.5	112.7
Medium- and Heavy-Duty Trucks	230.3	404.1	416.8	429.7	440.0	439.5	422.8	192.4	83.5
Aircraft	**189.0**	**193.5**	**168.9**	**174.7**	**175.4**	**181.0**	**123.2**	**-65.8**	**-34.8**
Commercial Aviation	110.9	133.9	121.5	129.2	130.8	135.4	92.1	-18.7	-16.9
Military Aircraft	36.1	19.9	12.6	12.6	12.2	12.2	10.8	-25.3	-70.1
General Aviation	42.0	39.6	34.8	33.0	32.4	33.4	20.2	-21.8	-51.9
Ships and Boats	**47.0**	**45.4**	**40.7**	**43.8**	**41.1**	**40.0**	**32.3**	**-14.6**	**-31.2**
Rail	**39.0**	**51.5**	**40.2**	**41.4**	**42.5**	**39.7**	**34.2**	**-4.7**	**-12.2**
Pipelines[7]	**36.0**	**32.4**	**39.2**	**41.3**	**49.9**	**57.9**	**57.1**	**21.1**	**58.6**
Lubricants	**11.8**	**10.2**	**10.4**	**9.6**	**9.2**	**8.8**	**8.0**	**-3.8**	**-32.2**
Transportation Total	**1,529.6**	**1,980.3**	**1,832.4**	**1,849.6**	**1,879.5**	**1,879.1**	**1,632.4**	**102.8**	**6.7**

U.S. Transportation GHG Emissions by Gas, 2020
(Tg CO_2 Equivalent)

Source	CO_2	CH_4	N_20	HFCs	Total	Percent
On-Road Vehicles[6]	**1,336.3**	**0.8**	**9.8**	**30.7**	**1,377.6**	**75.2**
Passenger Cars	605.0	0.4	3.9	8.3	617.7	33.7
Light-Duty Trucks	297.8	0.2	2.2	15.6	315.8	17.2
Motorcycles	3.2	0.0	0.1	0.0	3.3	0.2
Buses	17.4	0.0	0.1	0.4	18.0	1.0
Medium- and Heavy-Duty Trucks	412.9	0.1	3.4	6.3	422.8	23.1
Aircraft	**122.0**	**0.0**	**1.1**	**0.0**	**123.2**	**6.7**
Commercial Aviation	91.3	0.0	0.8	0.0	92.1	5.0
Military Aircraft	10.7	0.0	0.1	0.0	10.8	0.6
General Aviation	20.0	0.0	0.2	0.0	20.2	1.1
Ships and Boats	**27.6**	**0.4**	**0.2**	**4.2**	**32.3**	**1.8**
Rail	**33.7**	**0.1**	**0.3**	**0.1**	**34.2**	**1.9**
Pipelines[7]	**57.1**	**0.0**	**0.0**	**0.0**	**57.1**	**3.1**
Lubricants	**8.0**	**0.0**	**0.0**	**0.0**	**8.0**	**0.4**
Transportation Total	**1,584.7**	**1.2**	**11.4**	**35.0**	**1,632.3**	**89.1**

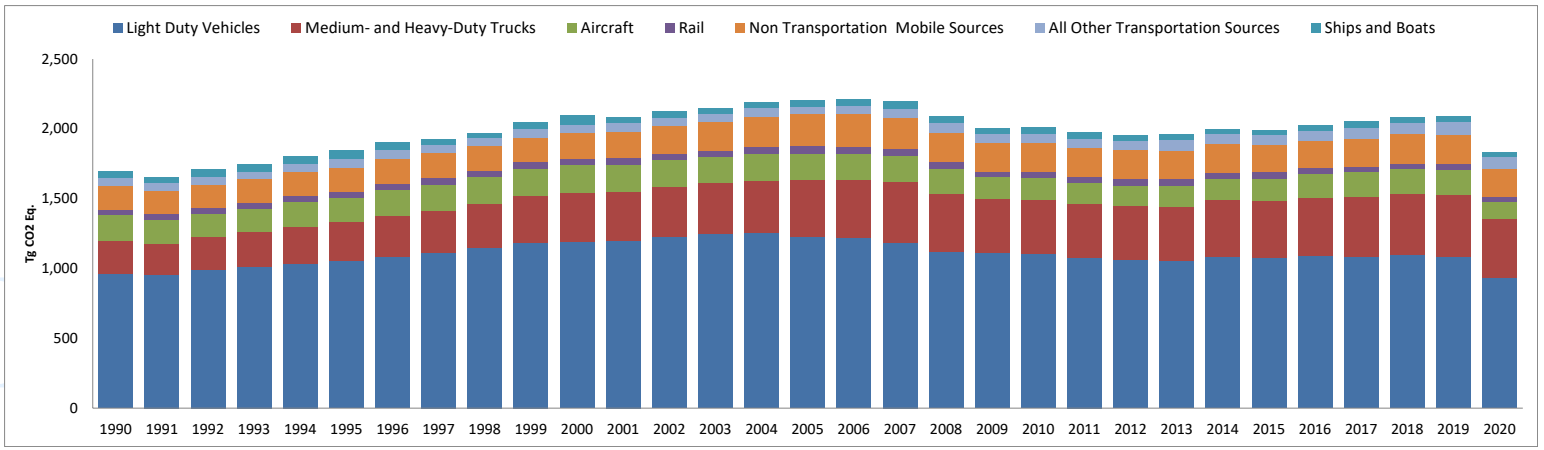
U.S. Non-Transportation Mobile GHG Emissions

Non-Transportation Mobile[8]	**167.3**	**224.8**	**195.4**	**202.0**	**207.6**	**211.5**	**199.3**	**32.0**	**19.1**
Agricultural Equip.	44.9	52.6	41.5	41.2	41.2	41.0	40.4	-4.5	-9.9
Construction Equip.	50.3	78.5	61.8	67.0	70.2	72.4	67.1	16.7	33.2
Other	72.1	93.7	92.1	93.8	96.3	98.1	91.8	19.7	27.4
Non-Transportation + Transportation Total	**1,696.9**	**2,205.1**	**2,027.8**	**2,051.6**	**2,087.1**	**2,090.7**	**1,831.7**	**134.8**	**7.9**

U.S. Non-Transportation Mobile GHG Emissions by Gas, 2020

Non-Transportation Mobile[8]	**192.2**	**1.0**	**6.1**	**0.0**	**199.3**	**10.9**
Agricultural Equip.	39.1	0.1	1.2	0.0	40.4	2.2
Construction Equip.	65.1	0.2	1.8	0.0	67.1	3.7
Other	88.0	0.7	3.1	0.0	91.8	5.0
Non-Transportation + Transportation Total	**1,777.0**	**2.2**	**17.4**	**35.0**	**1,831.6**	**100.0**

Change in GHG Emissions by Source: 1990–2020



[6] GHG emissions and vehicle miles traveled (VMT) estimates for on-road vehicles presented in the Inventory are based on Federal Highway Adminstration (FHWA) data. In 2011 FHWA changed its methods for estimated VMT and related data, including how vehicles are classified. This change in vehicle classification moved some smaller trucks and sport utility vehicles from the light truck category to the passenger vehicle category in this Inventory, leading to a shift in emissions among on-road vehicle classes. These changes apply to the 2007 to 2020 time period.

[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.

[8] Note: non-transportation mobile source CO_2 emissions estimates are presented here and in Annex 3.2 of the Inventory for informational purposes,but these emissions are officially accounted for in the industrial and commercial sectors of the Inventory. See Annex 3.2 of the Inventory for more information.

2020 Fuel Consumption

	Volume (billion gallons unless otherwise specified)	Energy (Tbtu)	CO_2 (Tg)
MOTOR GASOLINE	**112.2**	**13,929.0**	**984.1**
Transportation[9]			
Passenger Cars	68.3	8,490.0	599.9
Light-Duty Trucks	32.3	4,010.8	283.4
Medium- and Heavy-Duty Trucks	4.5	561.2	39.6
Motorcycles	0.4	45.7	3.2
Buses	0.1	12.0	0.8
Recreational Boats	1.1	140.0	9.9
Non-Transportation Mobile[10]			
Agricultural Equipment	0.1	16.2	1.1
Construction Equipment	0.4	46.8	3.3
Other Non-Transportation Mobile	5.0	606.3	42.8
DISTILLATE FUEL	**56.0**	**7,766.1**	**575.7**
Transportation[9]			
Passenger Cars	0.3	47.6	3.5
Light-Duty Trucks	1.4	188.0	13.9
Buses	1.5	209.5	15.5
Medium- and Heavy-Duty Trucks	36.3	5,031.0	372.9
Recreational Boats	0.3	35.5	2.6
Ships and Non-Recreational Boats	0.7	103.0	7.6
Rail	3.0	418.3	31.0
Non-Transportation Mobile[10]			
Agricultural Equipment	3.7	510.7	37.9
Construction Equipment	6.0	827.5	61.3
Other Non-Transportation Mobile	2.8	395.1	29.3
RESIDUAL FUEL OIL	**0.7**	**99.6**	**7.5**
Ships and Boats	0.7	99.6	7.5
JET FUEL	**12.4**	**1,670.2**	**120.6**
Commercial Aircraft	9.4	1,263.3	91.3
General Aviation Aircraft	1.9	258.3	18.6
Military Aircraft	1.1	148.5	10.7
AVIATION GASOLINE	**0.2**	**20.2**	**1.4**
General Aviation Aircraft	0.2	20.2	1.4
ELECTRICITY (Billion Kilowatt hours)	**11.5**	**39.3**	**4.7**
Transportation			
Passenger Cars	4.0	13.6	1.6
Light-Duty Trucks	0.9	3.2	0.4
Buses	0.0	0.1	0.0
Rail	6.5	22.3	2.6

	Volume (billion gallons unless otherwise specified)	Energy (Tbtu)	CO_2 (Tg)
NATURAL GAS (billion cubic feet)	**1,103.9**	**1,144.7**	**60.6**
Transportation			
Passenger Cars	0.1	0.1	0.0
Light-Duty Trucks	0.2	0.2	0.0
Medium- and Heavy-Duty Trucks	0.8	0.8	0.0
Buses	16.2	16.8	0.9
Pipelines	1,041.0	1,079.5	57.1
Non-Transportation Mobile[10]			
Agricultural Equipment	1.5	1.5	0.1
Construction Equipment	5.8	6.1	0.3
Other Non-Transportation Mobile	38.3	39.7	2.1
LPG	**2.5**	**229.7**	**14.4**
Transportation			
Passenger Cars	0.0	0.0	0.0
Light-Duty Trucks	0.0	1.0	0.1
Medium- and Heavy-Duty Trucks	0.0	4.2	0.3
Buses	0.0	1.4	0.1
Non-Transportation Mobile[10]			
Agricultural Equipment	0.0	0.0	0.0
Construction Equipment	0.0	2.3	0.1
Other Non-Transportation Mobile	2.4	220.9	13.9
LUBRICANTS	**0.0**	**1.0**	**8.0**
Total[11]	**193.2**	**24,899.8**	**1,777.0**

BIOFUELS[12]	**15.4**	**1,381.3**	**95.8**
Transportation			
Biodiesel	*1.9*	*239.0*	*17.7*
Ethanol	*11.7*	*994.6*	*68.1*

[9] Excludes contributions from biofuels.

[10] Non-transportation mobile fuel consumption, energy, and CO_2 are estimated in part by the MOVES-Nonroad model (see www.epa.gov/moves). Fuel consumption in MOVES-Nonroad is intended to reflect real-world usage and may include low-level ethanol blends. Note that non-transportation mobile source CO_2 estimates are presented here and in Annex 3.2 of the Inventory for informational purposes, but these emissions are officially accounted for in the industrial and commercial sectors of the Inventory and do not include emissions from biofuels.

[11] Total Volume is the sum of physical (billion) gallons of fuel; because natural gas volumes are reported as million cubic feet, natural gas volumes are converted to billion gallons of gasoline equivalent for the Total Volume (billion gallons) sum in this table.

[12] Biofuels are presented as line items for informational purposes only, in line with IPCC methodological guidance and UNFCCC reporting obligations. Biofuel estimates only reflect transportation sources and do not include biofuels used in non-transportation mobile sources, e.g., ethanol used in commercial or industrial applications. CO_2 emissions from the combustion of biofuels are not directly included in the energy sector (which includes transportation sources) of 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 1990–2020* (EPA 2022). The U.S. Environmental Protection Agency prepares the 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 the inventory is available at: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks. 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[13]

Passenger Cars:[14] automobiles used primarily to transport 12 people or less. In 2020, passenger cars traveled a total of 1,896,549 million vehicle miles.

Light-Duty Trucks:[14] 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 2020, light-duty trucks traveled a total of 672,196 million vehicle miles.

Medium- and Heavy-Duty Trucks:[14] 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 2020, medium- and heavy-duty trucks traveled a of 317,245 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 or GWP of 25, which means that releasing one ton of CH_4 is equivalent to releasing 25 tons of CO_2.

The data in this document is based on the 100-year time horizon GWP values from the IPCC's Fourth Assessment Report15, in accordance with UNFCCC reporting guidelines for national GHG inventories. More information on greenhouse gases and GWP is available at: www.epa.gov/ghgemissions/overview-greenhouse-gases.

[13] 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.

[14] GHG emissions and VMT estimates for on-road vehicles presented in the Inventory are based on FHWA data. In 2011 FHWA changed its methods for estimated VMT and related data, including how vehicles are classified. This change in vehicle classification moved some smaller trucks and sport utility vehicles from the light truck category to the passenger vehicle category in this Inventory, leading to a shift in emissions among on-road vehicle classes. These changes apply to the 2007 to 2020 time period.

[15] See www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf. f.