

Data Highlights

Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018



About the Greenhouse Gas Inventory

EPA's annual report, the [Inventory of U.S. Greenhouse Gas Emissions and Sinks](#) (the Inventory), provides a comprehensive accounting of U.S. greenhouse gas emissions and sinks by source, economic sector, and greenhouse gas going back to 1990. This technical overview summarizes the latest information on U.S. anthropogenic greenhouse gas emission trends from 1990 through 2018. The estimates presented are calculated using methodologies consistent with those recommended in the *2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (IPCC 2006).

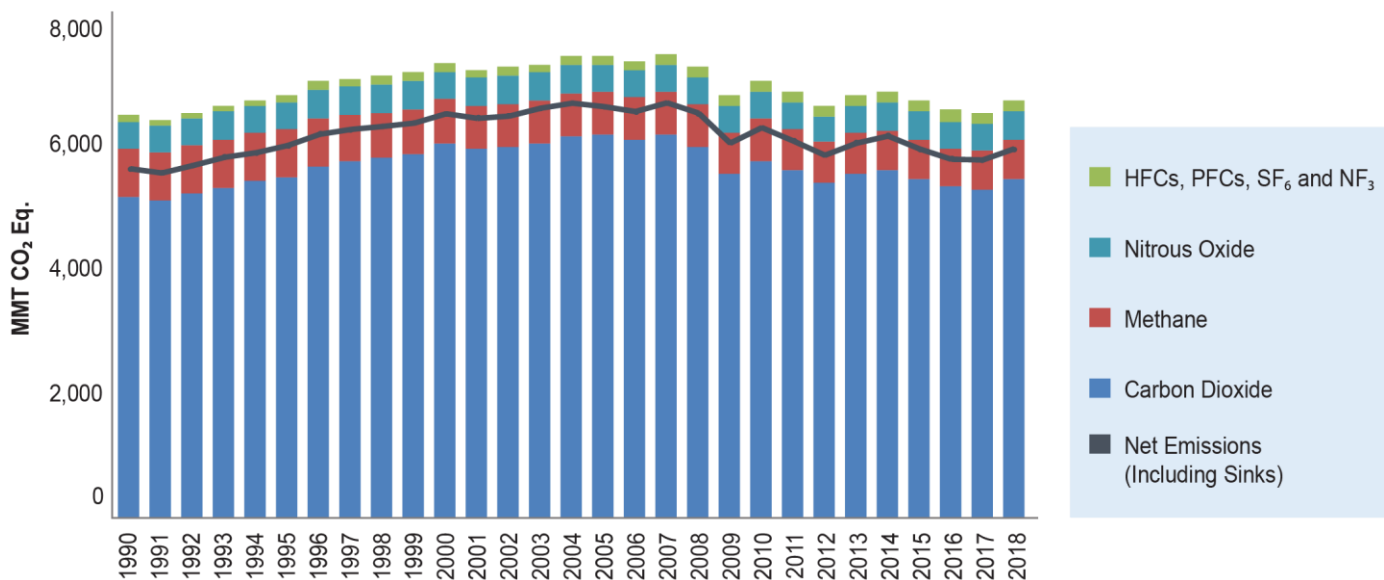
In preparing the annual Inventory, EPA collaborates with hundreds of experts representing more than a dozen U.S. government agencies, academic institutions, industry associations, consultants, and environmental organizations. EPA also collects greenhouse gas emission data from individual facilities and suppliers of certain fossil fuels and industrial gases through its [Greenhouse Gas Reporting Program \(GHGRP\)](#). The GHGRP does not provide full coverage of total annual U.S. greenhouse emissions and sinks (e.g., the GHGRP excludes emissions from the agricultural, land use, and forestry sectors), but it is an important input to the calculations of national-level emissions in the Inventory.

Highlights of Recent Trends in Emissions and Sinks

GHG emissions show long-term decline since 2005, with annual variation

In 2018, total gross U.S. greenhouse gas emissions were 6,677 million metric tons of carbon dioxide equivalent (MMT CO₂ Eq.). Net emissions (including sinks) were 5,903 MMT CO₂ Eq. From 2005 to 2018, net emissions declined 10 percent, reflecting long-term trends in many factors including population, economic growth, energy markets, technological changes including energy efficiency, and energy fuel choices. The decline in recent years is due to an increasing shift to use of less CO₂-intensive natural gas for generating electricity and a rapid increase in the use of renewable energy in the electric power sector. Between 2017 and 2018, greenhouse gas emissions increased 3 percent due to multiple factors, including increased energy use from greater heating and cooling needs due to a colder winter and hotter summer in 2018 compared to 2017. Since 1990, net emissions have increased 6 percent.

Total U.S. Greenhouse Gas Emissions by Gas

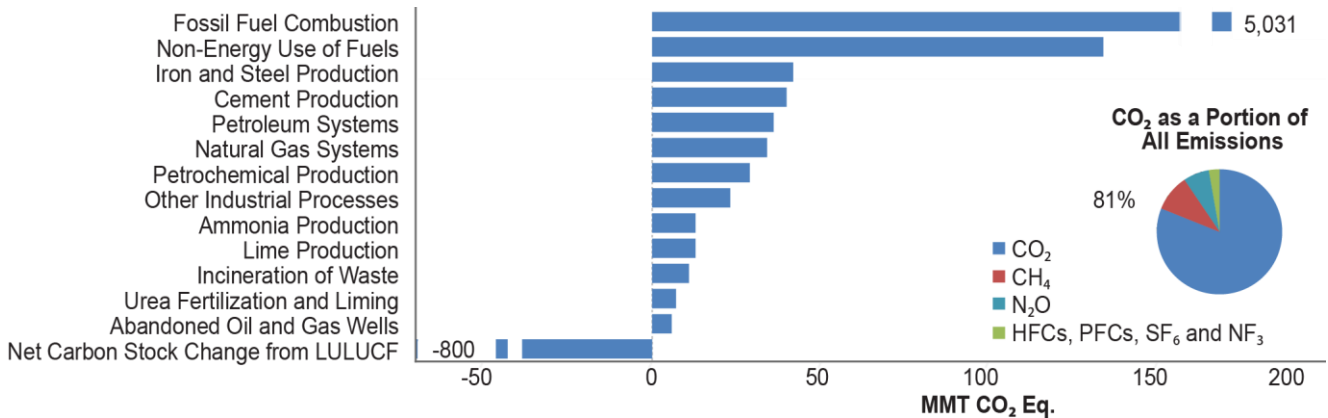


More about Carbon Dioxide

CO₂ is the primary greenhouse gas contributing to total U.S. emissions, accounting for 81 percent of the total in 2018. Total CO₂ emissions increased 3 percent between 2017 and 2018. In 2018, fossil fuel combustion (e.g., for electric power generation) accounted for nearly 93 percent of CO₂ emissions. Changes in CO₂ emissions from fossil fuel combustion are influenced by many of the same long-term and short-term factors already noted above. Fossil fuel combustion CO₂ emissions also depend on the type of fuel consumed (e.g., natural gas) and its carbon intensity.

Other sources of U.S. CO₂ emissions include non-combustion emissions from industrial processes (e.g., cement production) and changes in land use. Land use, land-use change and forestry (LULUCF) activities include fluxes of carbon resulting from land use conversions (e.g., emissions from conversion of forest land to agricultural or urban use) or land use management practices that remove CO₂ from the atmosphere and store it in long-term carbon sinks (e.g., through net forest growth). The LULUCF sector offset about 12 percent of total gross U.S. emissions in 2018 and is a steady sink across the 1990 to 2018 time series. Major U.S. sinks include long-term forests and recent conversions of other land uses to forests.

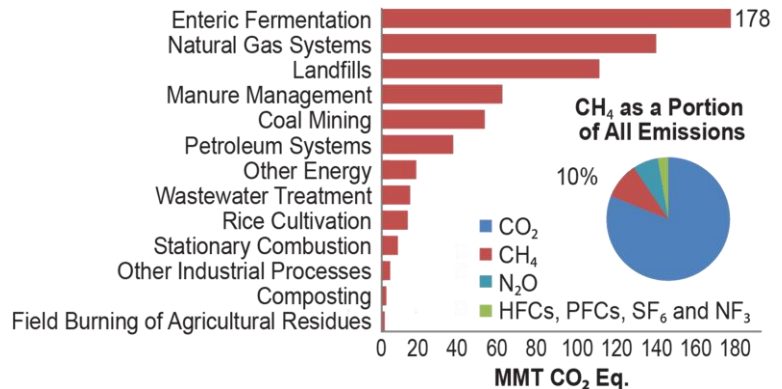
2018 Sources of Carbon Dioxide (CO₂) Emissions



More about Methane

CH₄ accounted for nearly 10 percent of emissions and has decreased 7 percent since 2005 and 18 percent since 1990. Emissions increased by less than 1 percent from 2017 to 2018. Key trends include reduced emissions from natural gas systems due to decreases in emissions from distribution, transmission, and storage; decreases in emissions from landfills due to increased landfill gas collection and less decomposable materials discarded in landfills; and increased emissions from livestock in line with increasing cattle populations.

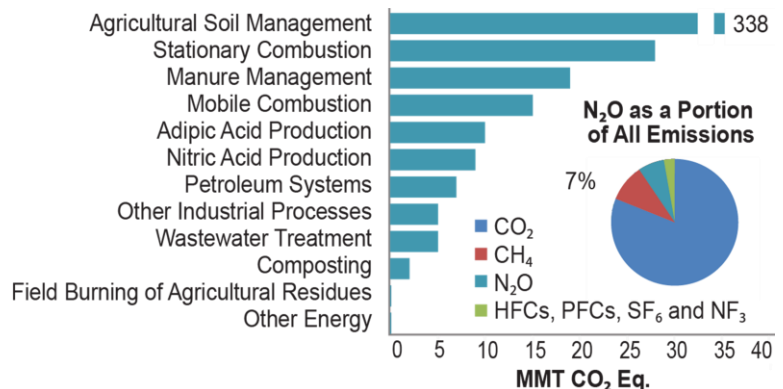
2018 Sources of Methane (CH₄) Emissions



More about Nitrous Oxide

N₂O accounted for 7 percent of emissions and has decreased by less than 1 percent since 1990. Emissions increased by 3 percent from 2017 to 2018. Key trends in N₂O emissions are influenced by changes in emissions from agricultural soils due to interannual weather patterns, fertilizer use, and crop production; an increase of N₂O emissions from stationary combustion; and a decrease in N₂O emissions from mobile combustion due to national emission control standards and technologies for on-road vehicles.

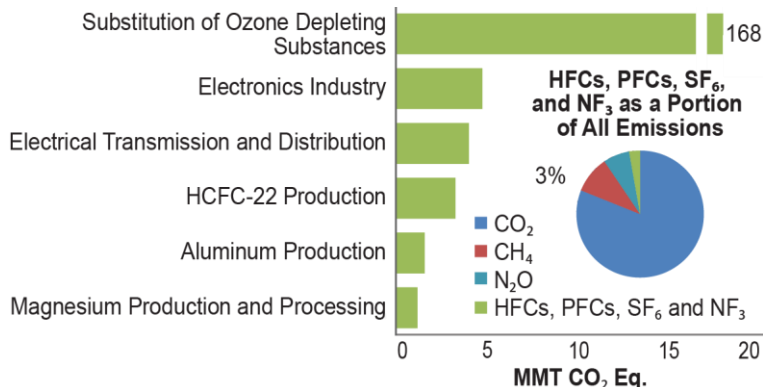
2018 Sources of Nitrous Oxide (N₂O) Emissions



More about Fluorinated Gases

Emissions of fluorinated gases accounted for 3 percent of emissions and have increased by 24 percent since 2005 and 83 percent since 1990. Emissions decreased by less than 1 percent since 2017. Key trends include a significant increase in HFCs and PFCs resulting from the substitution of ozone depleting substances (ODS) as a result of efforts to phase out CFCs and other ODS in the U.S., and increases in emissions from the electronics industry reflecting the competing influences of industrial growth and the adoption of emission reduction technologies.

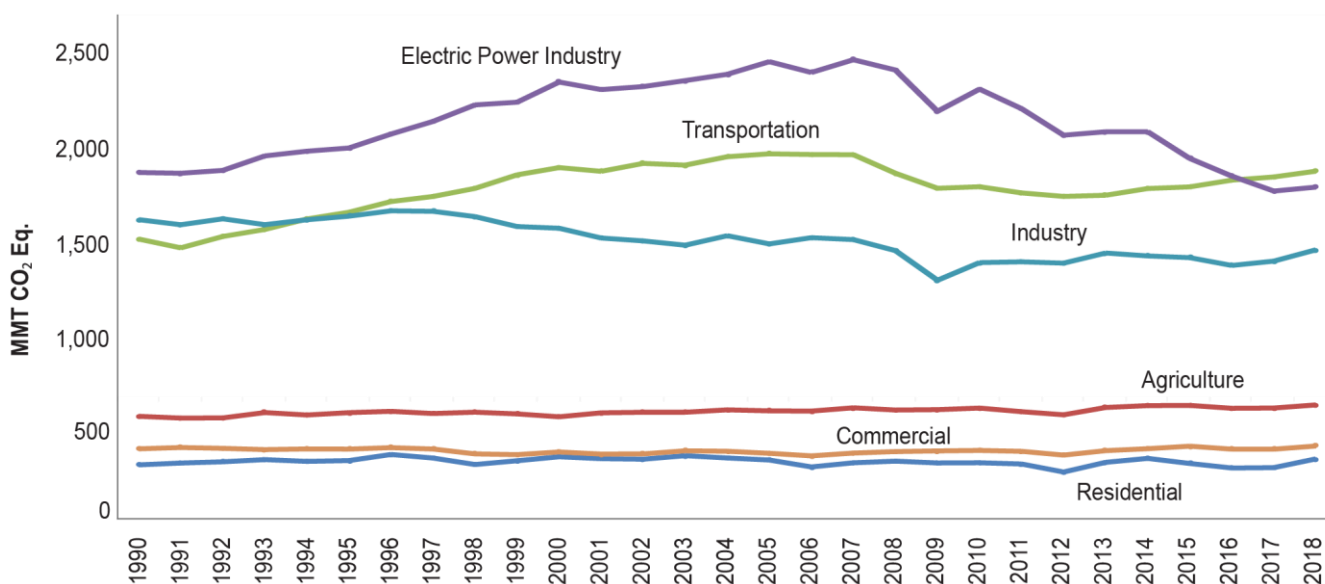
2018 Sources of Fluorinated (HFCs, PFCs, SF₆, and NF₃) Emissions



Emissions by Economic Sector

Greenhouse gases are emitted across five economic sectors: transportation, electric power (electricity generation), residential/commercial (homes and businesses), industry, and agriculture. For more information on trends in the land use, land use change and forestry sector, see textbox above titled More about Carbon Dioxide.

U.S. Greenhouse Gas Emissions Allocated to Economic Sectors*

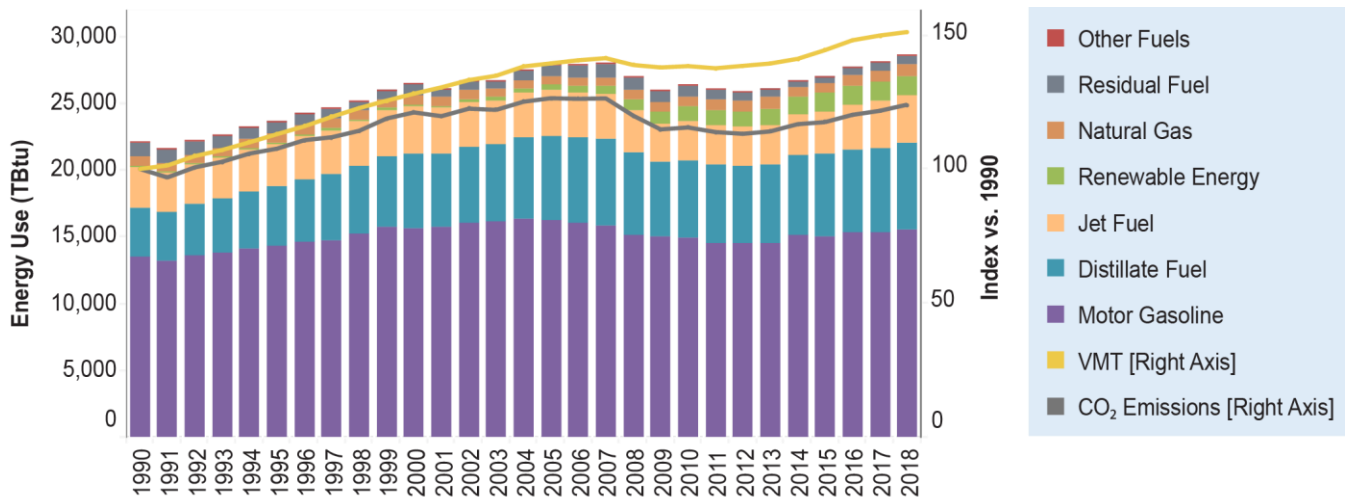


*Land use sinks and U.S. territories are excluded from this figure.

Transportation Sector

Transportation activities are the largest source of emissions, accounting for 28 percent of total U.S. greenhouse gas emissions in 2018, and have increased by 2 percent since 2017. From 1990 to 2018, transportation emissions from fossil fuel combustion rose by 21 percent due in large part to increased demand for travel. The number of vehicle miles traveled (VMT) by light-duty vehicles (i.e., passenger cars and light-duty trucks) increased by 46 percent from 1990 to 2018; VMT by medium- and heavy-duty trucks increased 113 percent over the same period. While an increased demand for travel has led to increasing CO₂ emissions since 1990, improvements in average new vehicle fuel economy since 2005 has slowed the rate of increase of CO₂ emissions. In 2018, light-duty vehicles represented 58 percent of CO₂ emissions from transportation fossil fuel combustion and medium- and heavy-duty trucks and buses represented 25 percent. Petroleum-based products supplied 95 percent of the energy used for transportation, with 57 percent from gasoline consumption in automobiles and other highway vehicles. Diesel fuel for freight trucks and jet fuel for aircraft accounted for 24 and 13 percent of fuel consumption, respectively. The remaining 6 percent of petroleum-based energy used for transportation was supplied by natural gas, residual fuel, aviation gasoline, and liquefied petroleum gases.

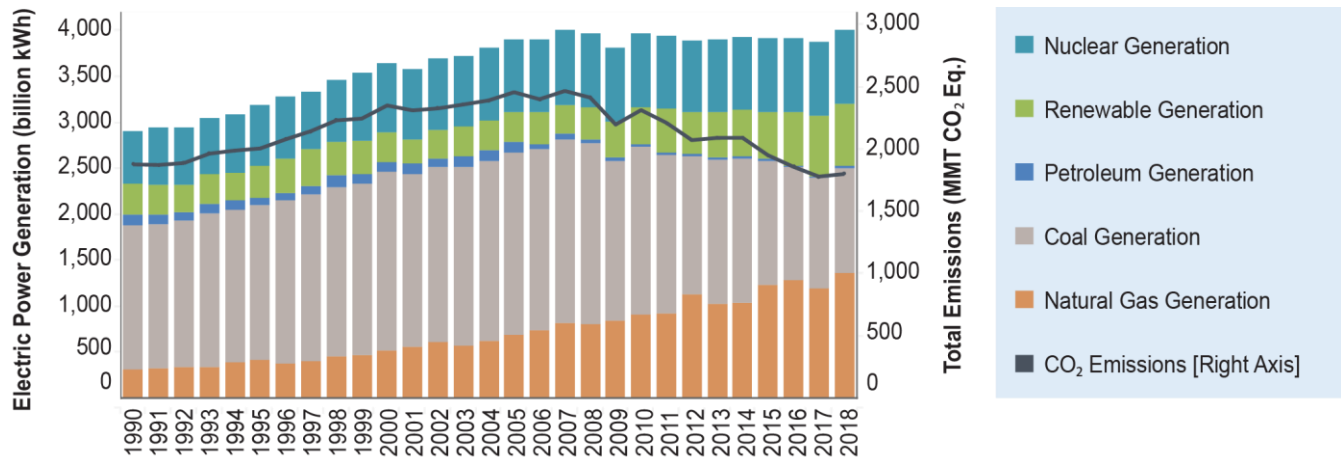
Fuels Used in Transportation Sector, Onroad VMT, and Total Sector CO₂ Emissions



Electric Power Sector

The electric power sector accounted for 27 percent of total U.S. greenhouse gas emissions in 2018. While emissions from the electric power sector have decreased by approximately 4 percent since 1990, the carbon intensity of the electric power sector, in terms of emissions (CO₂ Eq.) per QBtu input, has significantly decreased—by 13 percent—during that same timeframe. This decoupling of electric power generation and the resulting CO₂ emissions is shown below.

Electric Power Generation and Emissions

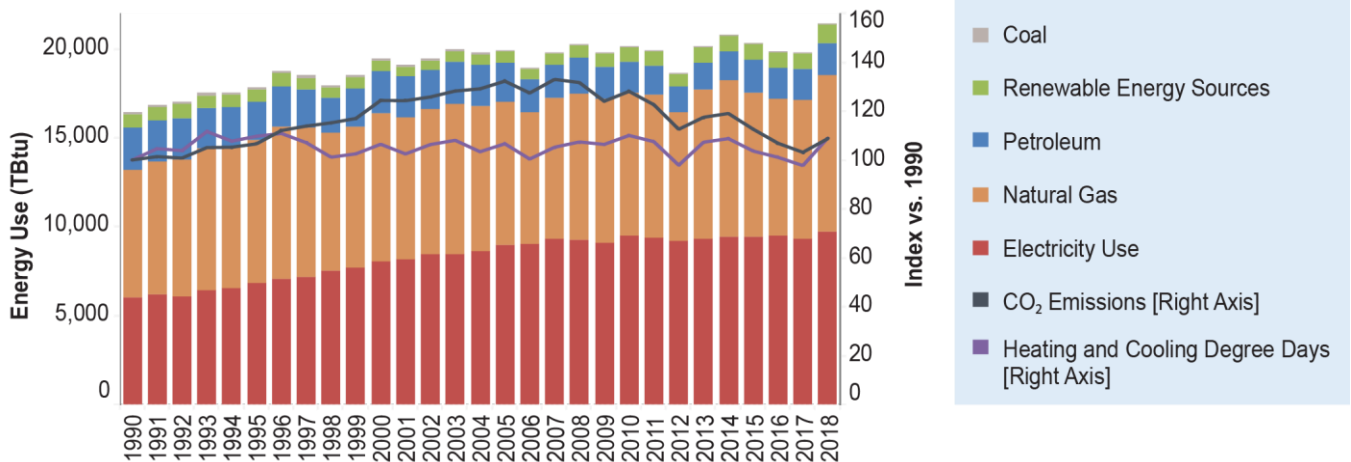


Trends in CO₂ emissions from fossil fuel combustion have been strongly influenced by the electric power sector, which historically has accounted for the largest share of these emissions. The types of fuel consumed to produce electricity have changed in recent years. Total electric power generation increased by 3 percent from 2017 to 2018. However, CO₂ emissions only increased 1 percent from 2017 to 2018 due to increasing electric power generation from natural gas and renewables and decreasing generation from coal. Carbon dioxide emissions from coal consumption for electric power generation decreased by 42 percent since 2005. The decrease in coal-powered electricity generation and increase in natural gas and renewable electricity generation have contributed to a 27 percent decrease in overall CO₂ emissions from electric power generation from 2005 to 2018.

Commercial and Residential Sectors

The commercial and residential sectors accounted for 7 and 6 percent total U.S. greenhouse gas emissions in 2018, respectively. Emissions from the commercial and residential sectors have increased since 1990 and short-term trends are often correlated with seasonal fluctuations in energy use caused by weather conditions. Emissions from natural gas consumption in the residential and commercial sectors increased by 13 percent and 11 percent from 2017 to 2018, respectively. This trend can largely be attributed to a 12 percent increase in heating degree days, which led to an increased demand for heating fuel in these sectors.

Fuels Used in Residential and Commercial Sectors, Heating and Cooling Degree Days, and Total Sector CO₂ Emissions



Industry

The industrial sector accounted for 22 percent of U.S. greenhouse gas emissions in 2018. Since 1990, industrial sector emissions have declined by 10 percent. Structural changes within the U.S. economy that led to shifts in industrial output away from energy-intensive manufacturing products to less energy-intensive products (e.g., from steel to computer equipment) have had a significant effect on industrial emissions. EPA’s GHGRP data provide insights into underlying trends in the industrial sector. Between 2017 and 2018, industrial sector coal consumption increased in specific industries, including chemical manufacturing; pulp, paper and print; food processing, beverages and tobacco; and minerals manufacturing.

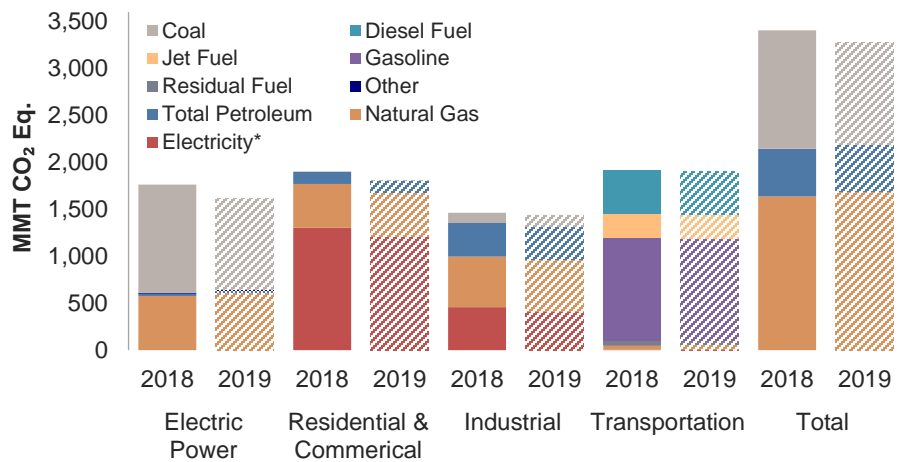
Agriculture

Agriculture accounted for 10 percent of U.S. greenhouse gas emissions in 2018 and includes a variety of processes, including enteric fermentation in domestic livestock, livestock manure management, and agricultural soil management. In 2018, agricultural soil management was the largest source of N₂O emissions, and enteric fermentation was the largest source of CH₄ emissions in the United States.

Preliminary Outlook for 2019

Carbon dioxide emissions from fossil fuel combustion represent about 75 percent of total U.S. CO₂ emissions. While the current Inventory does not include 2019 estimates, preliminary energy data are available for 2019 and can be used to project energy-related CO₂ emissions. Preliminary 2019 data are not available for other sectors to provide projections. The preliminary estimates indicate fossil fuel combustion CO₂ emissions will decrease by about 3 percent in 2019 compared to 2018 (U.S. EIA 2020b). Carbon dioxide emissions from the electric power sector are projected to represent the largest decline in 2019 compared to 2018. This reflects the continuing trend of increasing electricity generation from natural gas and renewables and decreasing generation from coal (EPA 2019), as well as an anticipated decrease in electricity demand due in part to milder weather in 2019 compared to 2018 and associated lower space heating and cooling demand (U.S. EIA 2020a). Transportation sector CO₂ emissions are anticipated to remain relatively unchanged compared to 2018 and continue to be the largest source of fossil fuel combustion CO₂ emissions in 2019 (U.S. EIA 2020a).

Comparison of Fossil Fuel CO₂ Combustion Emissions by Sector in 2018 and 2019 Projection



* Electric power emissions allocated to end use sectors.

References

EPA (2020) *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*. Office of Atmospheric Programs, U.S. Environmental Protection Agency (EPA Publication No. 430-R-20-002). Available online at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2018>

U.S. Energy Information Administration (EIA) (2020a) *March 2020 Monthly Energy Review*. Available online at: <https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>

U.S. EIA (2020b) *Short-Term Energy Outlook (STEO): March 2020*. Available online at: <https://www.eia.gov/outlooks/steo/>

EPA (2019) *Clean Air Markets: Power Plant Emission Trends*. Available online at: <https://www.epa.gov/airmarkets/power-plant-emission-trends>

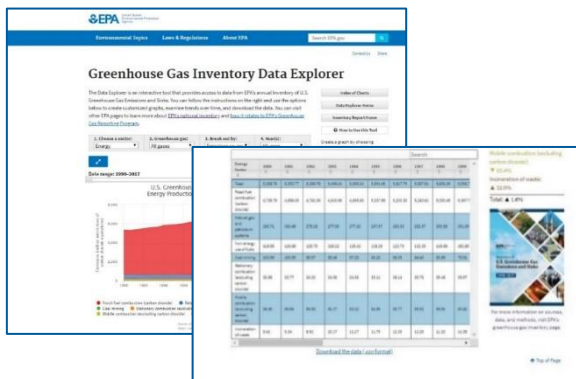
For More Information

Additional resources and tools with more information and data related to the U.S. Greenhouse Gas Inventory are available at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>.

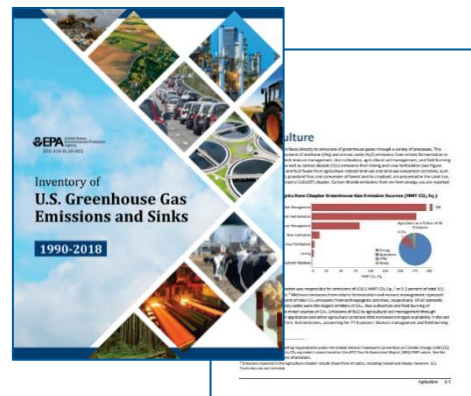
Fast Facts on the National-Level U.S. Greenhouse Gas Inventory and U.S. Transportation sector provide a quick look at trends and an overview of findings



The Greenhouse Gas Inventory Data Explorer allows users to visualize the data underlying U.S. Inventory estimates



The full *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018* report [here](#) provides access to in-depth information on data sources and methodologies



Download CSVs of the Inventory report tables for your own use

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1994	1995	1996	1997	1998
Total	97,762	559,168	552,137	558,284	561,875	570,128	574,754	565,845	574,441	556,157	519,966	538,456	496,575	507,555	520,333	529,913	530,448
Land use change and forestry	1,0855	250,039	252,424	248,588	247,442	246,983	249,279	252,897	250,870	256,071	243,671	245,027					
Buildings	2,9535	140,171	132,564	136,326	129,974	148,137	139,622	140,882	123,413	125,895	106,667	114,151					
Manufacturing and construction	51,184	77,018	75,964	71,140	71,129	72,184	70,718	72,075	71,184	61,97	66,212	68,914					
Transportation	67,118	37,513	36,644	37,816	39,330	40,837	42,158	41,370	42,190	41,992	39,552	42,652					
International aviation and shipping	42,056	62,231	59,629	57,388	55,096	51,988	48,599	45,928	41,035	37,499	35,169	33,709					
Land use, land-use change, and forestry	36,348	11,493	11,777	12,212	12,486	12,762	12,858	12,910	13,102	12,249	11,658	11,377					
Buildings	61,768	616,634	609,369	612,179	617,167	628,019	630,795	622,856	629,171	617,153	571,886	589,438					
Manufacturing and construction													63,224	64,690	65,769	66,519	66,607
Transportation													11,269	11,701	12,304	12,262	11,218
International aviation and shipping													539,756	530,775	539,791	549,242	558,243
Total													539,756	530,775	539,791	549,242	558,243