EPA United States Environmental Protection Agency
430-K-20-001

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).

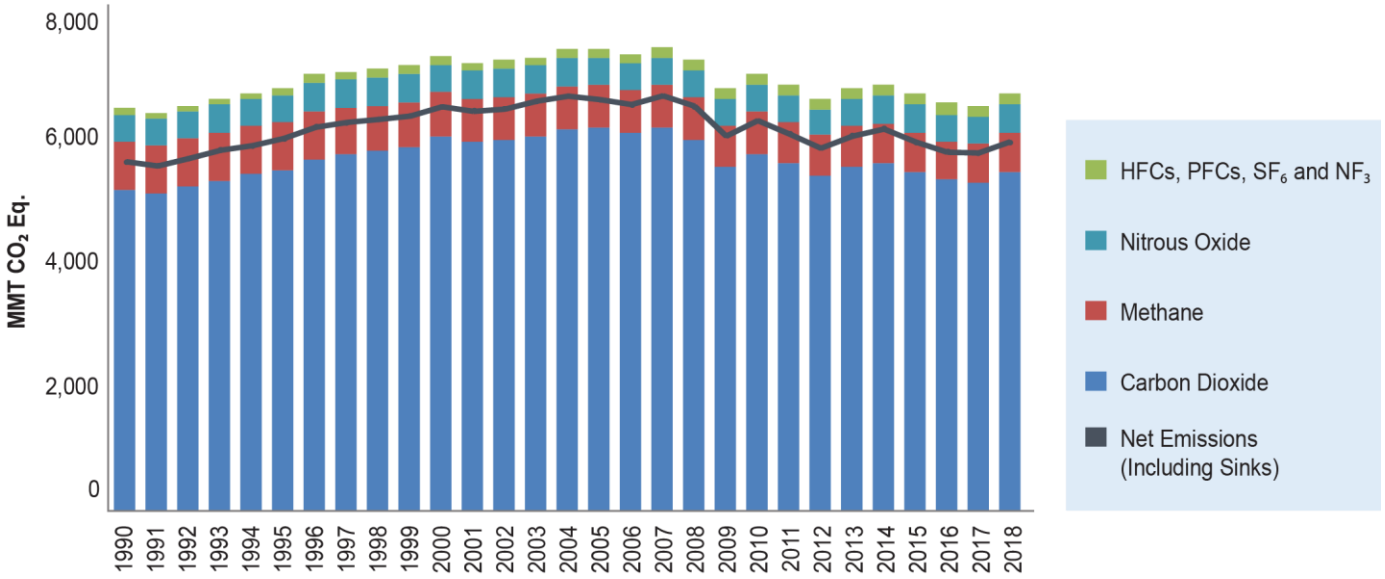
In preparing the annual Inventory, EPA collaborates with hundreds of experts representing more than a dozen U.S. government agencies, academic institutions, industry associations, consultants, and environmental organizations. EPA also collects greenhouse gas emission data from individual facilities and 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 CO_2 Eq.). Net emissions (including sinks) were 5,903 MMT CO_2 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 CO_2-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

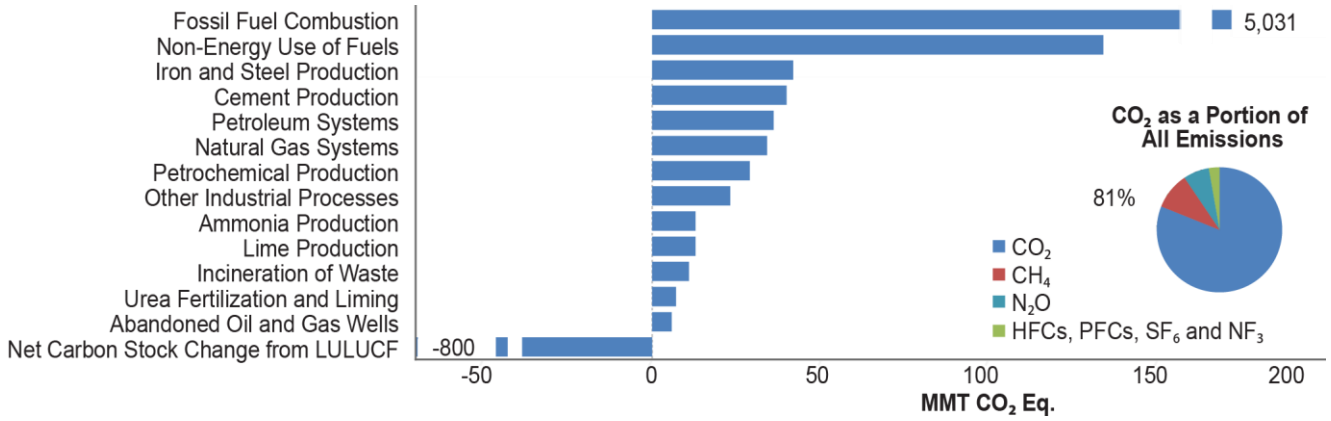


More about Carbon Dioxide

CO_2 is the primary greenhouse gas contributing to total U.S. emissions, accounting for 81 percent of the total in 2018. Total CO_2 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 CO_2 emissions. Changes in CO_2 emissions from fossil fuel combustion are influenced by many of the same long-term and short-term factors already noted above. Fossil fuel combustion CO_2 emissions also depend on the type of fuel consumed (e.g., natural gas) and its carbon intensity.

Other sources of U.S. CO_2 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 CO_2 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.

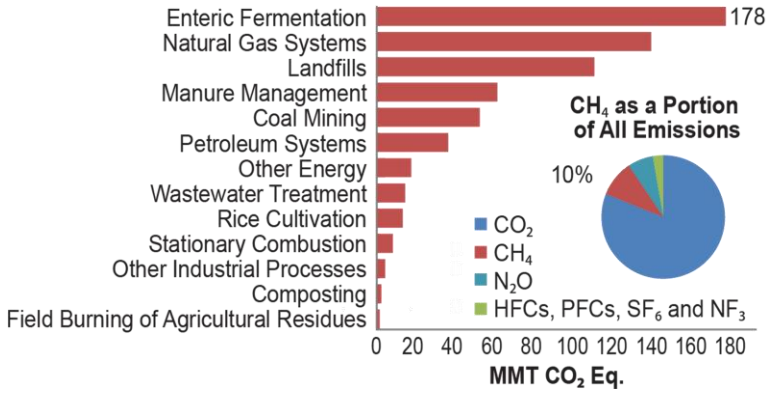
2018 Sources of Carbon Dioxide (CO_2) Emissions



More about Methane

CH_4 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.

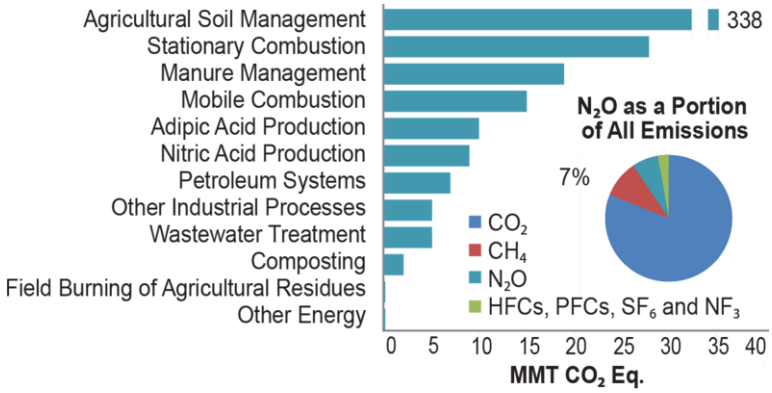
2018 Sources of Methane (CH_4) Emissions



More about Nitrous Oxide

N_2O 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 N_2O emissions are influenced by changes in emissions from agricultural soils due to interannual weather patterns, fertilizer use, and crop production; an increase of N_2O emissions from stationary combustion; and a decrease in N_2O emissions from mobile combustion due to national emission control standards and technologies for on-road vehicles.

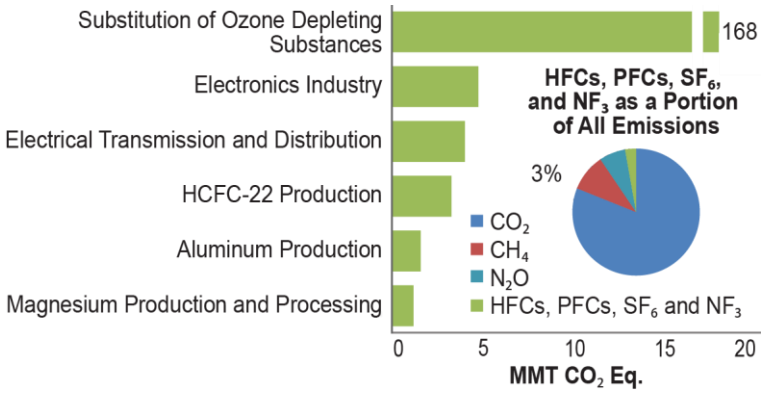
2018 Sources of Nitrous Oxide (N_2O) Emissions



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.

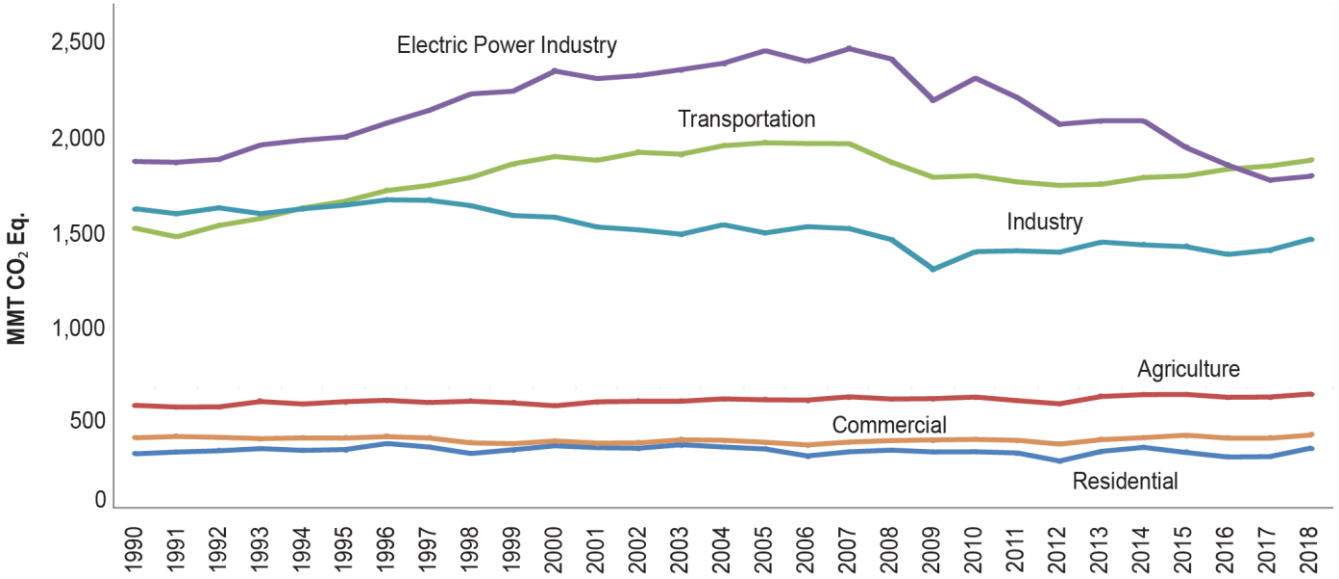
2018 Sources of Fluorinated (HFCs, PFCs, SF_6, and NF_3) Emissions



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*

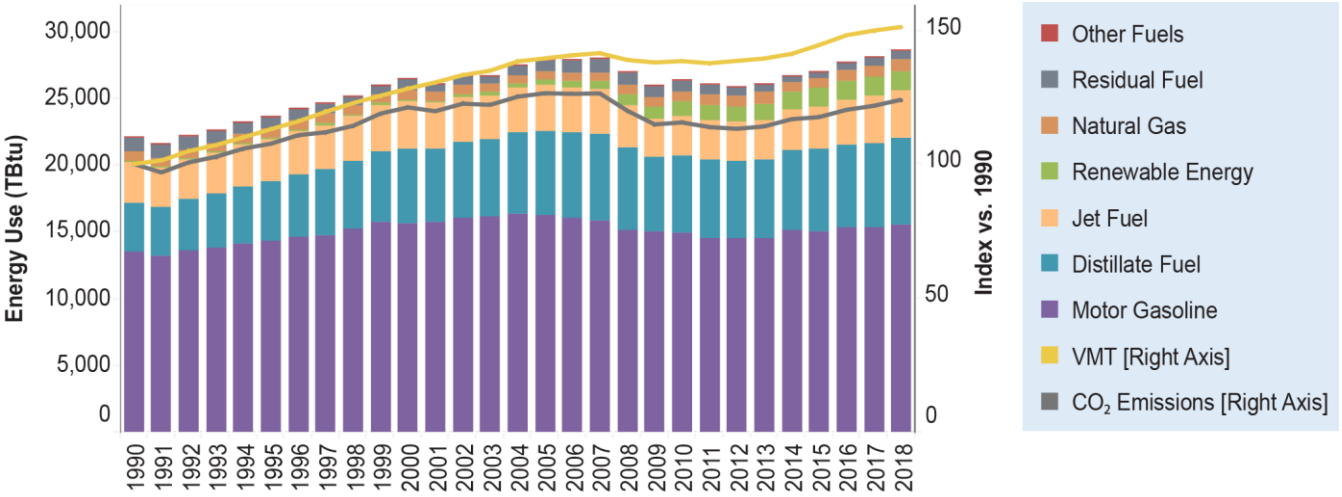


*Land use sinks and U.S. territories are excluded from this figure.

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 CO_2 emissions since 1990, improvements in average new vehicle fuel economy since 2005 has slowed the rate of increase of CO_2 emissions. In 2018, light-duty vehicles represented 58 percent of CO_2 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.

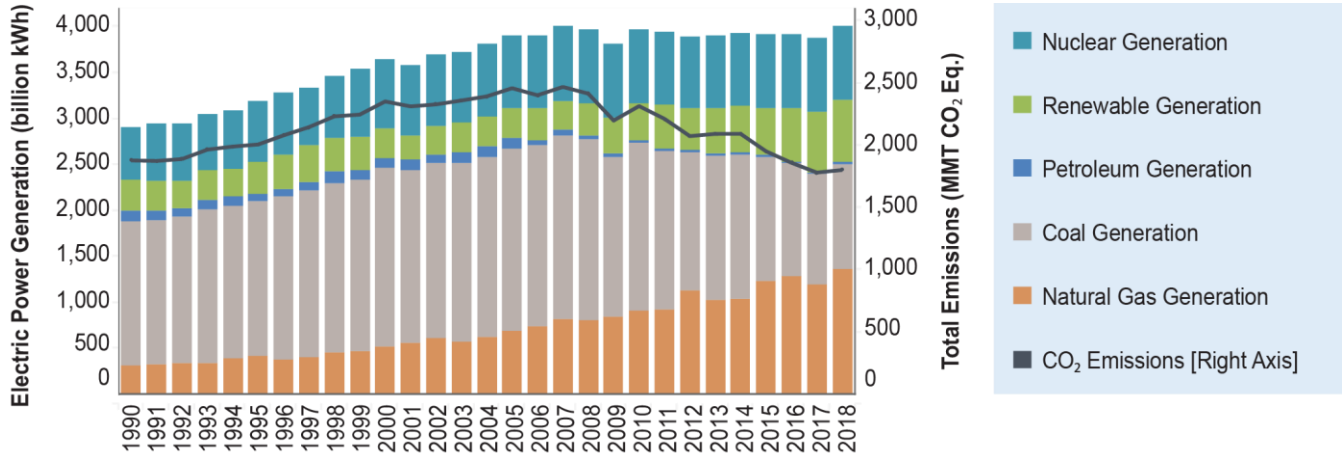
Fuels Used in Transportation Sector, Onroad VMT, and Total Sector CO_2 Emissions



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 (CO_2 Eq.) per QBtu input, has significantly decreased–by 13 percent–during that same timeframe. This decoupling of electric power generation and the resulting CO_2 emissions is shown below.

Electric Power Generation and Emissions

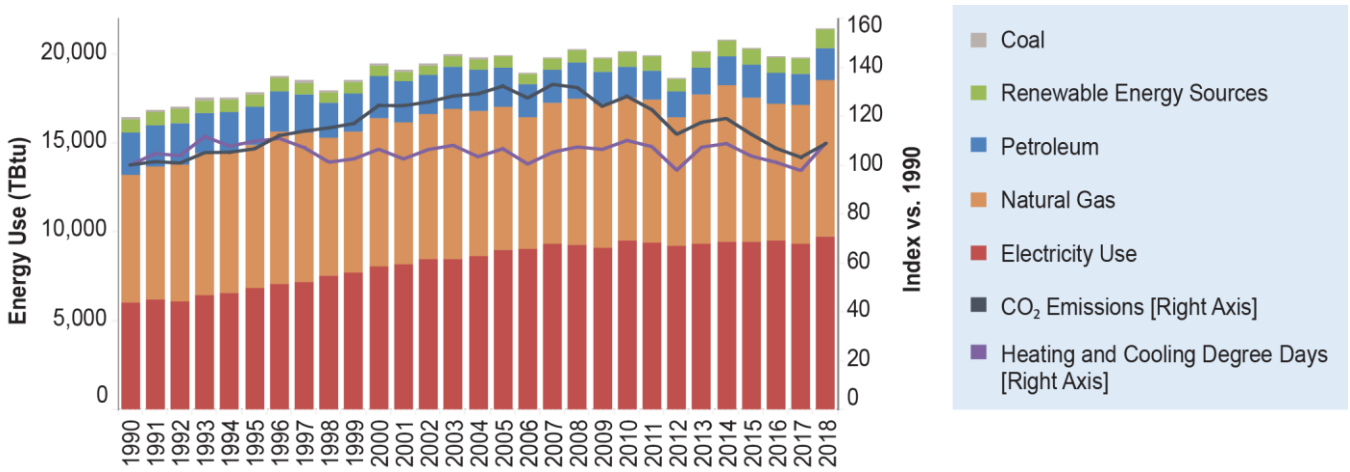


Trends in CO_2 emissions from fossil fuel combustion have been strongly influenced by the electric power sector, which historically has accounted for the largest share of these emissions. The types of fuel consumed to produce electricity have changed in recent years. Total electric power generation increased by 3 percent from 2017 to 2018. However, CO_2 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 CO_2 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 CO_2 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 decreased, and natural gas 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 N_2O emissions, and enteric fermentation was the largest source of CH_4 emissions in the United States.

Preliminary Outlook for 2019

Carbon dioxide emissions from fossil fuel combustion represent about 75 percent of total U.S. CO_2 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 CO_2 emissions. Preliminary 2019 data are not available for other sectors to provide projections. The preliminary estimates indicate fossil fuel combustion CO_2 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 CO_2 emissions are anticipated to remain relatively unchanged compared to 2018 and continue to be the largest source of fossil fuel combustion CO_2 emissions in 2019 (U.S. EIA 2020a).

Comparison of Fossil Fuel CO_2 Combustion Emissions by Sector in 2018 and 2019 Projection*

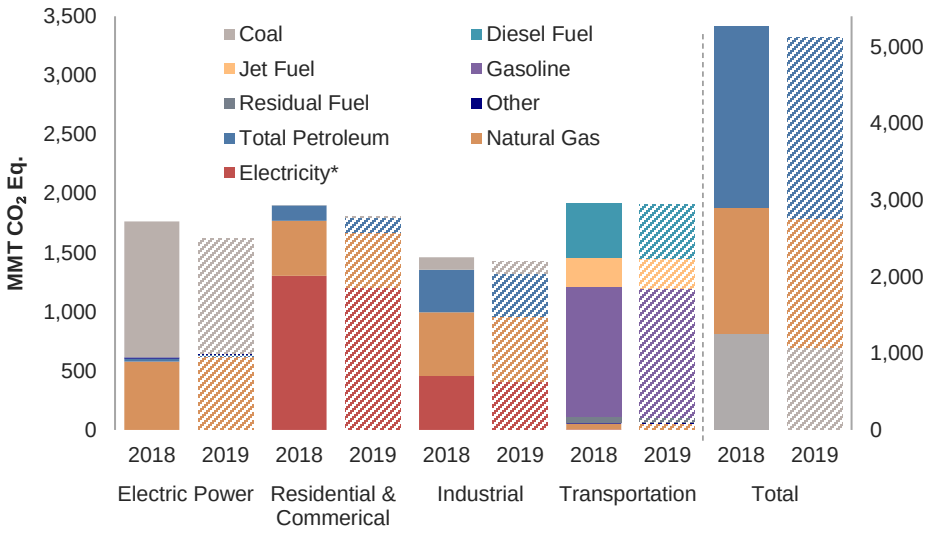


*Figure updated 2/26 to correct error in reporting of Total Emissions

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

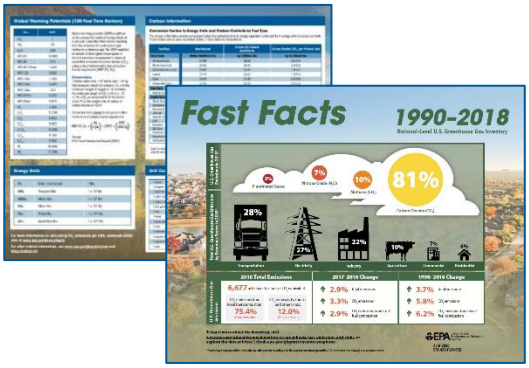
U.S. EIA (2020b) *Short-Term Energy Outlook (STEO): March 2020*. Available online at: https://www.eia.gov/outlooks/steo/

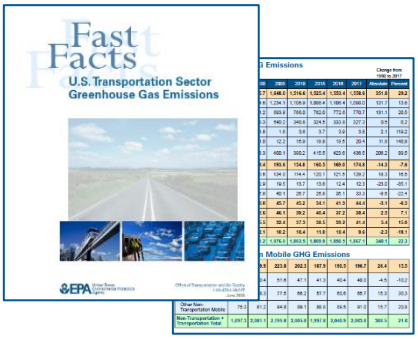
EPA (2019) Clean Air Markets: Power Plant Emission Trends. Available online at: https://www.epa.gov/airmarkets/power-plant-emission-trends

For More Information

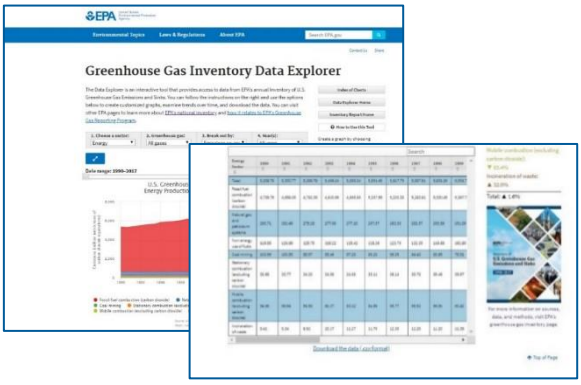
Additional resources and tools with more information and data related to the U.S. Greenhouse Gas Inventory are available at: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

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

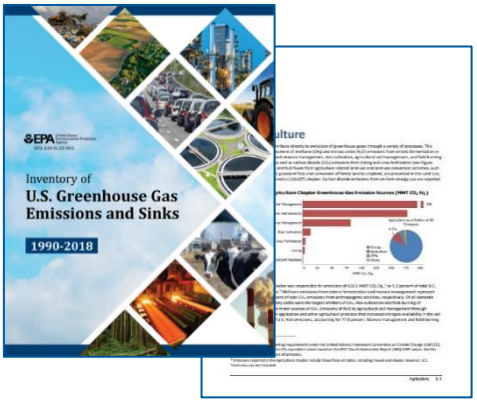




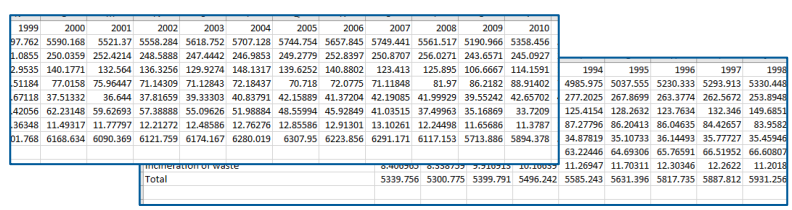
The Greenhouse Gas Inventory Data Explorer allows users to visualize the data underlying U.S. Inventory estimates



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



1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1994	1995	1996	1997	1998
97.762	5590.168	5521.37	5558.284	5618.752	5707.128	5744.754	5657.845	5749.441	5561.517	5190.966	5358.456	4985.975	5037.555	5230.333	5293.913	5330.448
1.0855	250.0359	252.4214	248.5888	247.4442	246.9853	249.2779	252.8397	250.8707	256.0271	243.6571	245.0927	277.2025	267.8699	263.3774	262.5672	253.8948
2.9535	140.1771	132.564	136.3256	129.9274	148.1317	139.6252	140.8802	123.413	125.895	106.6667	114.1591	125.4154	128.2632	123.7634	132.346	149.6851
51184	77.0158	75.96447	71.14309	71.12843	72.18437	70.718	72.0775	71.11848	81.97	86.2182	88.91402	87.27796	86.20413	86.04635	84.42657	83.9582
67118	37.51332	36.644	37.81659	39.33303	40.83791	42.15889	41.37204	42.19085	41.99929	39.55242	42.65702	34.87819	35.10733	36.14493	35.77727	35.45946
42056	62.23148	59.62693	57.38888	55.09626	51.98884	48.55994	45.92849	41.03515	37.49963	35.16869	33.7209	63.22446	64.69306	65.76591	66.51952	66.60807
36348	11.49317	11.77797	12.21272	12.48586	12.76276	12.85586	12.91301	13.10261	12.24498	11.65686	11.3787	11.26947	11.70311	12.30346	12.2622	11.2018
01.768	6168.634	6090.369	6121.759	6174.167	6280.019	6307.95	6223.856	6291.171	6117.153	5713.886	5894.378	5585.243	5631.396	5817.735	5887.812	5931.256
Incineration of waste								8.400503	8.338735	9.910915	10.10039					
Total								5339.756	5300.775	5399.791	5496.242					