2016 GHGRP Data Highlights

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GHGRP 2016: Reported data

7,631 facilities in nine industry sectors reported direct emissions. For reporting year (RY) 2016, over 8,100 facilities and suppliers reported to the greenhouse gas reporting program. Among these reporters,

- Reported direct emissions totaled 2.99 billion metric tons carbon dioxide equivalent (CO_2e), about half of total U.S. greenhouse gas emissions;
- 950 suppliers of fossil fuels and industrial gases reported; and
- 104 facilities reported injecting CO_2 underground.

Summary GHGRP data has been broken into several sections. Click the links below to expand each section.

All greenhouse gas data presented here reflect the information reported to EPA as of August 5, 2017. The reported emissions **exclude biogenic CO_2**. GHG data displayed are in units of carbon dioxide equivalent (CO_2e) and reflect the global warming potential (GWP) values from Table A-1 , which is generally based on the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report (AR4). The GWPs for some fluorinated GHGs that did not have GWPs in the AR4 are from the IPCC's Fifth Assessment Report.

Greenhouse Gas Reporting Program Background

As directed by Congress, EPA's Greenhouse Gas Reporting Program (GHGRP) collects annual greenhouse gas information from the top emitting sectors of the U.S. economy (Table 1). The GHGRP is the only dataset containing facility-level greenhouse gas (GHG) emissions data from large industrial sources across the United States. With six consecutive years of reporting for most sectors, GHGRP data are providing important new information on industrial emissions—showing variation in emissions across facilities within an industry, variation in industrial emissions across geographic areas, and changes in emissions over time at the sector and facility level. EPA is using this facility-level data to improve estimates of national greenhouse gas emissions in the U.S. Greenhouse Gas Inventory.

This document summarizes national industrial sector emissions and trends.

Table 1: GHGRP Sector Classifications

Industry Sector	Number of Reporters	Emissions (Million Metric Tons CO_2e)
Power Plants	1,405	1,876.3
Petroleum and Natural Gas Systems	2,248	282.9
Onshore Petroleum & Nat. Gas Prod.	512	85.4
Offshore Petroleum & Nat. Gas Prod.	134	7.3
Onshore Pet. & Nat. Gas Gathering & Boosting	299	83.0
Natural Gas Processing	447	55.9
Natural Gas Transmission/Compression	525	22.4
Onshore Natural Gas Transmission Pipelines	27	4.4
Underground Natural Gas Storage	53	1.5
Natural Gas Local Distribution Companies	169	14.2

Table 1: GHGRP Sector Classifications

Industry Sector	Number of Reporters	Emissions (Million Metric Tons CO_2e)
Liquefied Natural Gas Import/Export Equp.	6	2.0
LNG Storage	6	**
Other Petroleum & Natural Gas Systems	92	6.8
Refineries	145	179.3
Chemicals	454	176.6
Non-Fluorinated Chemicals		
Adipic Acid Production	3	8.7
Ammonia Manufacturing	26	28.3
Hydrogen Production	112	44.7
Nitric Acid Production	34	10.3
Petrochemical Production	66	53.5
Phosphoric Acid Production	12	1.5
Silicon Carbide Production	1	0.1
Titanium Dioxide Production	6	2.4
Other Chemicals	204	19.8
Fluorinated Chemicals		
Fluorinated GHG Production	14	4.5
HCFC-22 Prod./HFC-23 Dest.	4	2.8
Waste	1,505	107.4
Industrial Waste Landfills	172	8.7
MSW Landfills	1,137	86.6
Solid Waste Combustion	63	10.2
Industrial Wastewater Treatment	140	2.0
Metals	298	86.7
Aluminum Production	8	3.1
Ferroalloy Production	10	1.8
Iron and Steel Production	124	69.5
Lead Production	11	1.0
Magnesium Production	10	1.2
Zinc Production	5	0.6
Other Metals	130	9.4
Minerals	370	109.9
Cement Production	95	65.7
Glass Production	102	8.1
Lime Manufacturing	75	27.7
Soda Ash Manufacturing	3	3.8
Other Minerals	97	4.8
Pulp and Paper	228	37.7
Chemical Pulp and Paper Production	107	27.0
Other Paper Producers	121	10.8

Table 1: GHGRP Sector Classifications

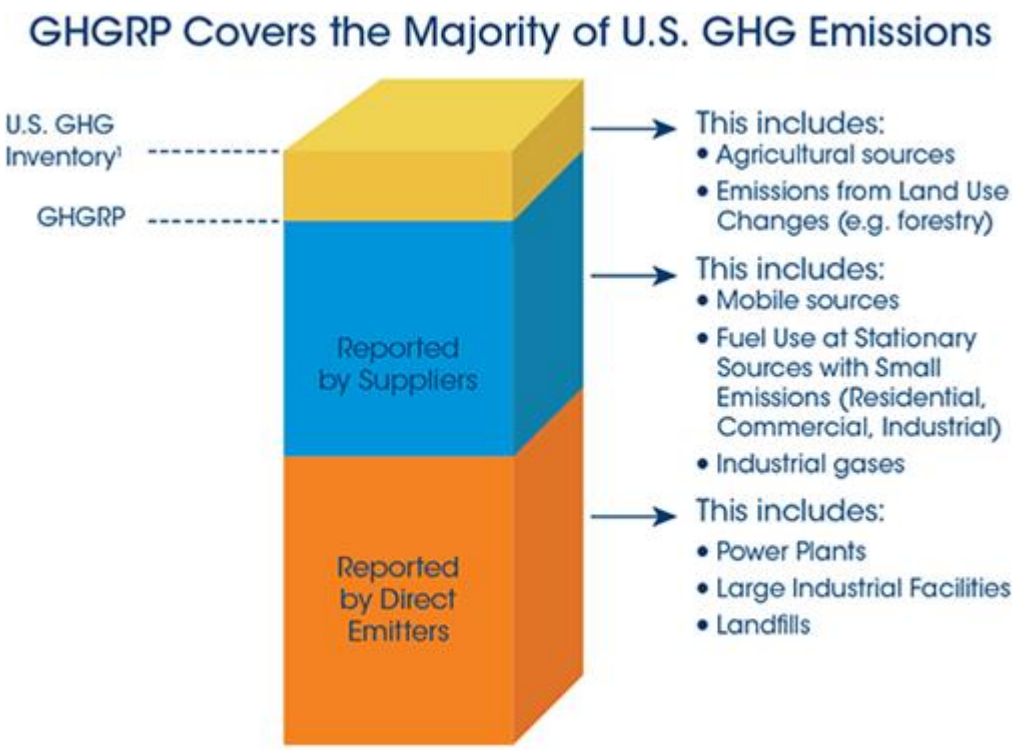
Industry Sector	Number of Reporters	Emissions (Million Metric Tons CO_2e)
Other	1,352	133.3
Food Processing	338	29.9
Ethanol Production	172	19.1
Other Manufacturing	279	15.1
Universities	114	8.7
Military	34	1.7
Other Combustion	173	10.7
Underground Coal Mines	94	38.8
Electronics Manufacturing	53	6.2
Electrical Equipment Manufacturers	7	0.1
Use of Electrical Equipment	88	3.0

** Total reported emissions are less than 0.05 million metric tons CO_2e.

The GHGRP does not represent total U.S. GHG emissions, but provides facility level data for large sources of direct emissions, thus representing the majority of U.S. GHG emissions. The GHGRP data collected from direct emitters represent about half of all U.S. emissions. When including greenhouse gas information reported to the GHGRP by suppliers, emissions coverage reaches approximately 85–90% (See Figure 1). The *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015* contains information on all GHG emissions sources and sinks in the United States.

Learn more about the differences between the Inventory and the GHGRP.

Figure 1: U.S. Greenhouse Gas Inventory and the Greenhouse Gas Reporting Program



[1] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014. April 2016.

Suppliers report the quantity of GHGs that would be emitted if the fuels and industrial GHGs that they place into the economy each year are used/released. Reporting by suppliers helps account for the greenhouse gas emissions by the numerous low-emitting sources that are not required to report emissions under the GHGRP (e.g., mobile sources, residential sources).

Table 2: Overview of GHG Data Reported (2016)

Direct emitters	
Number of facilities reporting	7,631
Reported direct emissions (billion metric tons CO_2e)	2.99
Suppliers of fuel and industrial gases	
Number of suppliers	950
Underground injection of carbon dioxide	
Number of carbon dioxide injection facilities	104

Who reports?

For 2016, 7,631 direct emitters submitted a GHG report. The Petroleum and Natural Gas Systems sector had the largest number of reporting facilities, followed by the Waste Sector and the Power Plants Sector. Among suppliers, Suppliers of Natural Gas and Natural Gas Liquids had the largest number of reporting facilities.

Table 3: Number of Direct Emitters that Reported (2016)

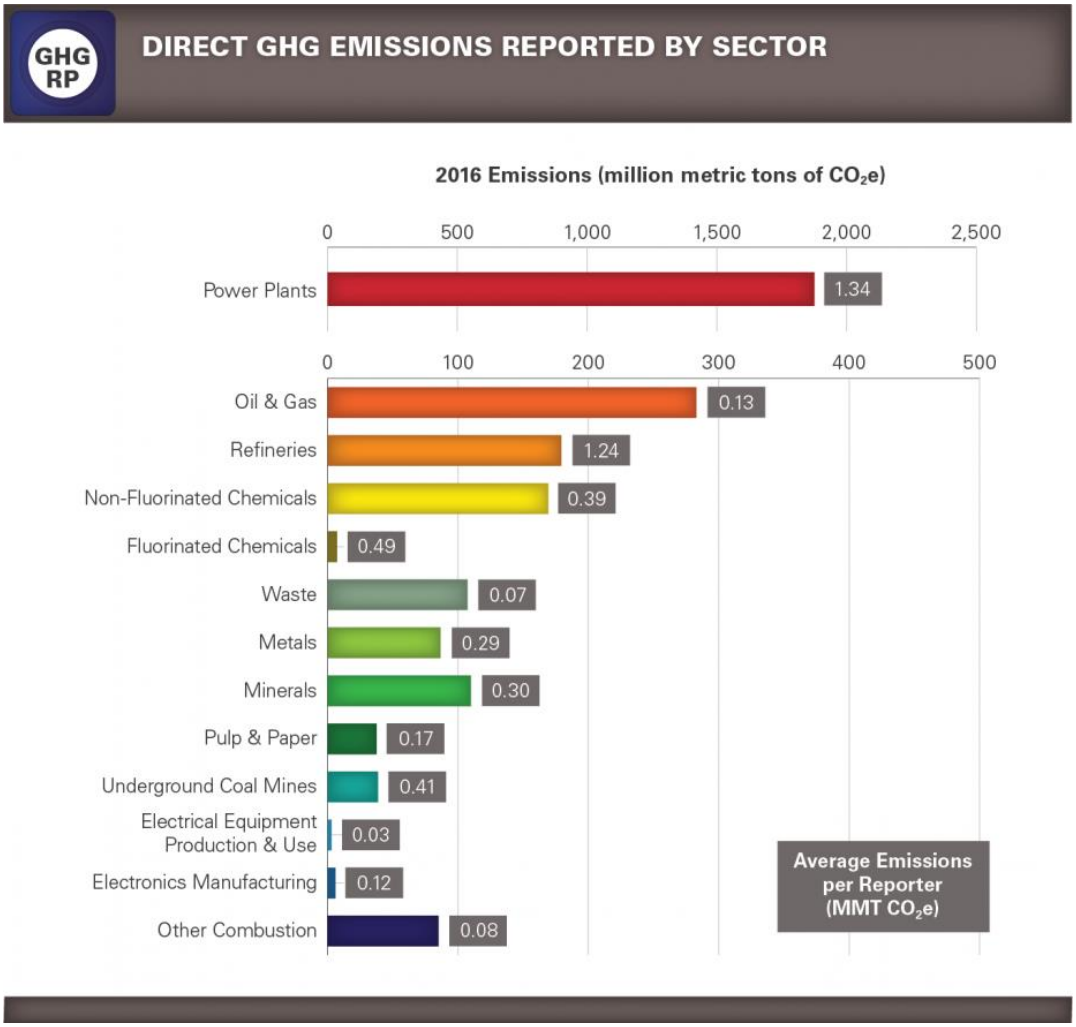
Industry Sector	Number of Reporters[1]
Power Plants	1,405
Petroleum and Natural Gas Systems	2,248
Refineries	145
Chemicals	454
• *Fluorinated Chemicals*	15
• *Non-fluorinated Chemicals*	439
Waste	1,505
Metals	298
Minerals	370
Pulp and Paper	228
Other	1,352
• *Underground Coal Mines*	94
• *Electrical Equipment Production & Use*	95
• *Electronics Manufacturing*	53
• *Other Combustion*	1,110

Reported Emissions

In 2016, 2.99 billion metric tons CO_2e were reported by direct emitters. The largest emitting sector was the Power Plants Sector with 1.9 billion metric tons CO_2e, followed by the Petroleum and Natural Gas Systems Sector with 283 million metric tons (MMT) CO_2e and the Refineries Sector with 179 MMT CO_2e. This information, as well as average emissions per reporter, is shown in the following chart.

[1] Totals sum to more than 7,631 because facilities whose activities fall within more than one sector are counted multiple times.

Figure 2: Direct GHG Emissions Reported by Sector (2016)



View this information in FLIGHT.

Emissions Trends

National level trends in greenhouse gas emissions are available through the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015*. The Greenhouse Gas Reporting Program is different from the U.S. GHG Inventory in that it collects information from the largest stationary sources in the U.S. and provides nearly complete emissions coverage for many of the largest emitting industries. Trends in emissions reported for individual industries are discussed in the industry-specific reports.

Total U.S. emissions decreased by 2.3 percent from 2014 to 2015, based on the U.S. GHG Inventory. Between 2014 and 2015, emissions reported to the GHGRP decreased by 4.7 percent (Table 4).

The U.S. GHG Inventory is not yet available for 2016. For sources reporting to the GHGRP, excluding emissions from the oil and gas sector (which reported new sources this year), emissions decreased by 4.0 percent from 2015 to 2016. Over the past six reporting years (2011-2016), GHGRP reported direct emissions from sectors other than oil and gas (also excluding suppliers) declined by 12.6 percent. This decline is primarily caused by a 15.5 percent decline in reported power plant emissions since 2011.

Table 4: Emissions Trends for U.S. GHG Inventory and GHGRP (2011-2016)

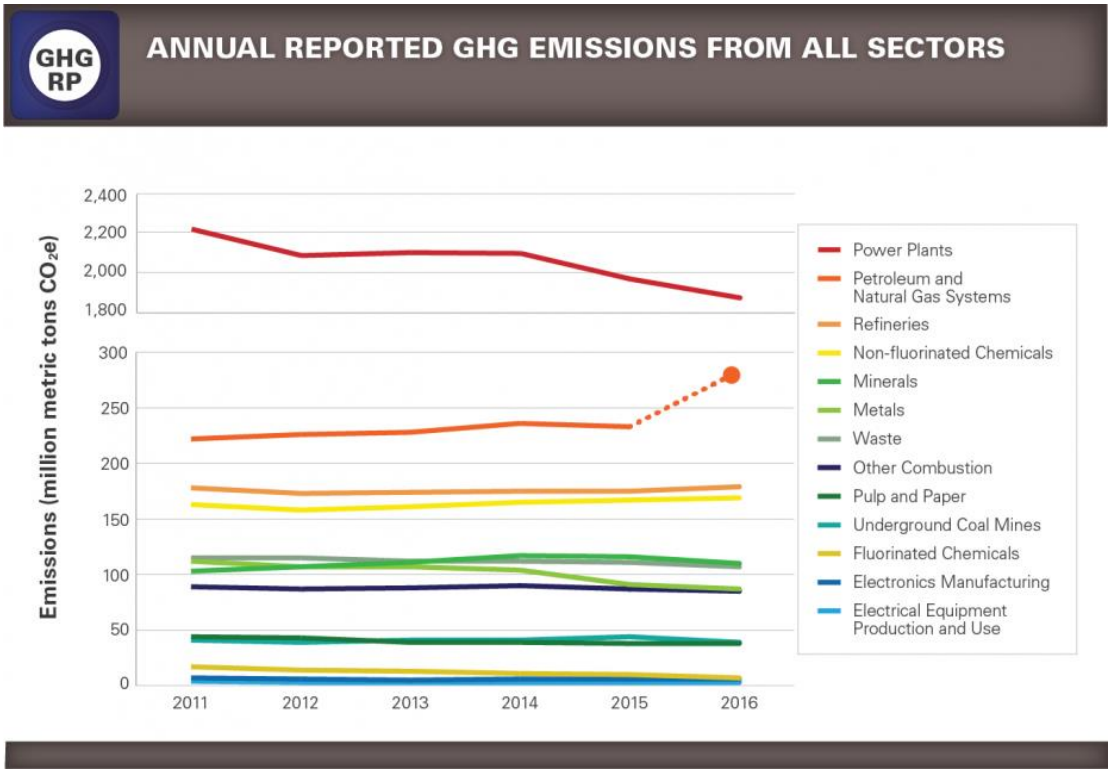
	2011	2012	2013	2014	2015	2016
U.S. GHG Inventory						
Total emissions (million metric tons CO_2e)	6,776.7	6,538.3	6,680.1	6,739.7	6,586.7	Not available
Percent change in emissions from previous year	-2.1%	-3.5%	2.2%	0.9%	-2.3%	Not available
GHGRP						
Number of direct-emitting facilities	7,643	7,891	7,975	8,200	8,035	7,631
Direct emissions (million metric tons CO_2e)	3,318.3	3,168.2	3,187.0	3,201.4	3,052.0	2,990.1[2]
Percent change in emissions from previous year	—	-4.5%	0.6%	0.5%	-4.7%	N/A[2]

Table 5: Emission Trends by Sector (2011-2016)

Sector	2011 Emissions (MMT CO_2e)	2012 Emissions (MMT CO_2e)[3]	2013 Emissions (MMT CO_2e)	2014 Emissions (MMT CO_2e)	2015 Emissions (MMT CO_2e)	2016 Emissions (MMT CO_2e)
Power Plants	2,221.7	2,088.9	2,104.1	2,100.1	1,970.7	1,876.3
Petroleum and Natural Gas Systems	222.2	226.1	227.9	235.9	232.9	282.9[1]
Refineries	178.2	172.5	174.1	175.2	175.1	179.3
Chemicals	180.4	172.5	174.0	176.5	176.9	176.6
• *Fluorinated Chemicals*	17.4	14.1	13.1	11.4	9.9	7.3
• *Non-fluorinated Chemicals*	163.0	158.4	160.9	165.2	167.0	169.3
Waste	114.9	115.4	111.6	112.0	110.8	107.4
Metals	112.0	106.8	106.9	104.4	90.8	86.7
Minerals	103.2	107.5	111.5	116.6	115.7	109.9
Pulp and Paper	44.2	42.7	39.4	39.3	38.4	37.7
Other	141.5	135.8	137.6	141.3	140.6	133.3
• *Underground Coal Mines*	40.9	38.8	41.0	41.2	43.9	38.8
• *Electrical Equipment Production & Use*	4.3	3.4	3.4	3.3	2.9	3.2
• *Electronics Manufacturing*	7.0	6.4	5.2	6.2	6.3	6.2
• *Other Combustion*	89.4	87.2	88.0	90.5	87.4	85.2

[2] GHG data for the Petroleum and Natural Gas Systems source category is not directly comparable between 2011-2015 and 2016 onwards. Facilities in the Onshore Oil & Gas gathering & Boosting and Onshore Gas Transmission Pipelines industry segments began reporting in 2016

Figure 3: Trends in Direct GHG Emissions (2011-2016)[3,4]



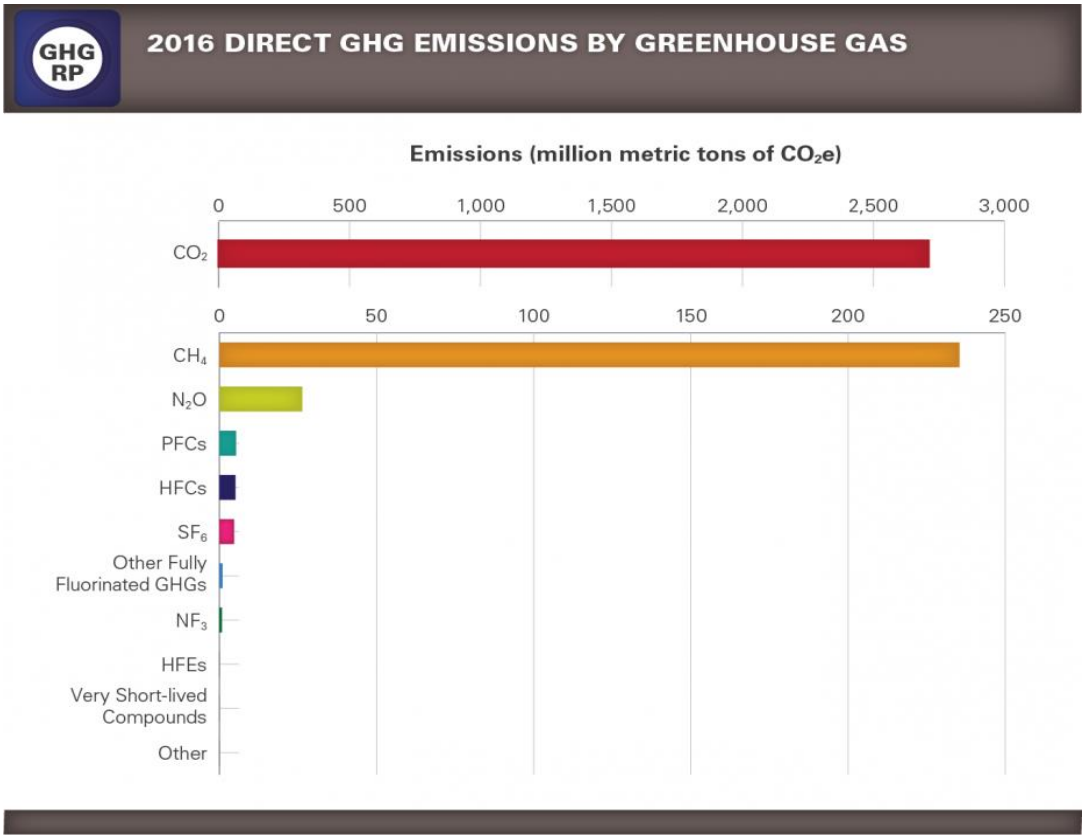
View this information in FLIGHT.

Emissions by GHG

Carbon dioxide is the GHG emitted in the largest quantities. The 2.7 billion metric tons of CO_2 reported for 2016 represent 90.7 percent of the GHGs reported in 2016.[5] Methane emissions represent 7.9 percent of reported 2016 GHG emissions, N_2O represents 0.9 percent, and fluorinated gases (HFCs, PFCs, SF_6) represent 0.6 percent (Figure 4).

[3] Non-fluorinated Chemicals and Fluorinated Chemicals are components of "Chemicals" in FLIGHT.
[4] Other Combustion, Underground Coal Mines, Electronics Manufacturing and Electrical Equipment Production & Use comprise "Other" in FLIGHT.
[5] The Inventory of U.S. Greenhouse Gas Emissions And Sinks for 2016 is not yet available. In 2015, CO_2 represented 82 percent of total U.S. GHG emissions.

Figure 4: Direct Emissions by GHG (2016)



The table below lists the primary sectors emitting each GHG.

Table 6: Largest Sources of GHG Emissions

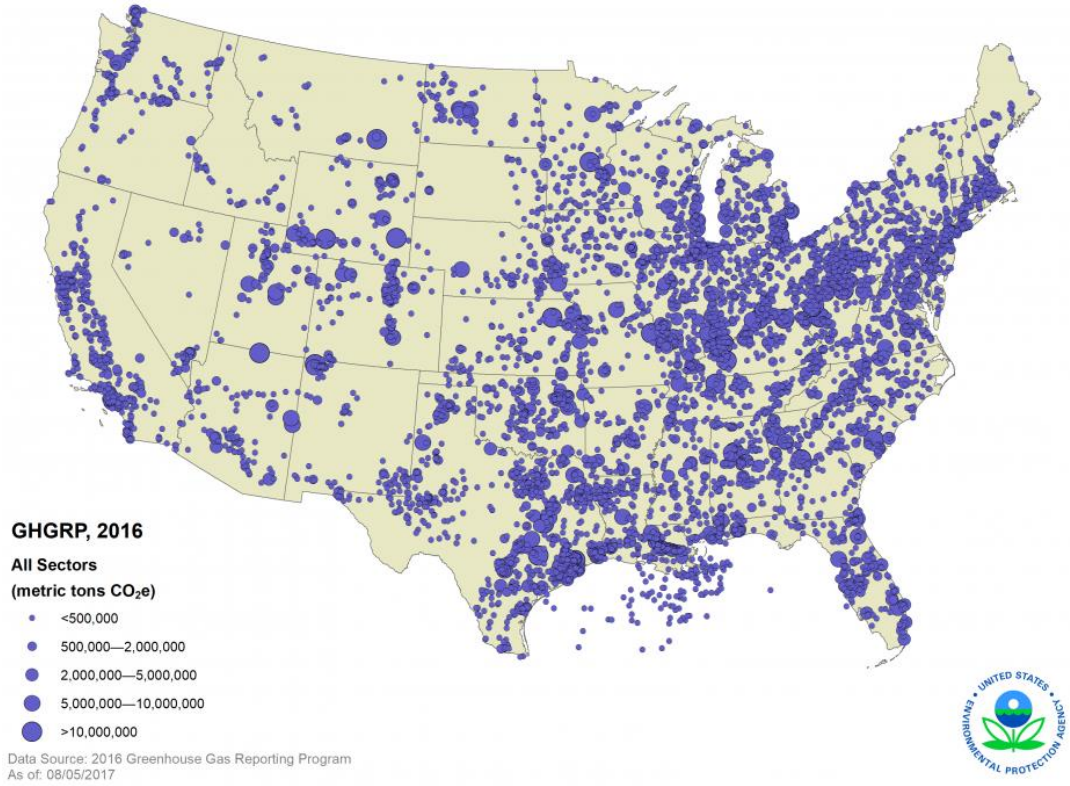
Greenhouse Gas	Source Categories Contributing Most to Emissions[6]	Sectors Contributing Most to Emissions
CO_2	Electricity Generation (D), Stationary Combustion (C)	Power Plants
CH_4	Petroleum & Natural Gas Systems (W), Municipal Landfills (HH)	Petroleum & Natural Gas Systems, Waste
N_2O	Nitric Acid Production (V), Adipic Acid Production (E), Electricity Generation (D)	Chemicals, Power Plants
SF_6	SF_6 from Electrical Equipment (DD), Electronics Manufacturing (I), Magnesium Production (T)	Other, Metals
NF_3	Electronics Manufacturers (I), Fluorinated Gas Production (L)	Other
HFCs	HCFC–22 Production and HFC–23 Destruction (O), Fluorinated Gas Production (L)	Chemicals
PFCs	Electronics Manufacturers (I), Aluminum Production (F)	Metals, Other

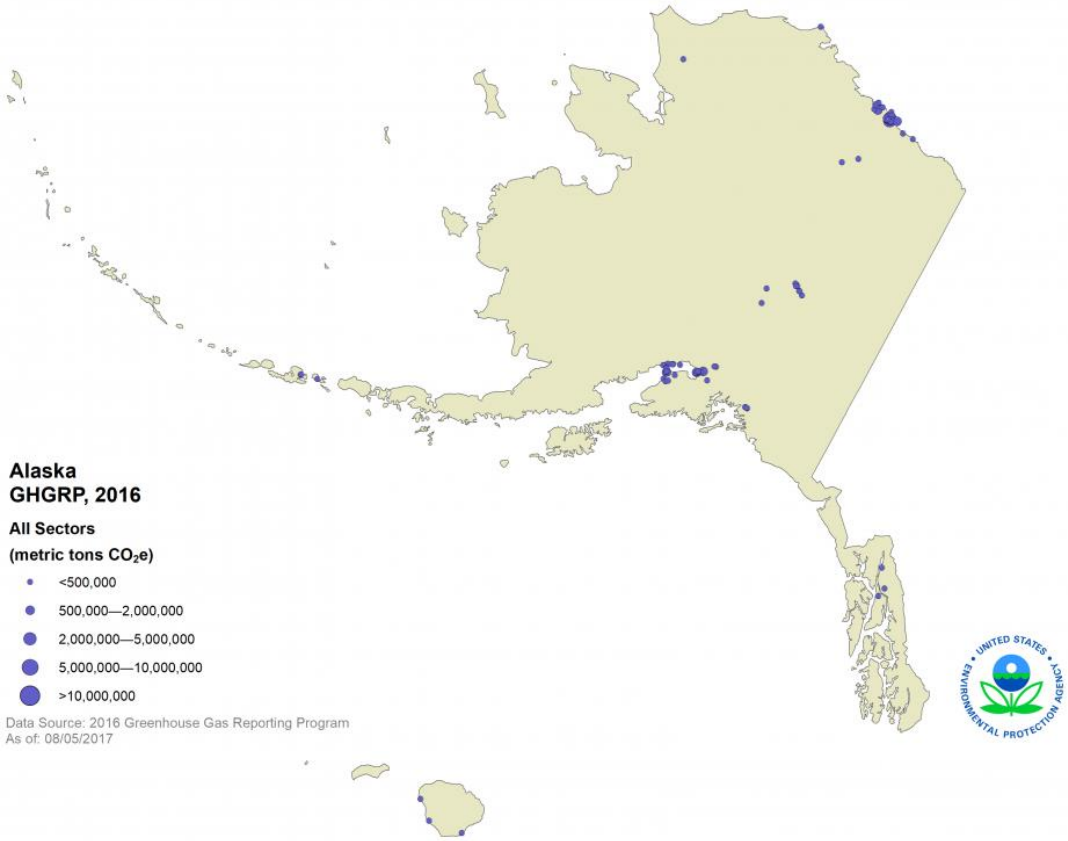
[6] These source categories account for 75 percent or more of the reported emissions of the corresponding GHG. The subpart under which the emissions were reported is shown in parentheses.

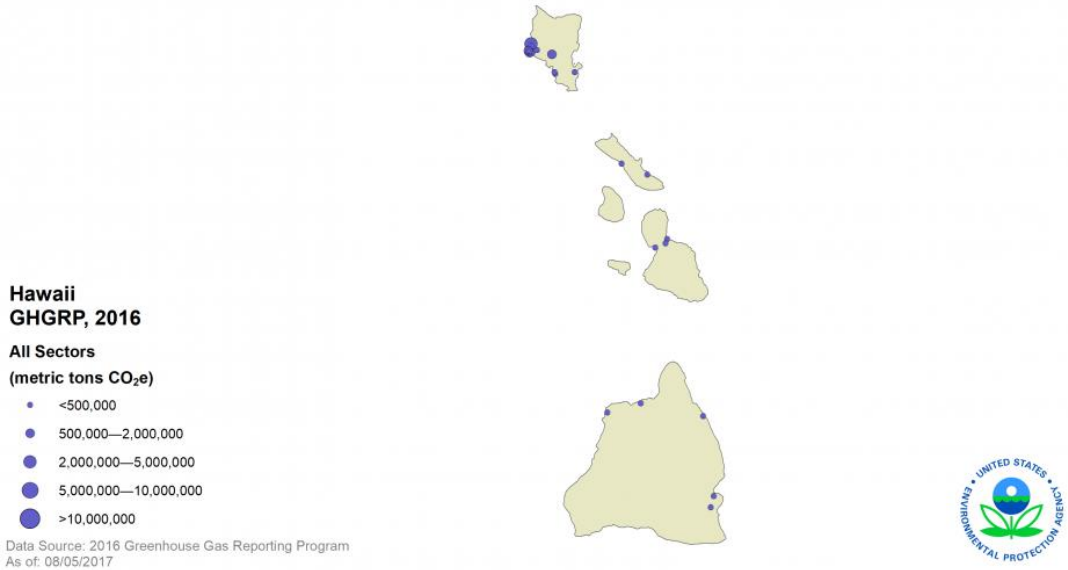
Geographic Distribution of Emissions

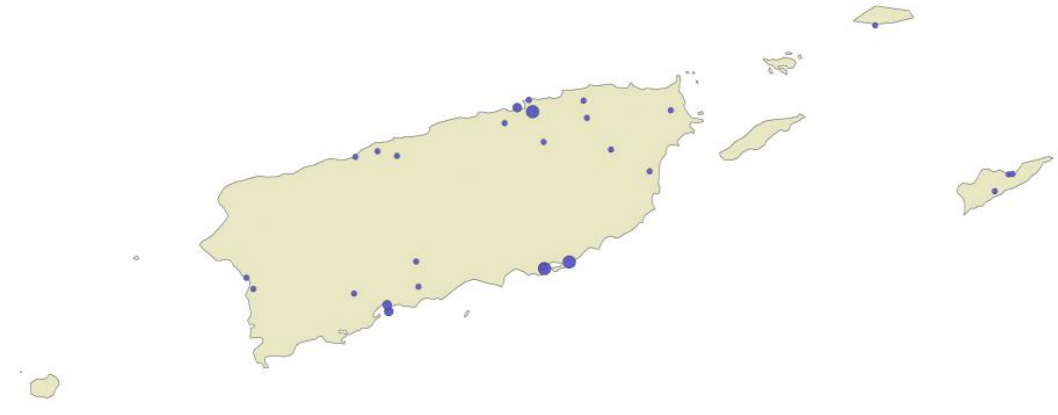
Figure 5: Location and Total Reported Emissions from GHGRP Facilities (2016)

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility. There are also facilities located in Alaska, Hawaii, Puerto Rico, the U.S. Virgin Islands, and Guam.




Alaska
GHGRP, 2016
All Sectors
(metric tons CO_2e)
<500,000
500,000—2,000,000
2,000,000—5,000,000
5,000,000—10,000,000
>10,000,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Hawaii
GHGRP, 2016
All Sectors
(metric tons CO_2e)
<500,000
500,000—2,000,000
2,000,000—5,000,000
5,000,000—10,000,000
>10,000,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017



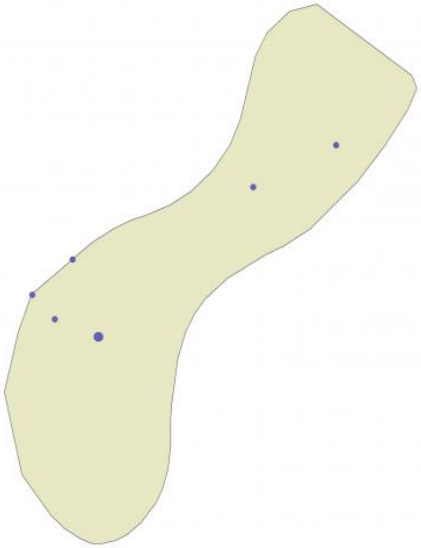
Puerto Rico and the Virgin Islands
GHGRP, 2016

All Sectors

(metric tons CO_2e)

- <500,000
- 500,000—2,000,000
- 2,000,000—5,000,000
- 5,000,000—10,000,000
- >10,000,000

Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017



Guam
GHGRP, 2016

All Sectors

(metric tons CO_2e)

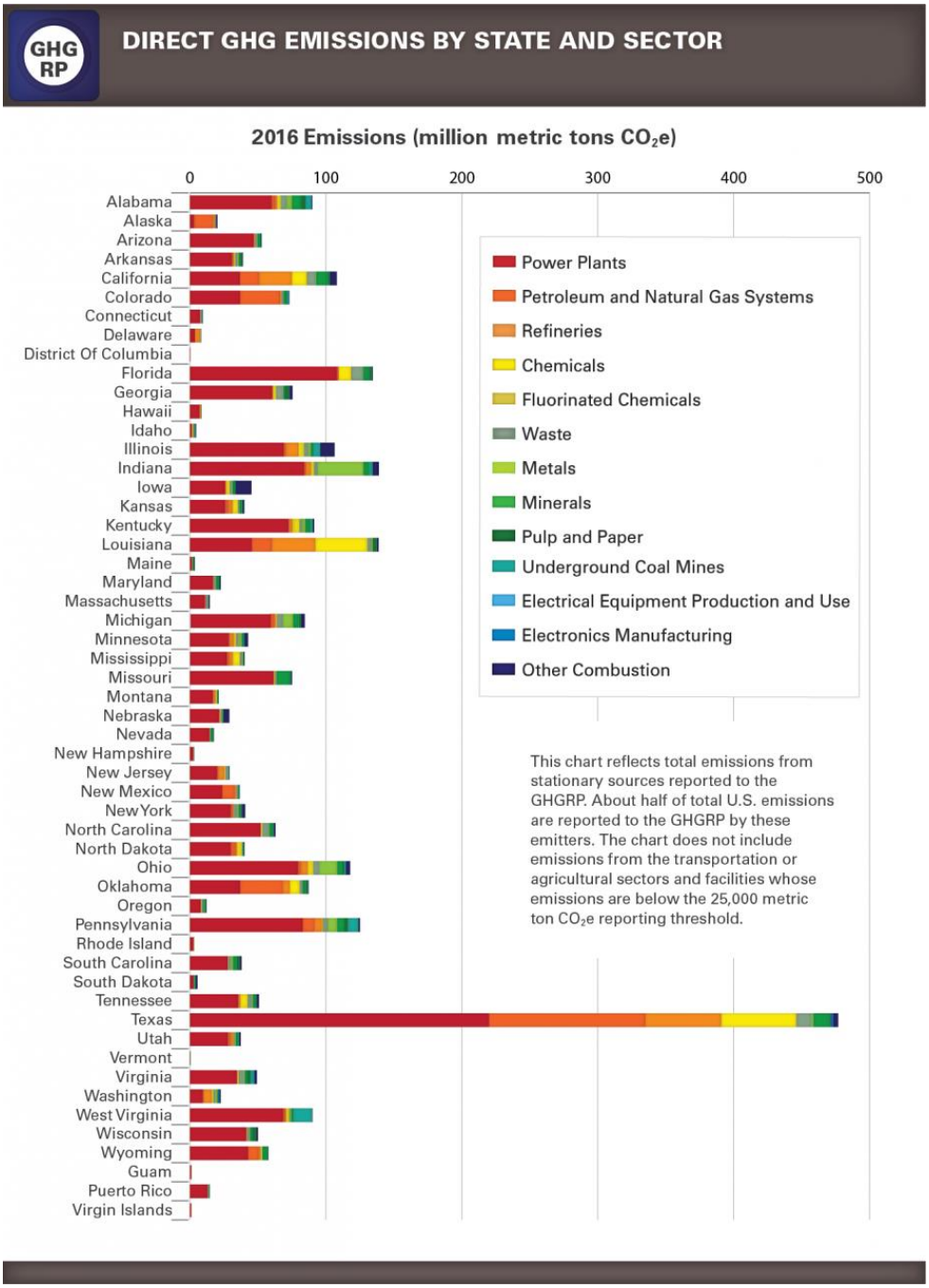
- <500,000
- 500,000—2,000,000
- 2,000,000—5,000,000
- 5,000,000—10,000,000
- >10,000,000

Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2015

Readers can identify facilities in their state, territory, county, or city by visiting the Facility Level Information on GreenHouse gases Tool (FLIGHT).

Because it generally applies to facilities that emit greater than 25,000 metric tons CO_2e per year, the GHGRP provides total reported emissions from large stationary sources in each state. Figure 6 shows the reported emissions in each state broken out by industrial sector.

Figure 6: Direct GHG Emissions by State and Sector (2016)

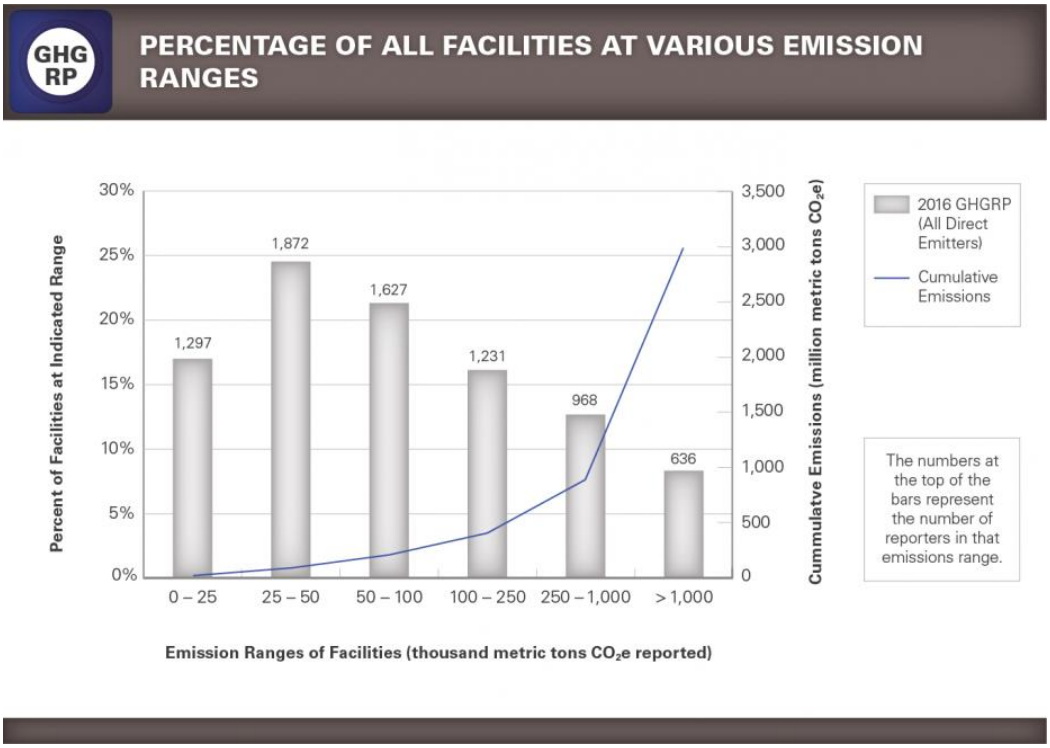


View this information in FLIGHT.

Emissions Range

The GHGRP provides a comprehensive dataset that can be used to determine the number of facilities at various emissions levels in many industry sectors. The GHGRP can also be used to determine the total GHG emissions from individual facilities, including emissions from fossil fuel combustion and other processes.

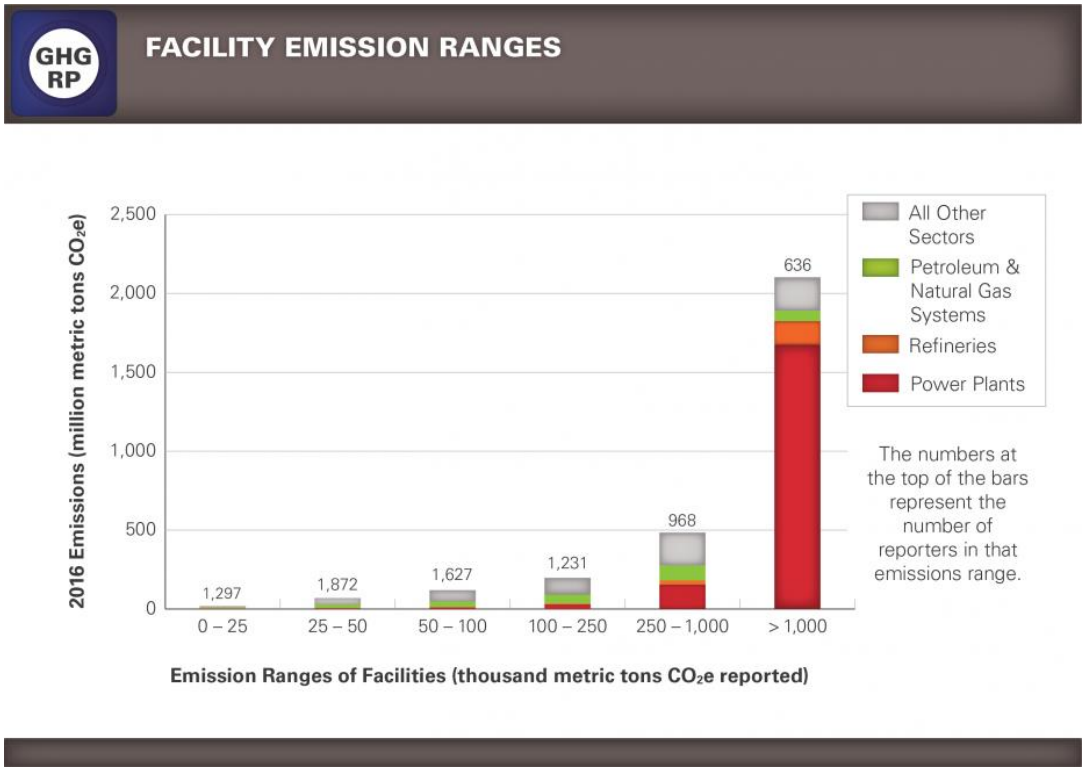
Figure 7: Percentage of All Reporting Facilities at Various Emission Ranges (2016)



Eighty percent of reporting facilities had emissions less than 250,000 metric tons CO_2e. In 2016, the 636 largest-emitting facilities—those emitting more than one million metric tons CO_2e—accounted for 2.1 billion metric tons CO_2e. These emissions represent 70.7 percent of the total 2.99 billion metric tons CO_2e reported. These high-emitting facilities are mainly power plants, but they also include petroleum refineries and facilities in the Chemicals and Metals sectors.

You can use FLIGHT to list and sort facilities based on total reported emissions. This tool also allows you to sort facilities by specific industry types.

Figure 8: Facility Emission Ranges (2016)



GHGRP Calculation Methods Used

The GHGRP prescribes methodologies that must be used to determine GHG emissions from each source category. Reporters generally have the flexibility to choose among several methods to compute GHG emissions. The decision of which method to use may be influenced by the existing environmental monitoring systems in place and other factors. Reporters can change emission calculation methods from year to year and within the same year, as long as they meet the requirements for use of the method selected.

Additional information on the methodologies that reporters use to determine GHG emissions

Report Verification

All reports submitted to EPA are evaluated by electronic validation and verification checks. If potential errors are identified, EPA will notify the reporter, who can resolve the issue either by providing an acceptable response describing why the flagged issue is not an error or by correcting the flagged issue and resubmitting their annual GHG report.

Additional information describing EPA's verification process in more details.

For More Information

For more detailed information from each industrial sector, view the industry sections below.

Use FLIGHT to view maps of facility locations, obtain summary data for individual facilities, create customized searchers, and display search results graphically.

Downloadable spreadsheets containing summary data reported to the GHGRP from each reporter are available on the Data Downloads page.

All other publicly available data submitted to the GHGRP are available for download through Envirofacts.

The U.S. Greenhouse Gas Inventory contains information on all sources of GHG emissions and sinks in the United States from 1990 to 2015.

All GHG emissions data reflect the global warming potential (GWP) values from the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (*Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K. and Reisinger, A. (eds)]. IPCC, Geneva, Switzerland, 2007*). The AR4 values also can be found in the current version of Table A-1 in subpart A of 40 CFR part 98.

GHGRP 2016: Power Plants

The power plant sector consists of facilities that produce electricity by combusting fossil fuels and/or biomass. The sector includes units that are subject to the Acid Rain Program and any other electricity generators that are otherwise required to report to the EPA CO_2 mass emissions year-round according to 40 CFR part 75. This sector also includes combustion units serving electricity generators that are located at facilities with primary NAICS codes of 221330 (Steam and Air-Conditioning Supply[7]) or 2211xx (Electric Power Generation, Transmission and Distribution), which includes some part 75 reporters that report heat input to the EPA on a year-round basis. The emissions from this sector are solely from stationary fuel combustion sources.

Power Plants Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e unless otherwise noted)

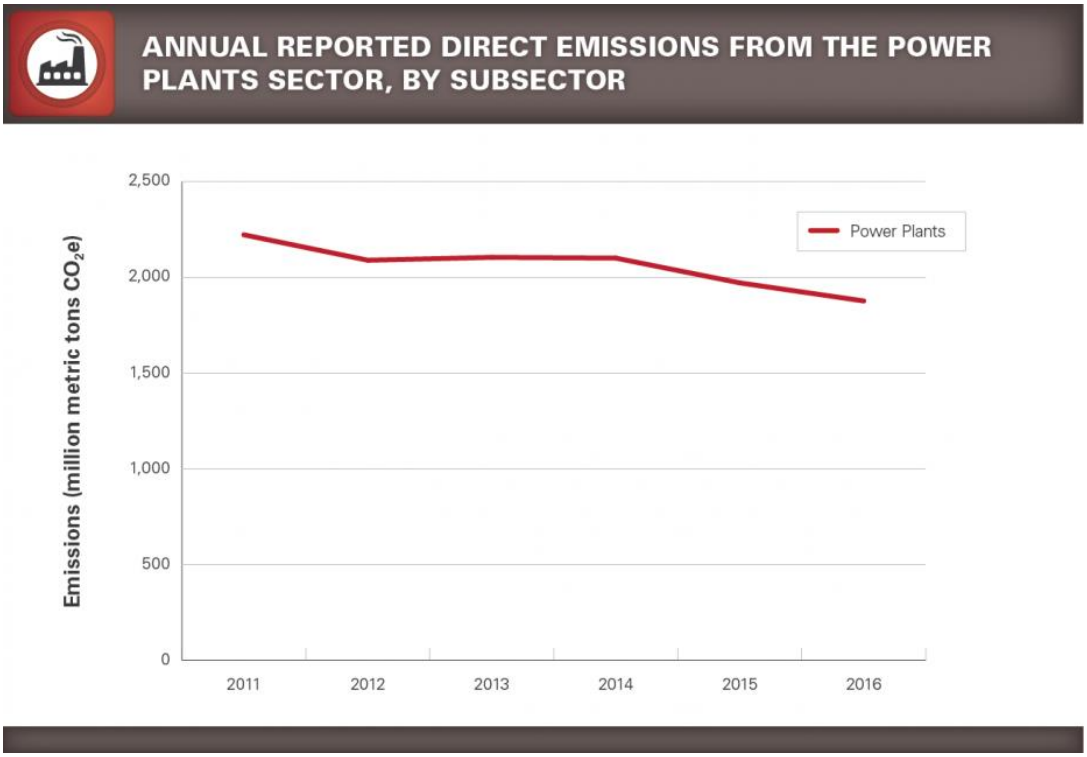
	2011	2012	2013	2014	2015	2016
Number of facilities:	1,592	1,609	1,577	1,547	1,483	1,405
Total emissions (CO2e):	2,221.7	2,088.9	2,104.1	2,100.1	1,970.7	1,876.3
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO2):	2,208.3	2,077.0	2,091.9	2,087.7	1,959.7	1,866.2
• Methane (CH4):	4.2	3.7	3.7	4.0	3.6	3.3
• Nitrous oxide (N2O):	9.2	8.2	8.4	8.4	7.4	6.8

Totals may not equal sum of individual GHGs due to independent rounding.

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

[7] Establishments primarily engaged in providing steam, heated air, or cooled air. The steam distribution may be through mains.

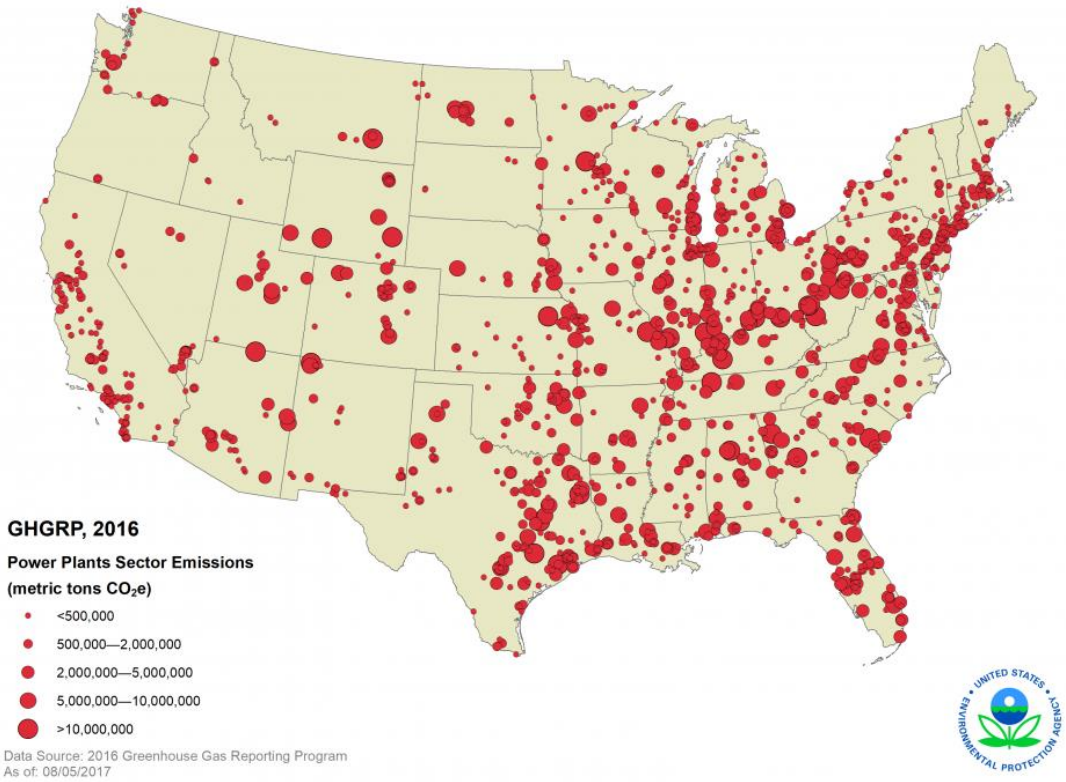
Trend of Annual Reported GHG Emissions in the Power Plant Sector (as of 8/5/17)



What factors influenced the trend in emissions for power plants?

Location and emissions range for each reporting facility in the power plant sector (as of 8/5/17)

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.


GHGRP, 2016
Power Plants Sector Emissions
(metric tons CO_2e)
<500,000
500,000—2,000,000
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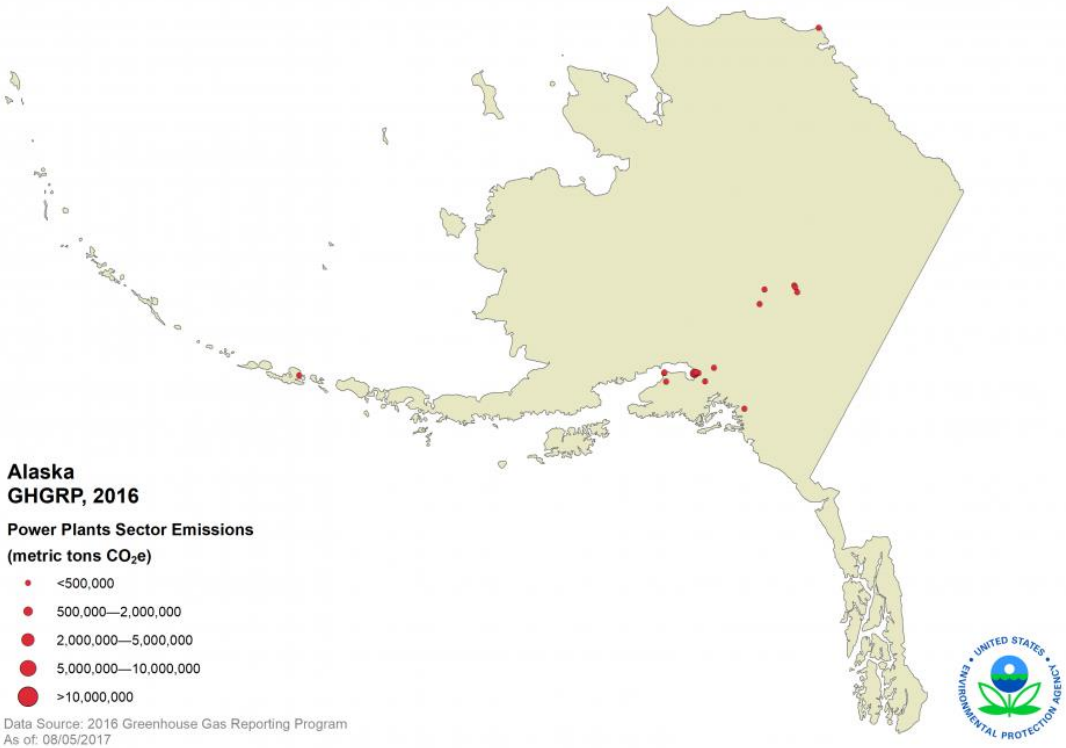
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Alaska
GHGRP, 2016
Power Plants Sector Emissions
(metric tons CO_2e)
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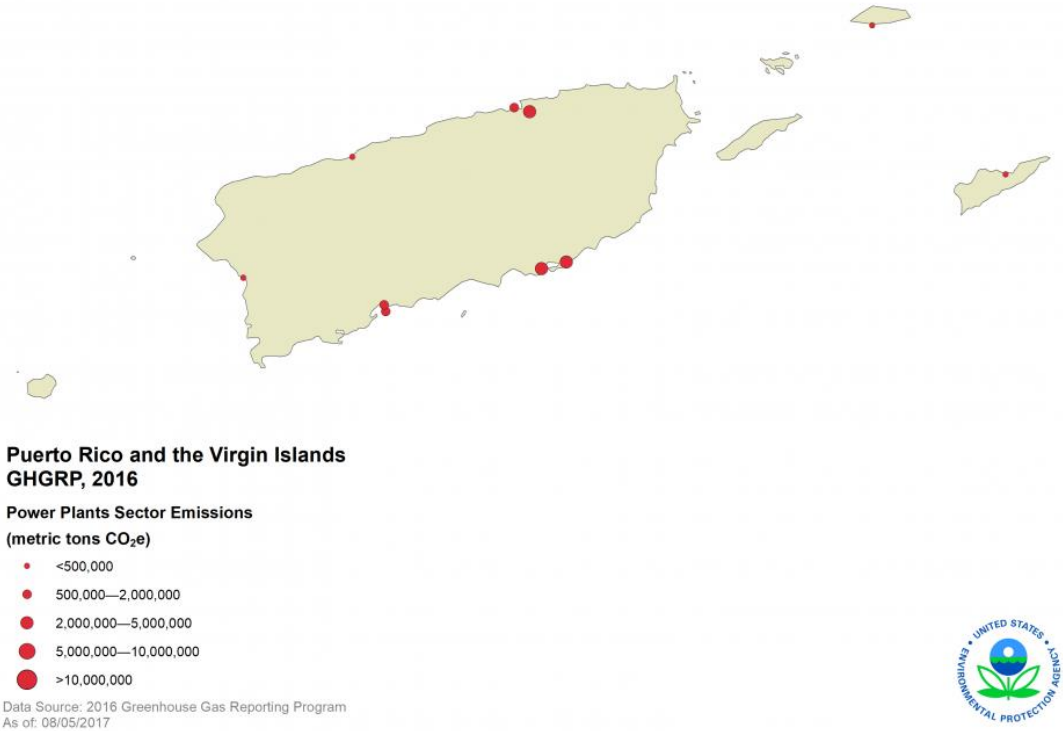
Puerto Rico and the Virgin Islands
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>10,000,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017

Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Petroleum & Natural Gas Systems

This sector consists of the following industry segments of the petroleum and natural gas industry.

- **Onshore Production.** Production of petroleum and natural gas associated with onshore production wells and related equipment.
- **Offshore Production.** Production of petroleum and natural gas from offshore production platforms.
- **Natural Gas Processing.** Processing of field quality gas to produce pipeline quality natural gas.
- **Natural Gas Transmission.** Compressor stations used to transfer natural gas through transmission pipelines.
- **Underground Natural Gas Storage.** Facilities that store natural gas in underground formations.
- **Natural Gas Distribution.** Distribution systems that deliver natural gas to customers.
- **Liquefied Natural Gas (LNG) Import/Export.** Liquefied Natural Gas import and export terminals.
- **LNG Storage.** Liquefied Natural Gas storage equipment.
- **Other Petroleum and Natural Gas Systems.** Stationary fuel combustion emissions from petroleum and natural gas source categories that are not otherwise listed.

Petroleum and Natural Gas Systems Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016[8]
Number of facilities:	1,921	2,096	2,186	2,419	2,419	2,248
Total emissions (CO_2e):	222.2	226.1	227.9	235.9	232.9	282.9
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	138.3	145.5	150.6	162.5	162.2	186.7
• Methane (CH_4):	83.7	80.1	77.1	73.3	70.1	96.0
• Nitrous oxide (N_2O):	0.1	0.4	0.1	0.1	0.6	0.2

Totals may not equal sum of individual GHGs due to independent rounding.

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e)
Onshore Production	512	85.4

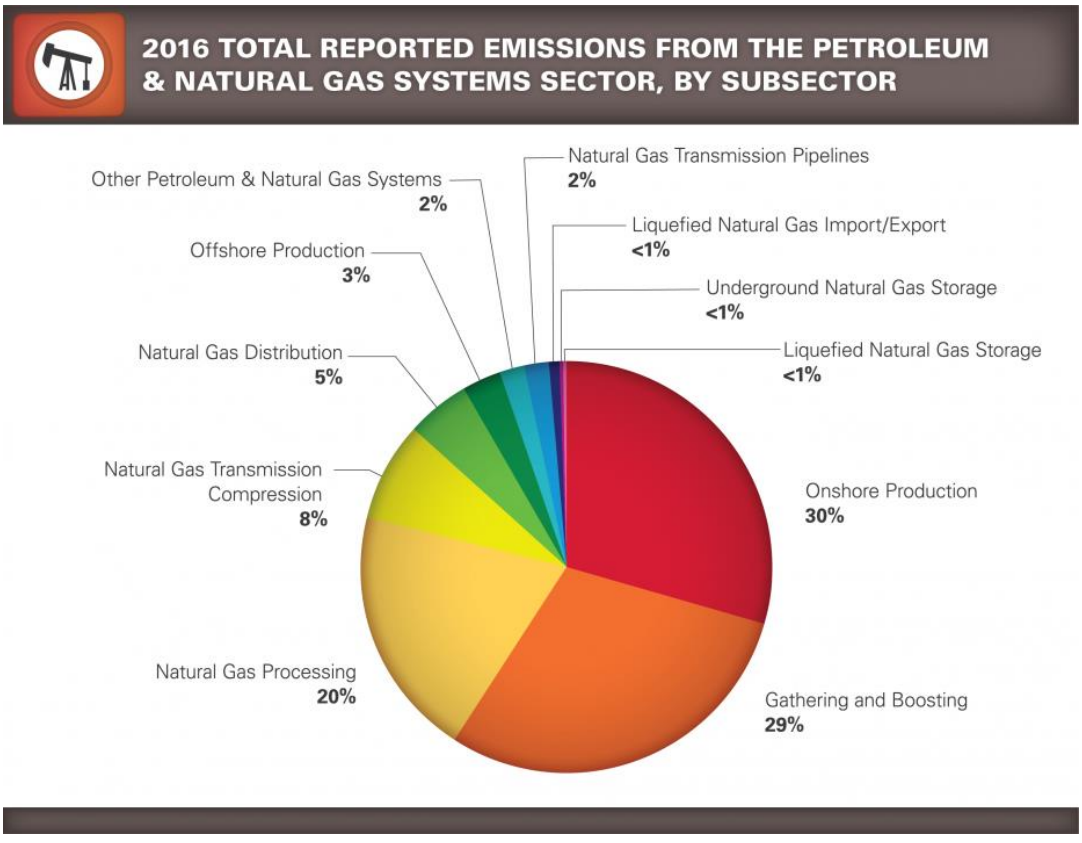
[8] Facilities in the Gathering and Boosting and Transmission Pipeline industry segments began reporting in 2016.

Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e)
Offshore Production	134	7.3
Gathering and Boosting	299	83.0
Natural Gas Processing	447	55.9
Natural Gas Transmission Compression	525	22.4
Natural Gas Transmission Pipelines	27	4.4
Underground Natural Gas Storage	53	1.5
Liquefied Natural Gas (LNG) Import/Export	6	2.0
LNG Storage	6	**
Natural Gas Distribution	169	14.2
Other Petroleum and Natural Gas Systems	541	29.1

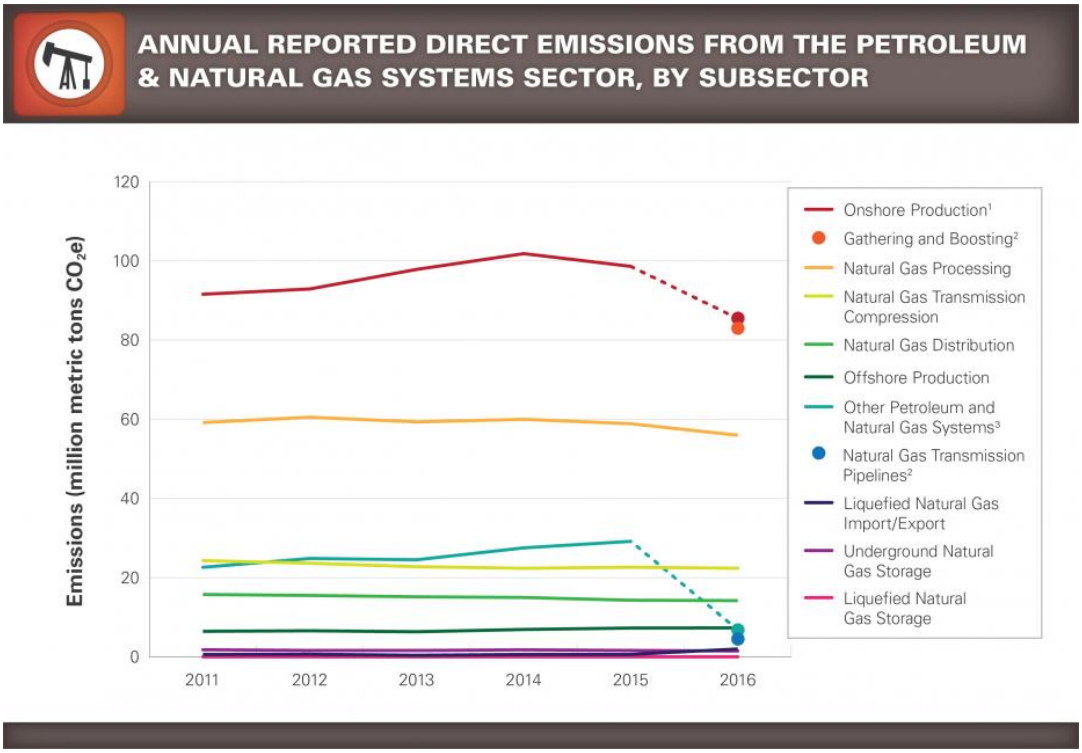
Totals may not equal sum of individual GHGs due to independent rounding.

** Total reported emissions are less than 0.05 million metric tons CO_2e.

Total Reported Direct Emissions from Petroleum and Natural Gas Systems, by Subsector (as of 8/13/17)



Trend of Annual Reported Direct Emissions from the Petroleum and Natural Gas Systems Sector, by Subsector (as of 8/5/17)

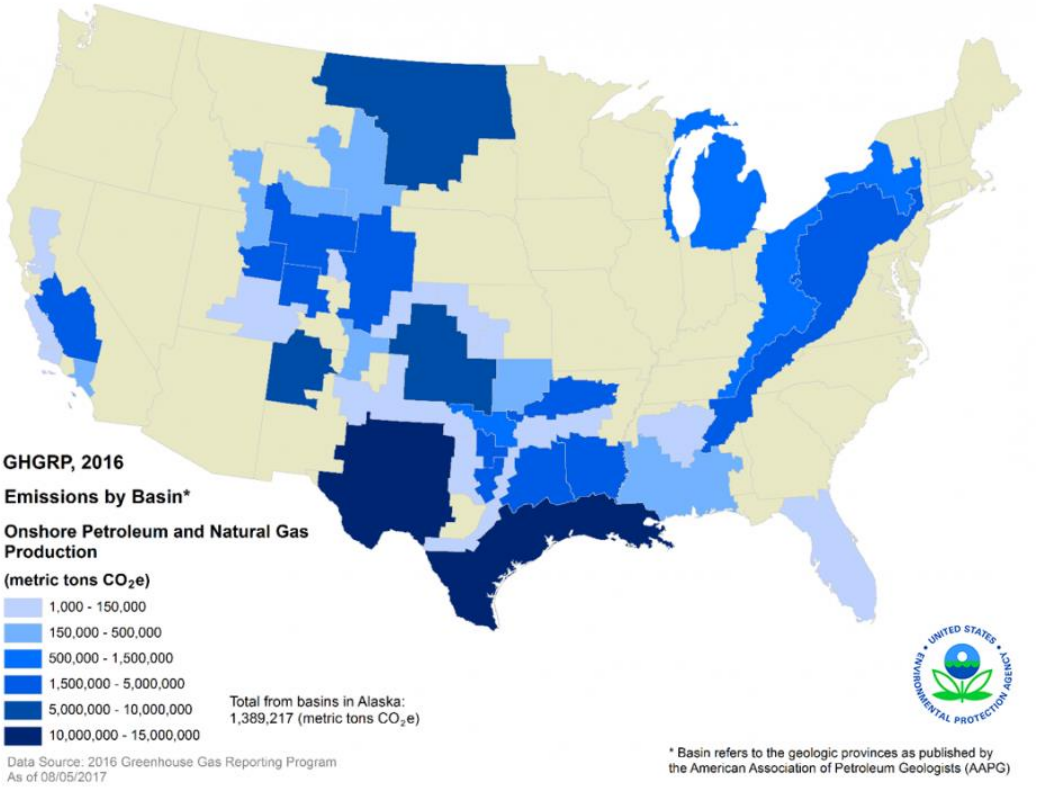


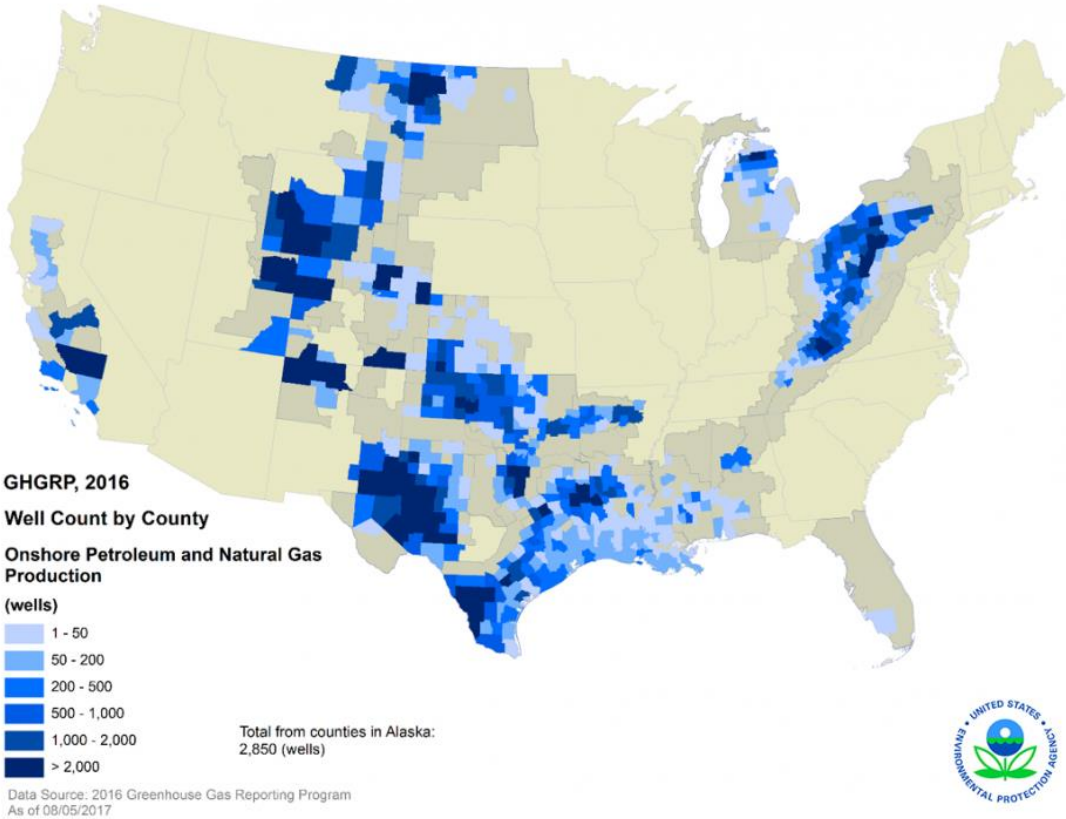
[1] Beginning in Reporting Year 2016, Onshore Production facilities began reporting emissions from oil well completions and workovers with hydraulic fracturing. These emissions were not reported for prior reporting years.

[2] This industry segment began reporting data for the first time in Reporting Year 2016.

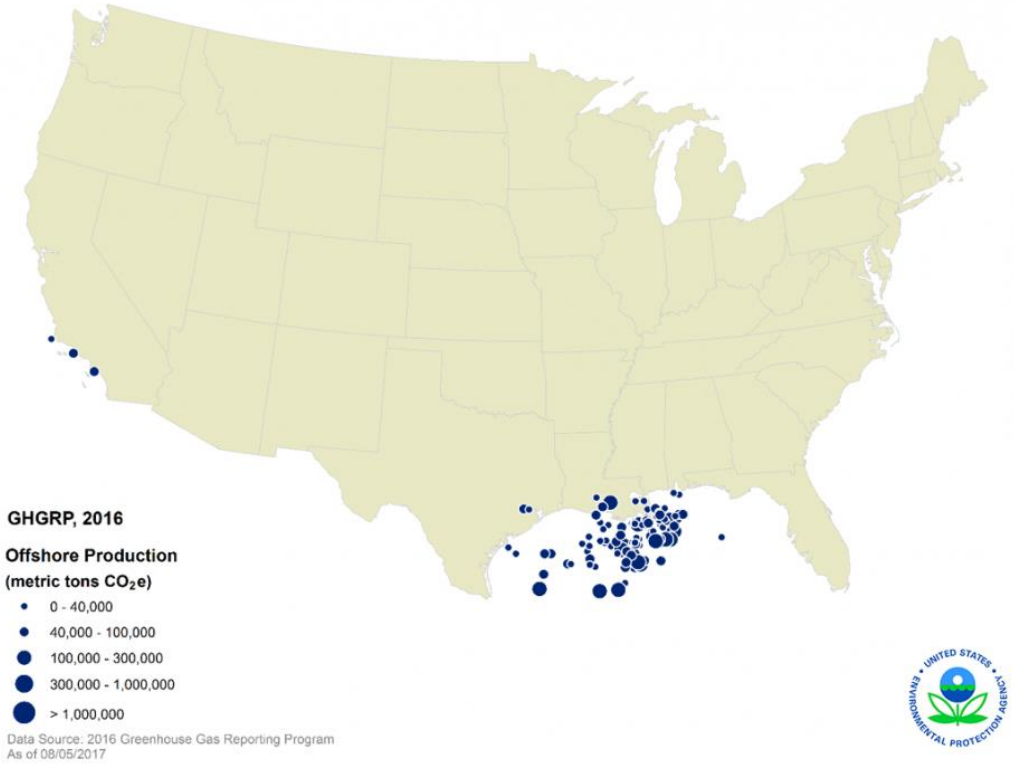
[3] Beginning in Reporting Year 2016, facilities that met the definition of Gathering and Boosting reported emissions for applicable sources. This includes certain stationary and portable fuel combustion equipment emissions that may have been published for Reporting Years 2011-2015 as Other Petroleum and Natural Gas Systems.

Reported emissions (CO_2e) and well count by county for onshore production facilities

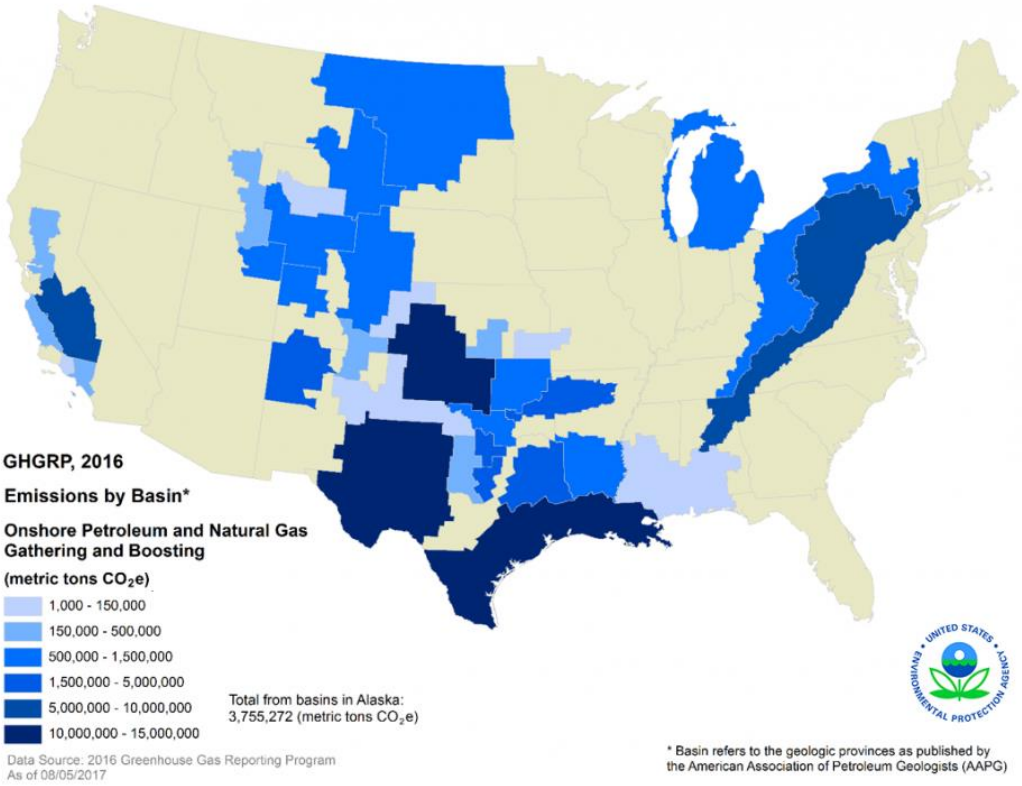




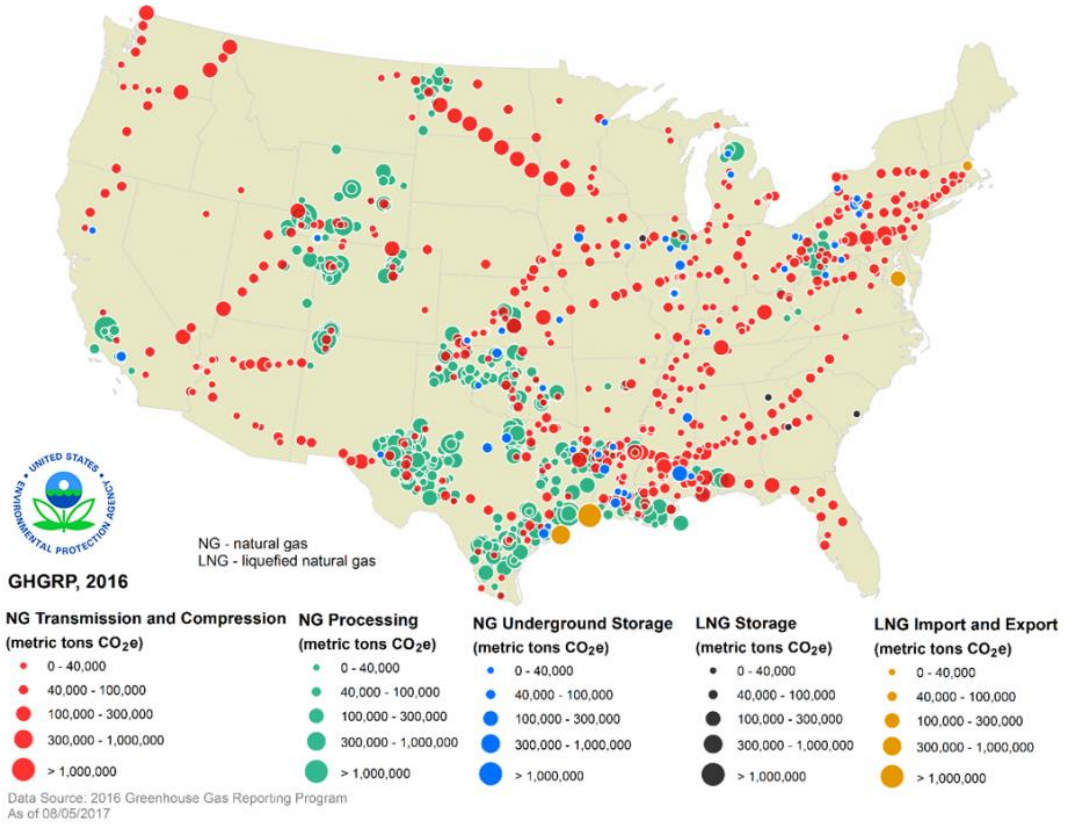
Facility locations and reported emissions (CO2e) for offshore production

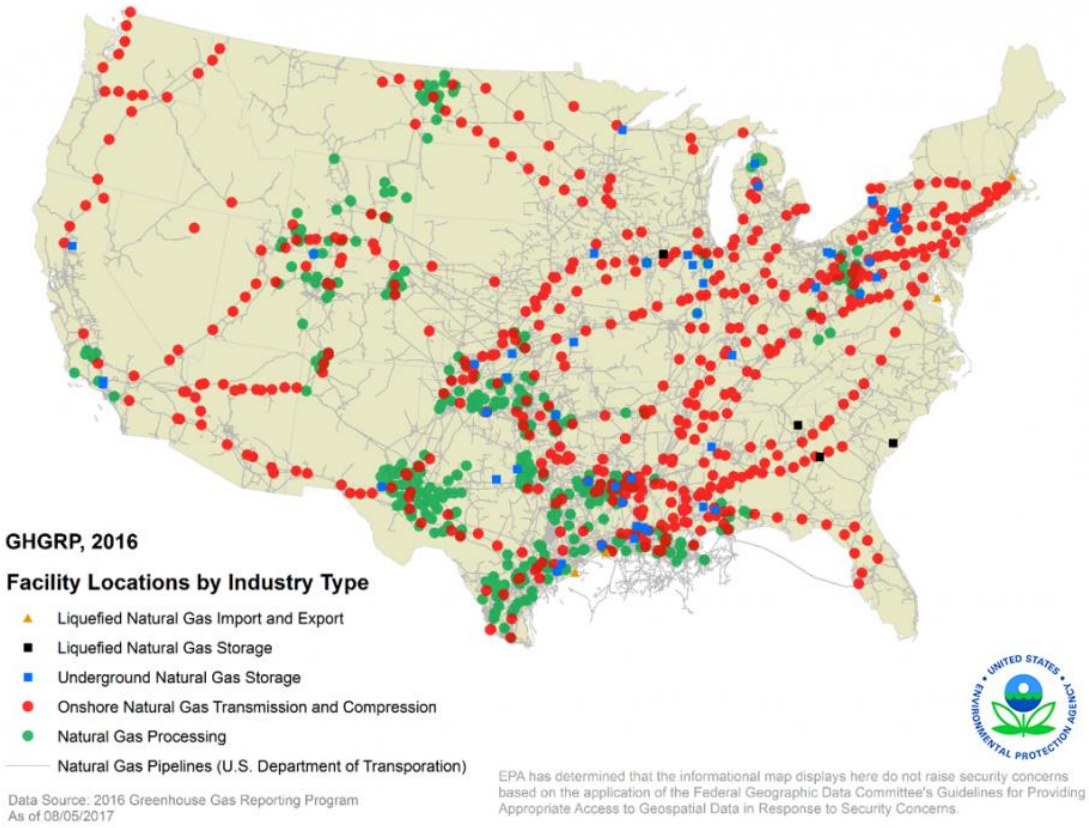


Reported emissions (CO_2e) by geologic basin for gathering and boosting facilities

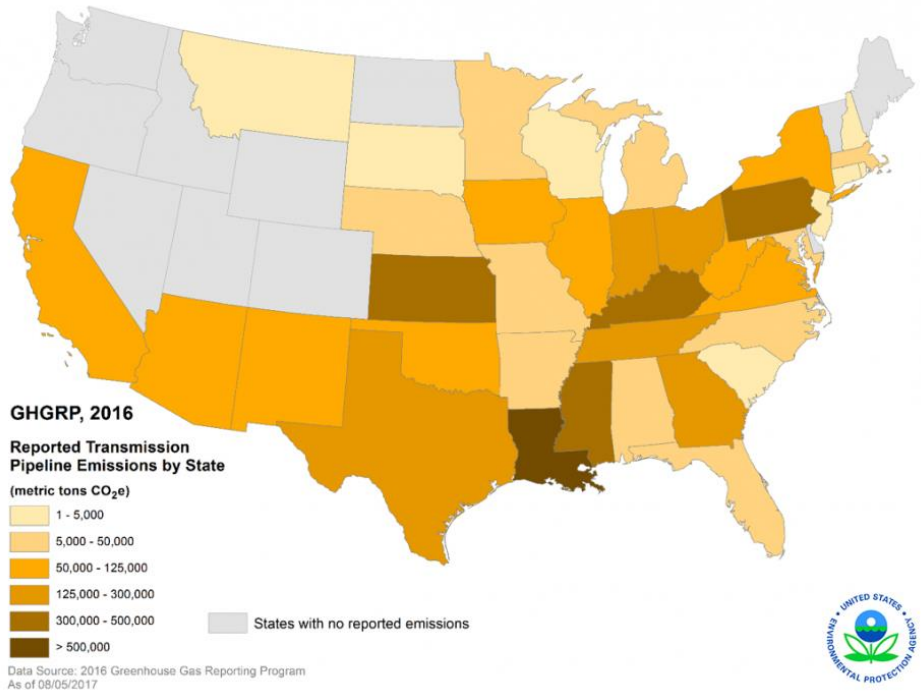


Reported emissions (CO_2e) and facility locations for industry types: natural gas processing, natural gas transmission, underground natural gas storage, LNG storage, LNG import/export

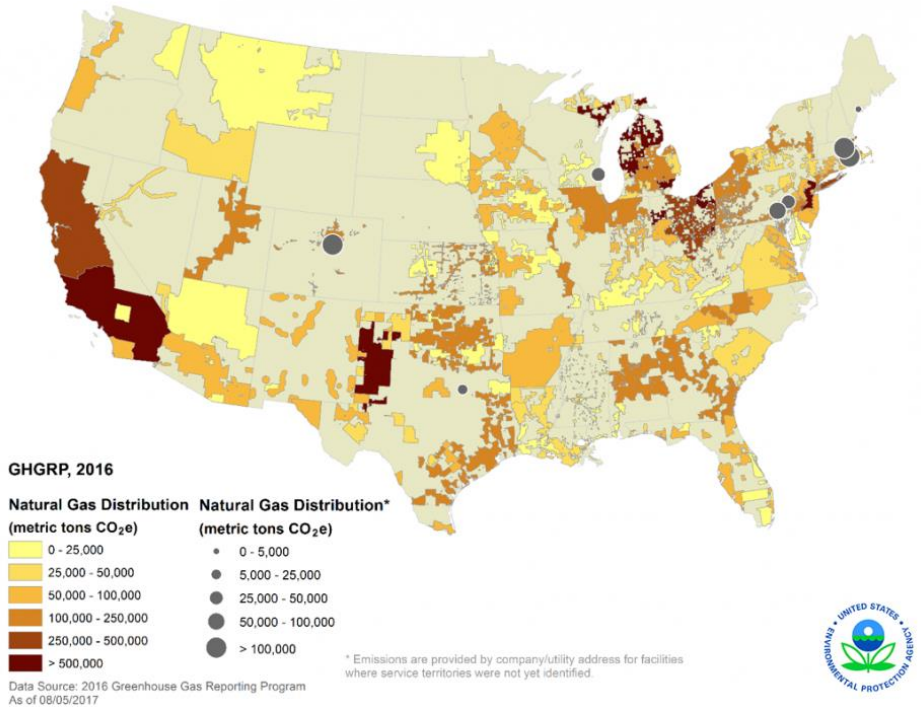




Reported emissions (CO_2e) by state for onshore gas transmission pipelines



Reported emissions (CO_2e) by natural gas utility service territory for natural gas local distribution companies



Other EPA Resources

- U.S. Greenhouse Gas Inventory Report
- GHGRP Subpart W – Petroleum and Natural Gas Systems

GHGRP 2016: Refineries

The refinery sector consists of facilities that produce gasoline, gasoline blending stocks, naphtha, kerosene, distillate fuel oils, residual fuel oils, lubricants, or asphalt (bitumen) by the distillation of petroleum or the re-distillation, cracking, or reforming of unfinished petroleum derivatives. GHG process emissions from this sector include emissions from venting, flares, and fugitive leaks from equipment (e.g., valves, flanges, pumps). In addition to emissions from petroleum refining processes, the sector includes combustion emissions from stationary combustion units located at these facilities. Process emissions from hydrogen production plants and petrochemical manufacturing facilities located at refineries are included in the chemical manufacturing sector. Emissions from industrial waste landfills and industrial wastewater treatment at these facilities are included in the waste sector.

Refineries Sector — Greenhouse Gas Emissions Reported to the GHGRP

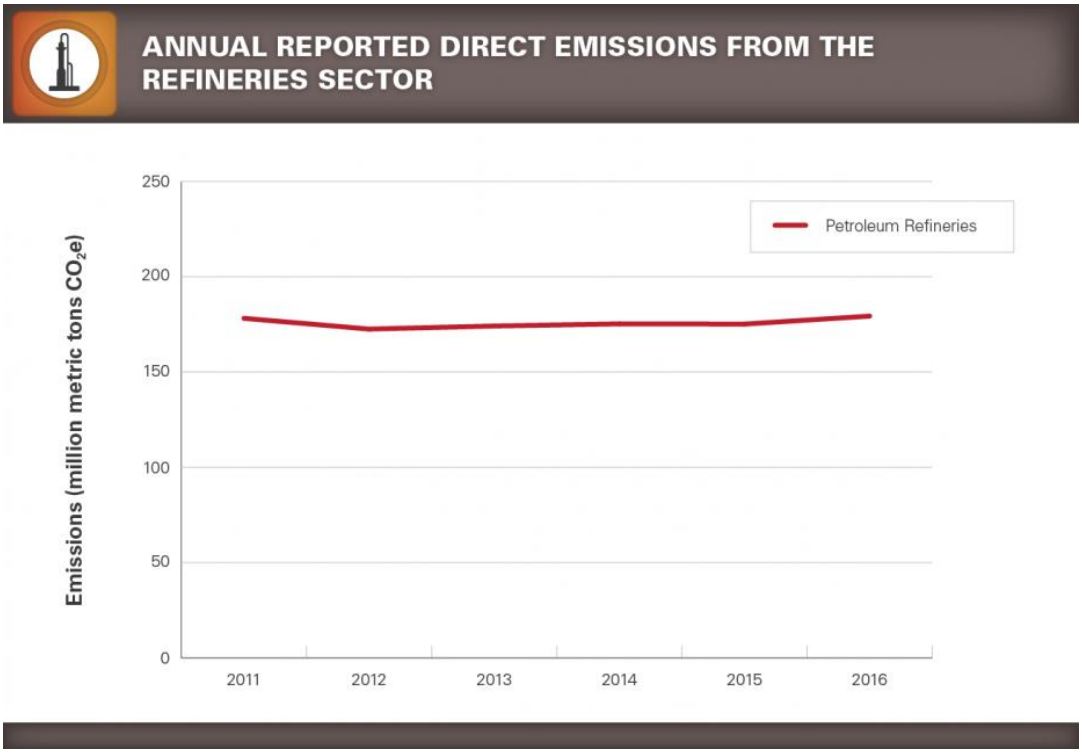
(all emissions values presented in million metric tons CO_2e)

	2011	**2012**	**2013**	**2014**	**2015**	**2016**
Number of facilities:	150	147	146	142	144	145
Total emissions (CO_2e):	178.2	172.5	174.1	175.2	175.1	179.3
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	176.8	171.2	172.8	174.0	173.8	177.8
• Methane (CH_4):	0.9	0.8	0.8	0.8	0.8	1.0
• Nitrous oxide (N_2O):	0.5	0.5	0.5	0.5	0.5	0.5

Totals may not equal sum of individual GHGs due to independent rounding.

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

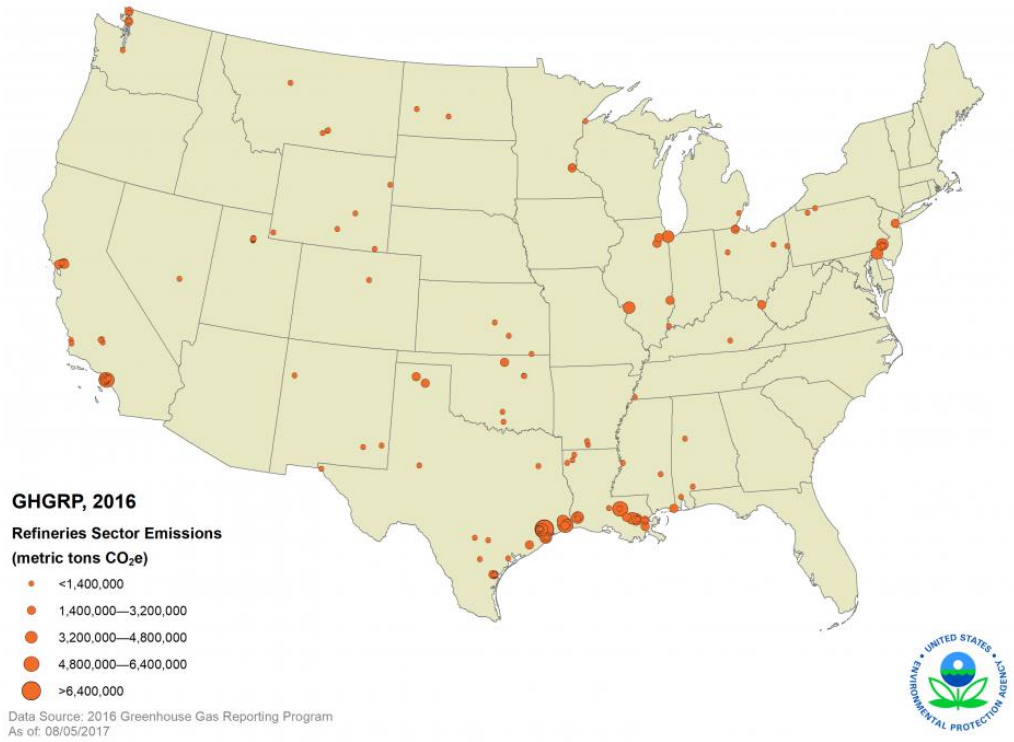
Trend of Annual Reported GHG Emissions in the Refinery Sector (as of 8/5/17)

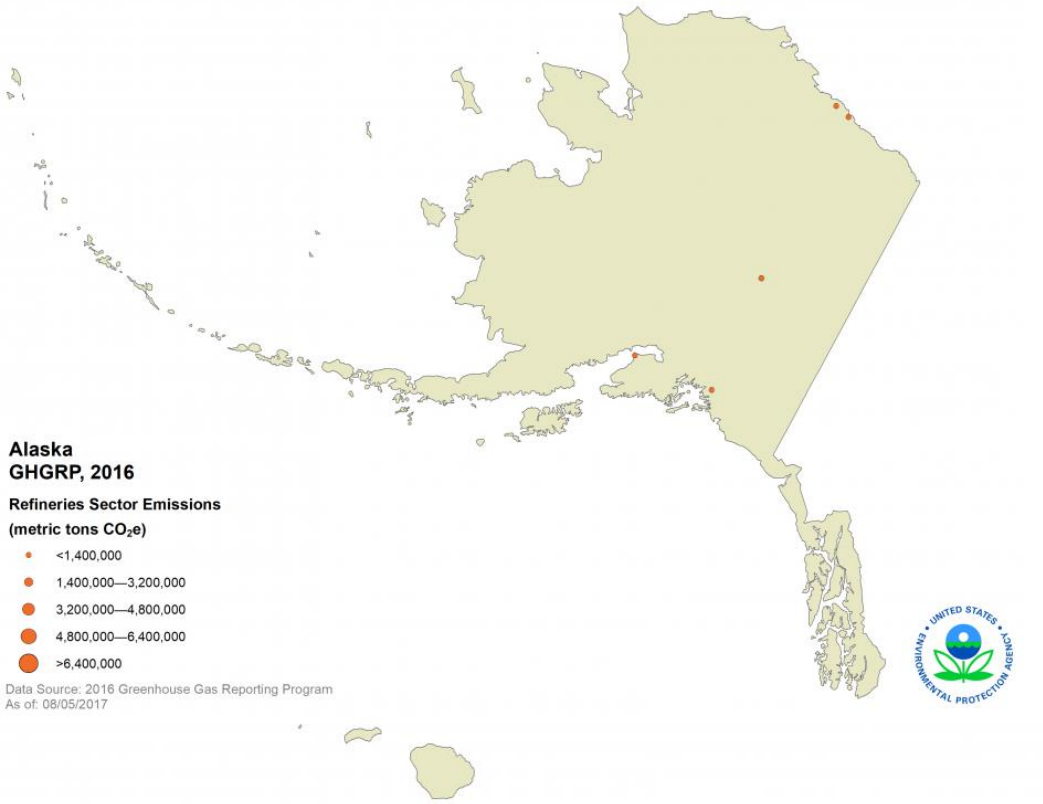


What factors influenced the trend in emissions for refineries?

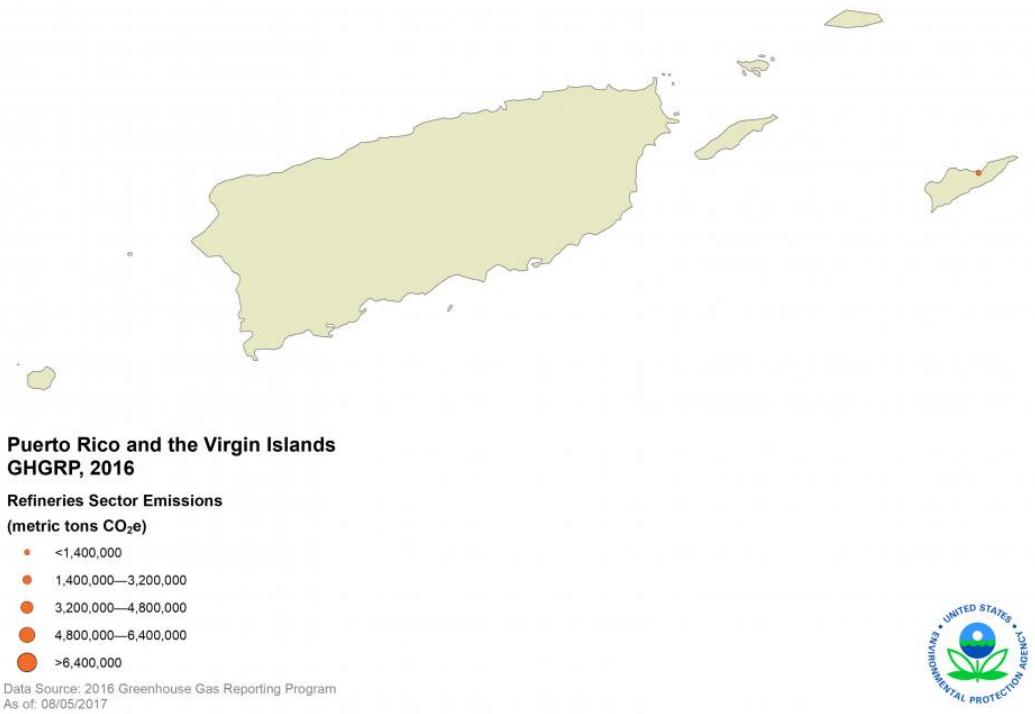
Location and emissions range for each reporting facility in the refinery sector (as of 8/5/17)

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.




Alaska
GHGRP, 2016
Refineries Sector Emissions
(metric tons CO_2e)
<1,400,000
1,400,000—3,200,000
3,200,000—4,800,000
4,800,000—6,400,000
>6,400,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Hawaii
GHGRP, 2016
Refineries Sector Emissions
(metric tons CO_2e)
<1,400,000
1,400,000—3,200,000
3,200,000—4,800,000
4,800,000—6,400,000
>6,400,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017



Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Chemicals

The chemical manufacturing sector consists of facilities that manufacture organic or inorganic chemicals. For this summary, the sector is broken down into facilities that produce fluorinated chemicals and non-fluorinated chemicals. The non-fluorinated chemicals subsector comprises facilities that produce adipic acid, ammonia, hydrogen (both merchant and non-merchant plants), nitric acid, petrochemicals, phosphoric acid, silicon carbide, titanium dioxide and other non-fluorinated chemicals. The fluorinated chemicals subsector comprises facilities that produce HCFC-22 (or destroy HFC-23) and other fluorinated chemicals. A more detailed description of these subsectors is provided below. A total of 454 chemicals facilities reported in 2016.

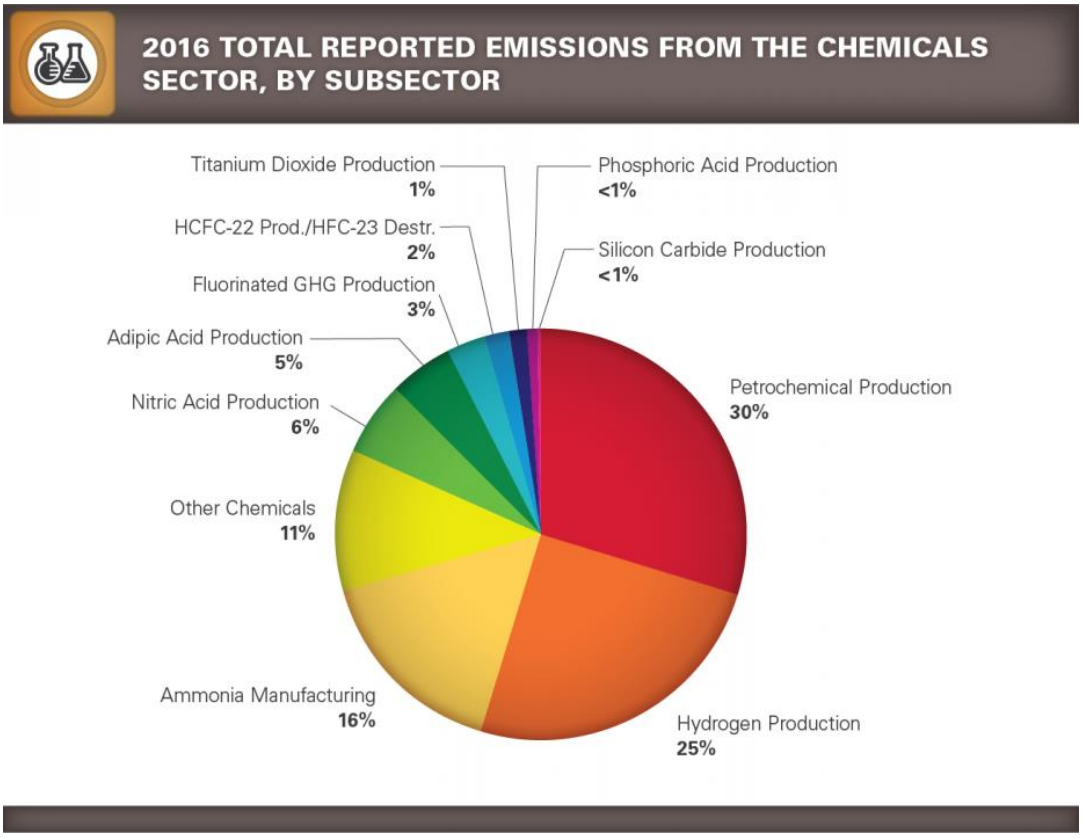
Chemicals Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	457	467	472	464	463	454
Total emissions (CO_2e):	180.4	172.5	174.0	176.5	176.9	176.6
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	142.4	143.0	146.7	149.2	151.6	152.5
• Methane (CH_4):	0.2	0.2	0.2	0.3	0.2	0.2
• Nitrous oxide (N_2O):	21.3	16.0	14.8	16.6	16.0	17.3
• Fluorinated GHGs:	16.5	13.3	12.3	10.5	9.1	6.6
Emissions by subsector						
• Non-fluorinated chemicals	163.9	159.2	161.7	166.0	167.8	170.0
• Fluorinated chemicals	16.5	13.3	12.3	10.5	9.1	6.6

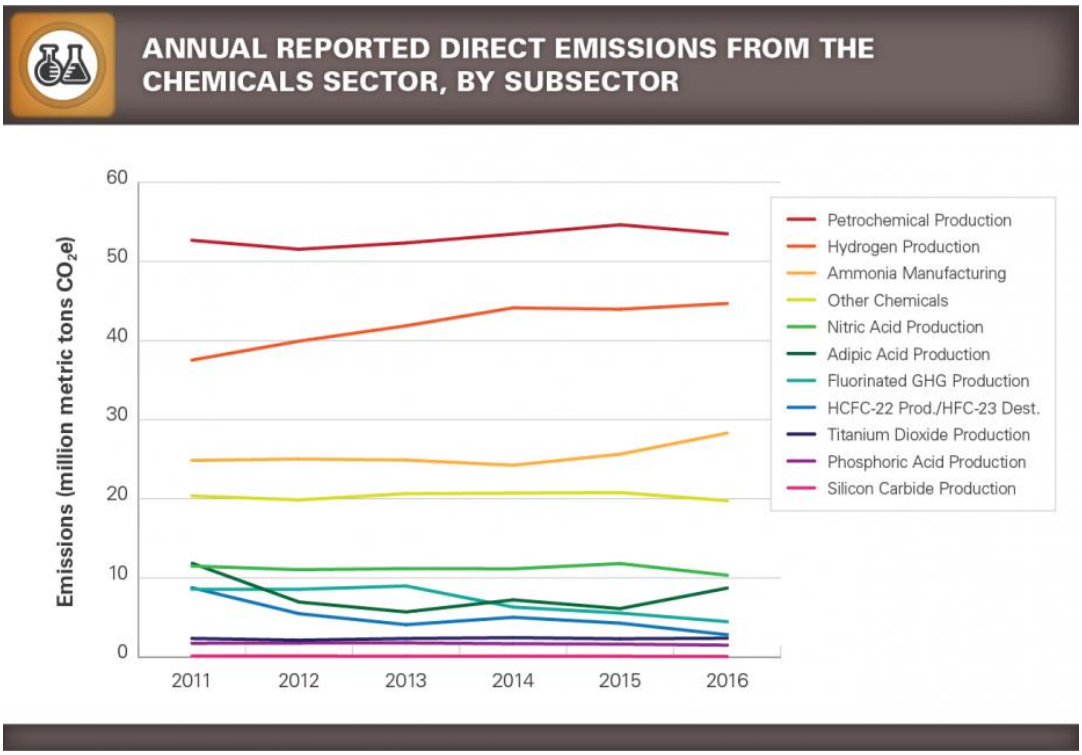
Totals may not equal sum of individual GHGs due to independent rounding.

2016 Total Reported Direct Emissions from Chemicals (All Subsectors), by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

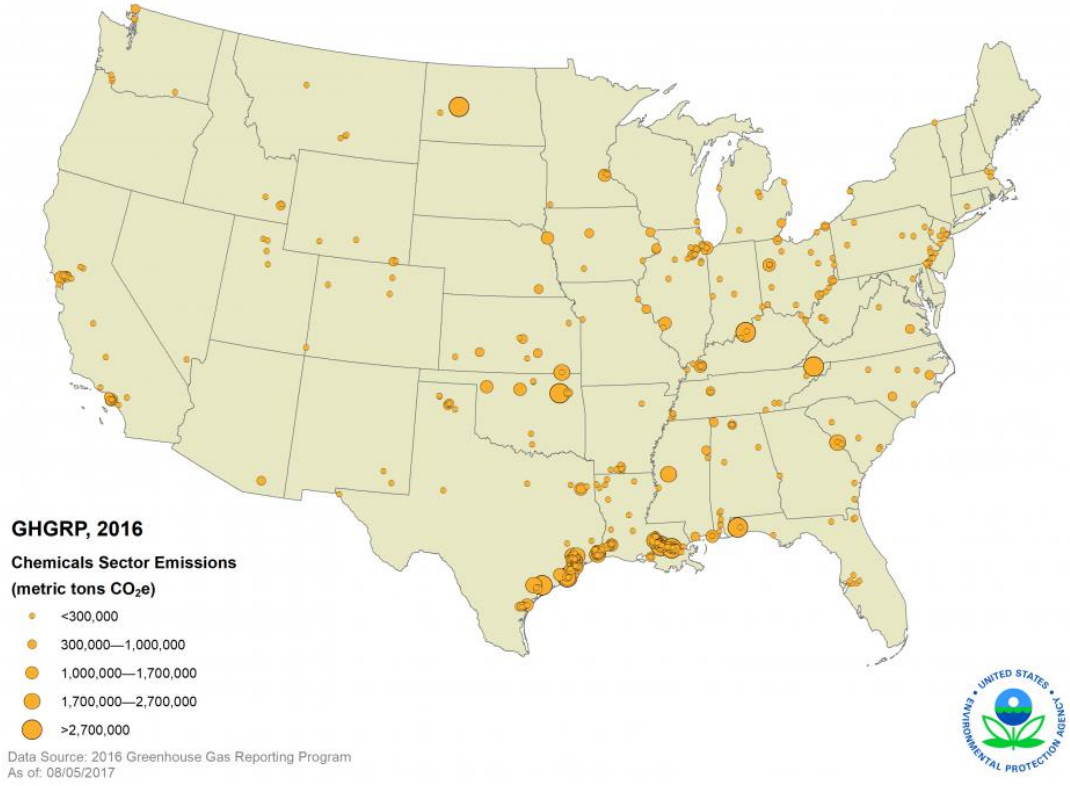
Trend of Annual Reported GHG Emissions for Chemicals (All Subsectors) (as of 8/5/17).



What factors influenced the trend in emissions for fluorinated chemicals production?

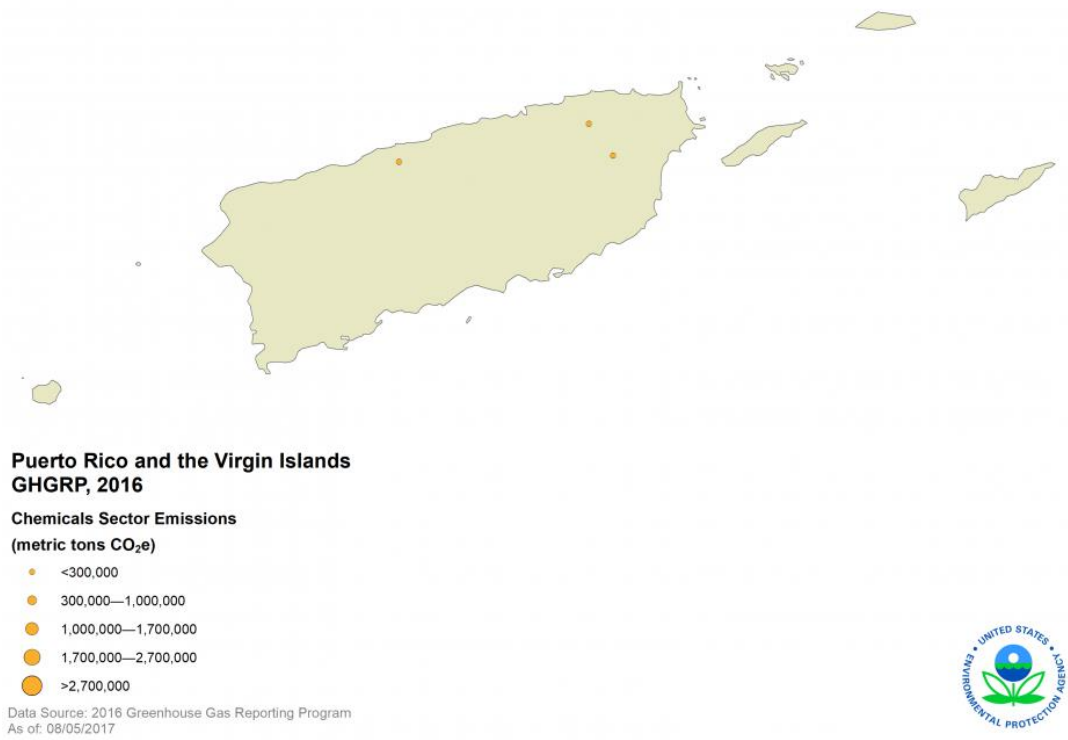
Location and emissions range for each reporting facility for Chemicals (All Subsectors) (as of 8/5/17)

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.




Alaska
GHGRP, 2016
Chemicals Sector Emissions
(metric tons CO_2e)
<300,000
300,000—1,000,000
1,000,000—1,700,000
1,700,000—2,700,000
>2,700,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Hawaii
GHGRP, 2016
Chemicals Sector Emissions
(metric tons CO_2e)
<300,000
300,000—1,000,000
1,000,000—1,700,000
1,700,000—2,700,000
>2,700,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017



Chemicals (Non-fluorinated)

The non-fluorinated chemical manufacturing subsector consists of facilities that produce adipic acid, ammonia, hydrogen (both merchant and non-merchant plants), nitric acid, petrochemicals (acrylonitrile, carbon black, ethylene, ethylene dichloride, ethylene oxide, and methanol), phosphoric acid, silicon carbide, soda ash, and titanium dioxide and other non-fluorinated chemicals. In addition to emissions from these chemical production processes, the subsector includes combustion emissions from facilities that produce pesticides, fertilizer, pharmaceuticals, and other organic and inorganic chemicals. A total of 439 facilities reported 2016 emissions under the non-fluorinated chemicals subsector. A small number of facilities in this subsector collect CO_2 either for use in their other production processes, to transfer to other users, or to sequester or otherwise inject underground; this subsector includes the CO_2 from those process emissions. For example, some of the process emissions reported for ammonia manufacturing plants includes CO_2 that is later consumed on site for urea production. This CO_2 is not released to the ambient air from the ammonia manufacturing process unit(s).

Chemicals (Non-Fluorinated) Subsectors — Greenhouse Gas Emissions Reported to the GHGRP

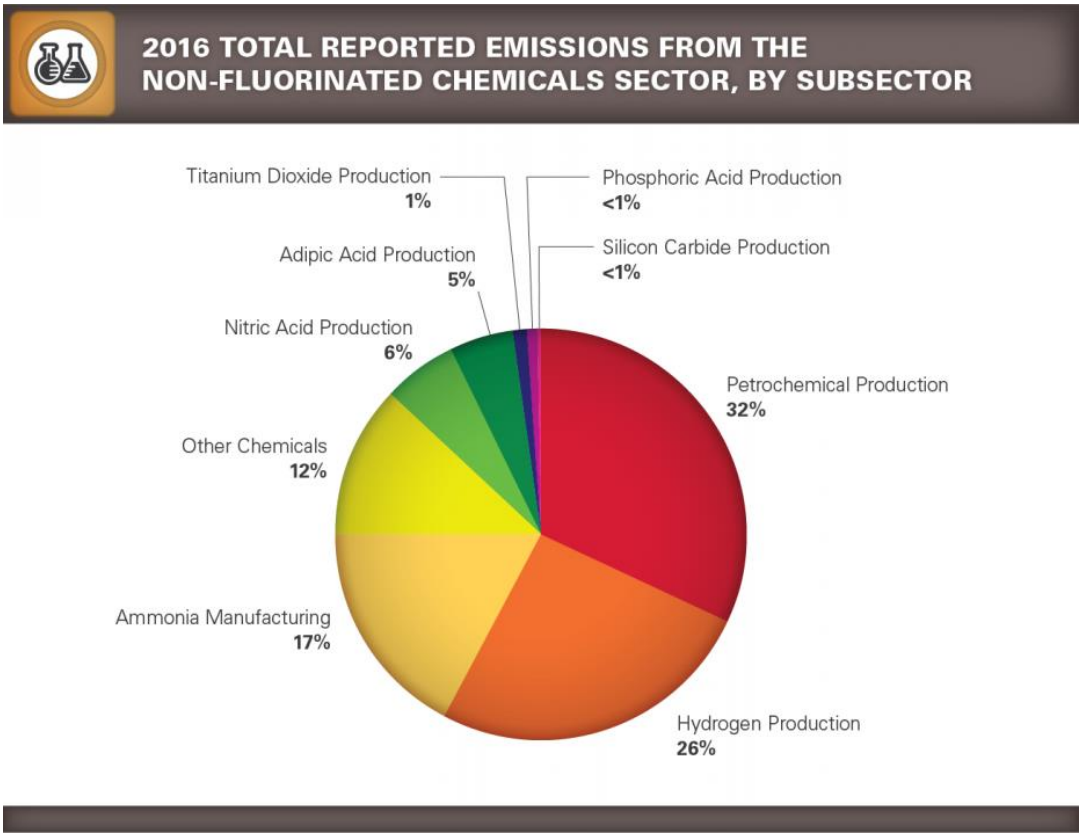
(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	441	451	456	449	448	439
Total emissions (CO_2e):	163.0	158.4	160.9	165.2	167.0	169.3
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	141.6	142.2	145.9	148.3	150.8	151.8
• Methane (CH_4):	0.2	0.2	0.2	0.3	0.2	0.2
• Nitrous oxide (N_2O):	21.3	16.0	14.8	16.6	16.0	17.3

Number of reporters and 2016 emissions (CO_2e) for the Non-Fluorinated Chemicals industry subsector

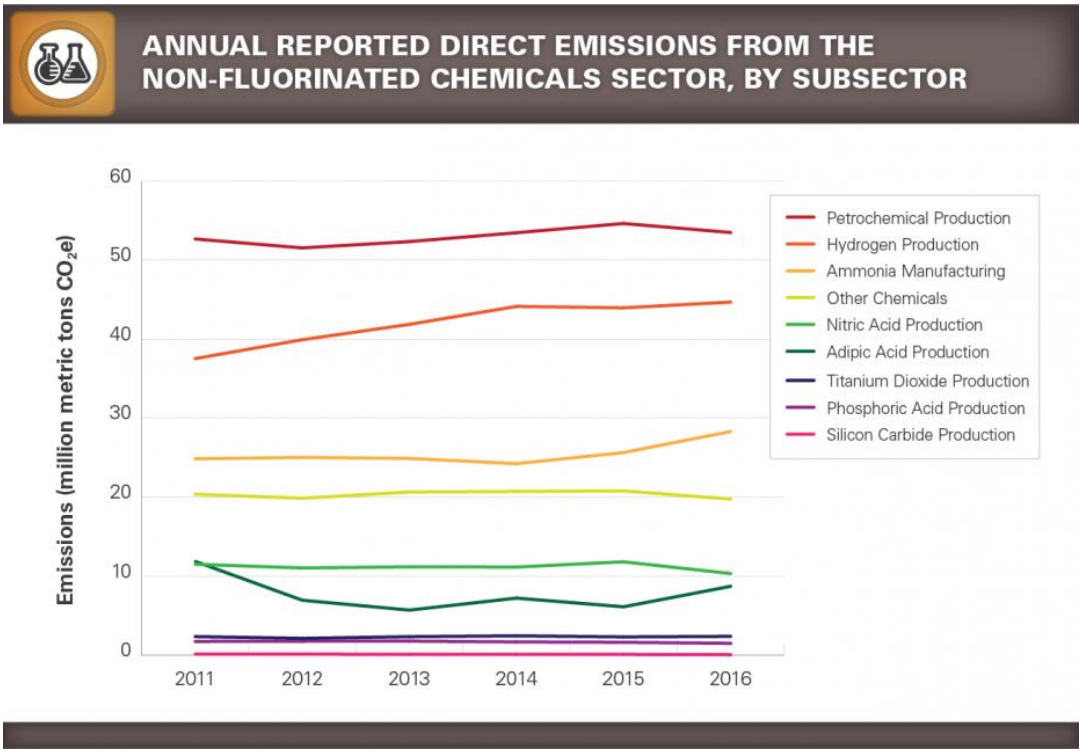
Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e)
Adipic Acid Production	3	8.7
Ammonia Manufacturing	26	28.3
Hydrogen Production	112	44.7
Nitric Acid Production	34	10.3
Petrochemical Production	66	53.5
Phosphoric Acid Production	12	1.5
Silicon Carbide Production	1	0.1
Titanium Dioxide Production	6	2.4
Other Chemicals	204	19.8

Total Reported Direct Emissions from Chemicals (Non-fluorinated), by Subsector, (as of 8/5/17).



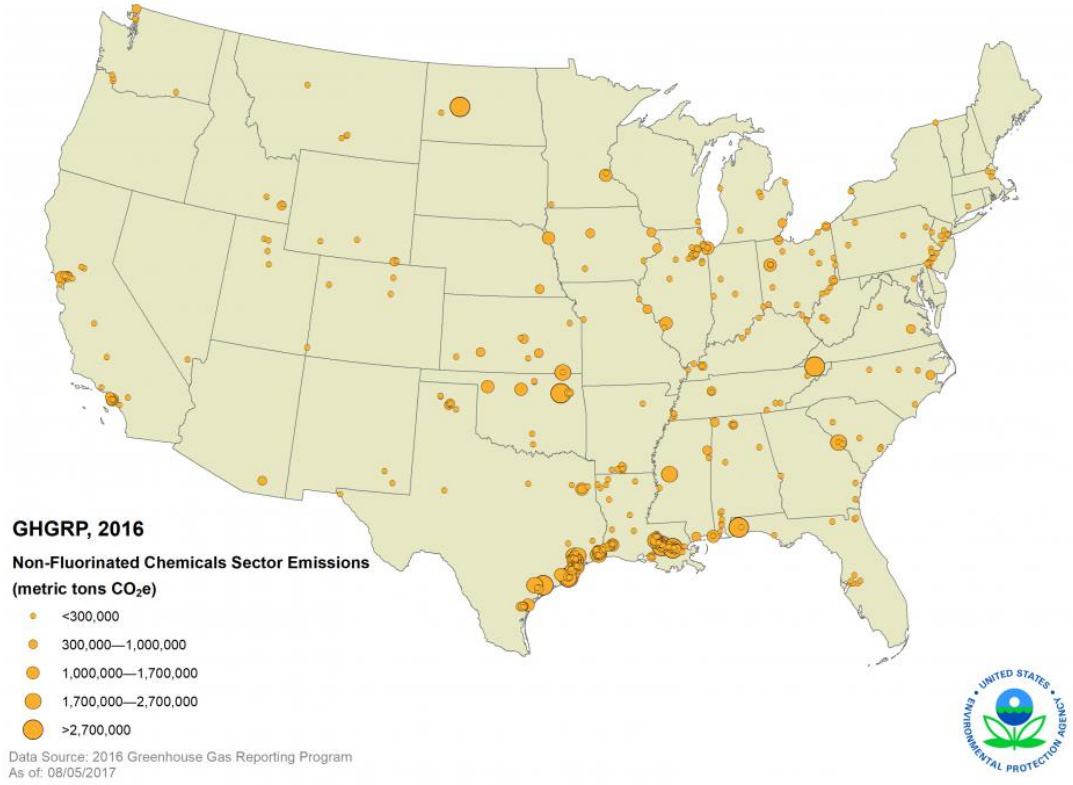
Sum of percentages may not equal 100% due to independent rounding.

Trend of Annual Reported GHG Emissions for Chemicals (Non-fluorinated), by Subsector (as of 8/5/17).



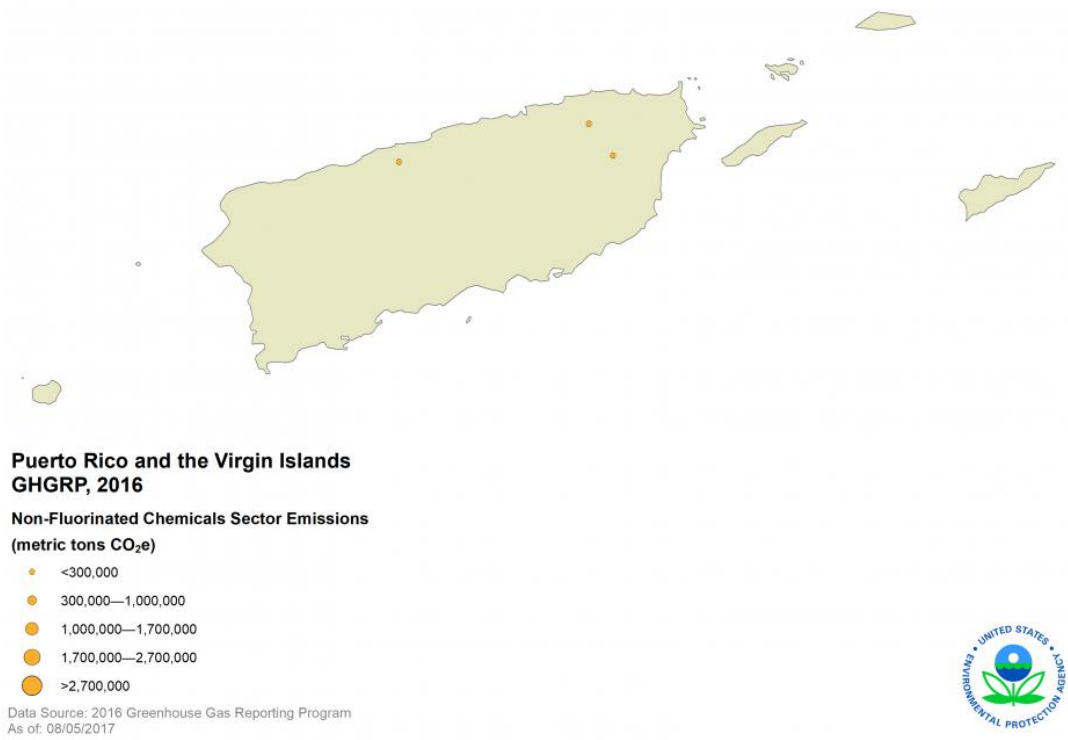
Location and emissions range for each reporting facility for Chemicals (Non-fluorinated) (as of 8/5/17).

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.




Alaska
GHGRP, 2016
Non-Fluorinated Chemicals Sector Emissions
(metric tons CO_2e)
<300,000
300,000—1,000,000
1,000,000—1,700,000
1,700,000—2,700,000
>2,700,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Hawaii
GHGRP, 2016
Non-Fluorinated Chemicals Sector Emissions
(metric tons CO_2e)
<300,000
300,000—1,000,000
1,000,000—1,700,000
1,700,000—2,700,000
>2,700,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017



Fluorinated Chemicals

The fluorinated chemical subsector includes facilities that produce hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), nitrogen trifluoride (NF_3), other fluorinated GHGs such as fluorinated ethers, and chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), including chlorodifluoromethane (HCFC-22). The subsector also includes facilities that destroy HFC-23, which is a by-product of HCFC-22 production and which may be emitted from the destruction process. This subsector does not include industries that use these fluorinated GHGs (i.e. semiconductors).

Fluorinated Chemicals Subsector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	16	16	16	15	15	15
Total emissions (CO_2e):	17.4	14.1	13.1	11.4	9.9	7.3
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	0.8	0.8	0.8	0.8	0.8	0.7
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	**	**	**	**	**
• Fluorinated GHGs:	16.5	13.3	12.3	10.5	9.1	6.6

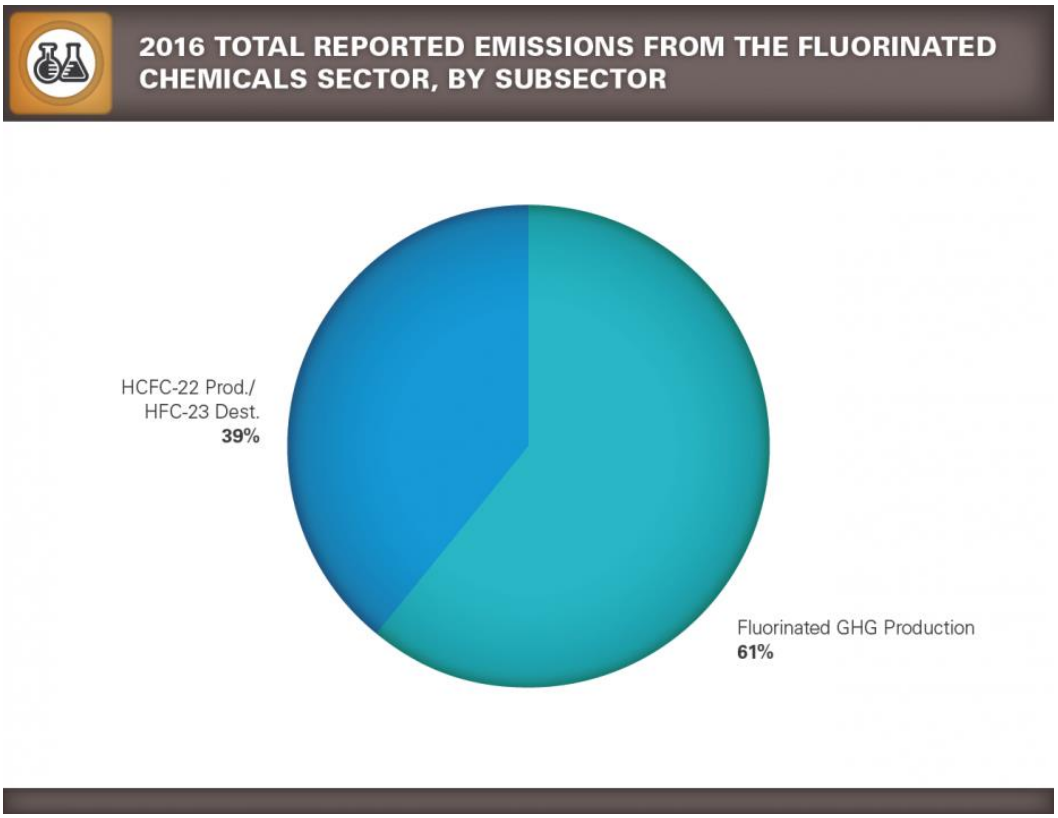
Totals may not equal sum of individual GHGs due to independent rounding.

** Total reported emissions are less than 0.05 million metric tons CO_2e.

Number of reporters and 2016 emissions (CO_2e) for the Fluorinated Chemicals industry subsector

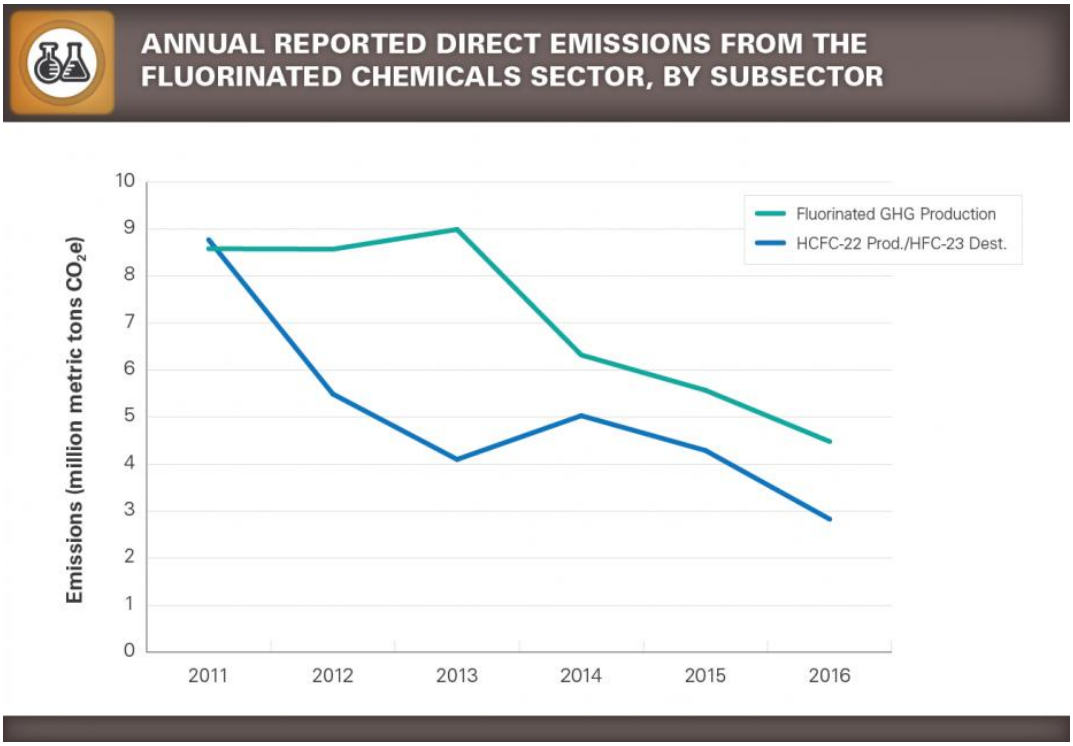
Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e)
Fluorinated GHG Production	14	4.5
HCFC-22 Production/HFC-23 Destruction	4	2.8

Total Reported Direct Emissions from Fluorinated Chemicals, by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

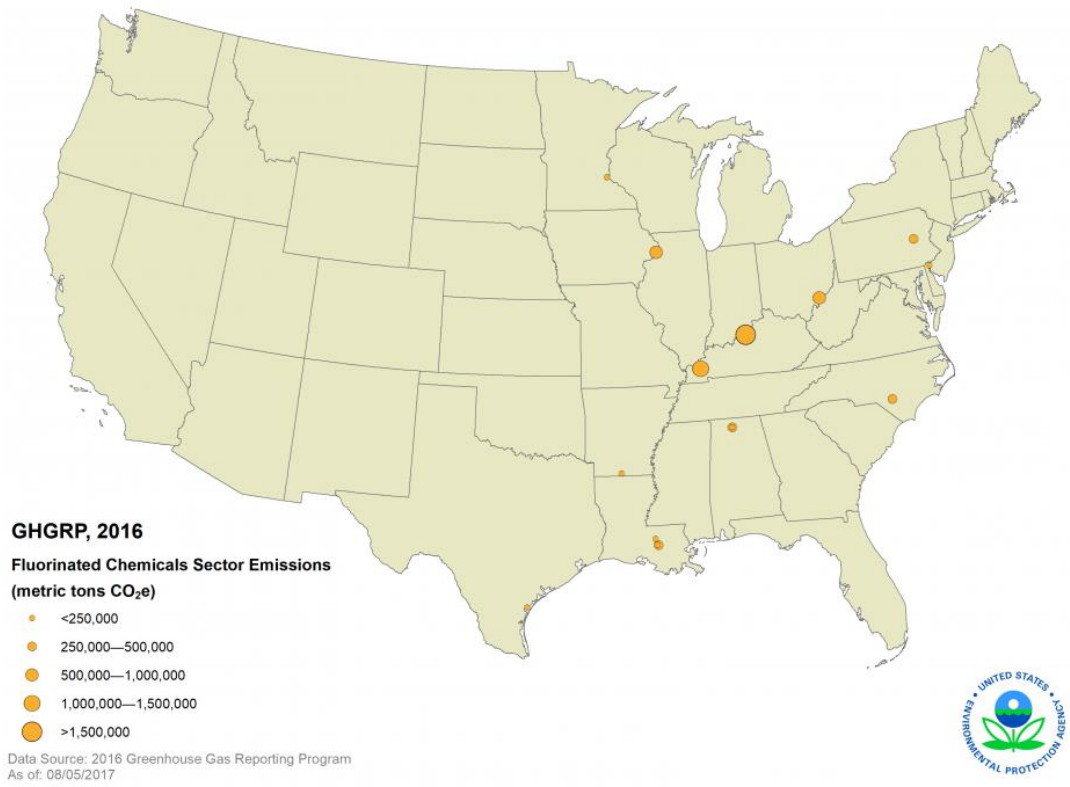
Trend of Annual Reported GHG Emissions from Fluorinated Chemicals, by Subsector (as of 8/5/17).



What factors influenced the trend in emissions for fluorinated chemicals production?

Location and emissions range for each reporting facility in Fluorinated Chemicals (as of 8/5/17).

This map shows the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.



Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Waste

The waste sector consists of municipal solid waste (MSW) landfills, industrial waste landfills, industrial wastewater treatment systems, and facilities that operate combustors or incinerators for the disposal of nonhazardous solid waste. Emissions from fossil fuel combustion at facilities with industrial waste landfills, and industrial wastewater treatment systems are included in other sectors.

MSW landfills. This category consists of landfills that accepted MSW on or after January 1, 1980 and generate methane in amounts equivalent to 25,000 metric tons of CO_2e or more per year. This category includes emissions from the landfill, landfill gas collection systems, and destruction devices for landfill gases (including boilers, engines, and flares).

Industrial Waste Landfills. This category consists of industrial waste landfills that accepted industrial waste on or after January 1, 1980 and that have a total landfill design capacity of 300,000 metric tons or more. The category excludes landfills for hazardous waste and those that receive only construction and demolition or inert wastes. This category includes emissions from the landfill, landfill gas collection systems, and destruction devices for landfill gases (including flares).

Industrial Wastewater Treatment. This category consists of anaerobic processes used to treat nonhazardous industrial wastewater and industrial wastewater treatment sludge at facilities that perform pulp and paper manufacturing, food processing, ethanol production, or petroleum refining.

Solid Waste Combustion. This category consists of combustors and incinerators for the disposal of nonhazardous solid waste.

Waste Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	1,644	1,650	1,634	1,628	1,541	1,505
Total emissions (CO_2e):	114.9	115.4	111.6	112.0	110.8	107.4
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	10.1	10.3	10.5	10.6	10.8	11.1
• Methane (CH_4):	104.4	104.8	100.7	101.1	99.6	95.9
• Nitrous oxide (N_2O):	0.4	0.4	0.4	0.4	0.4	0.4

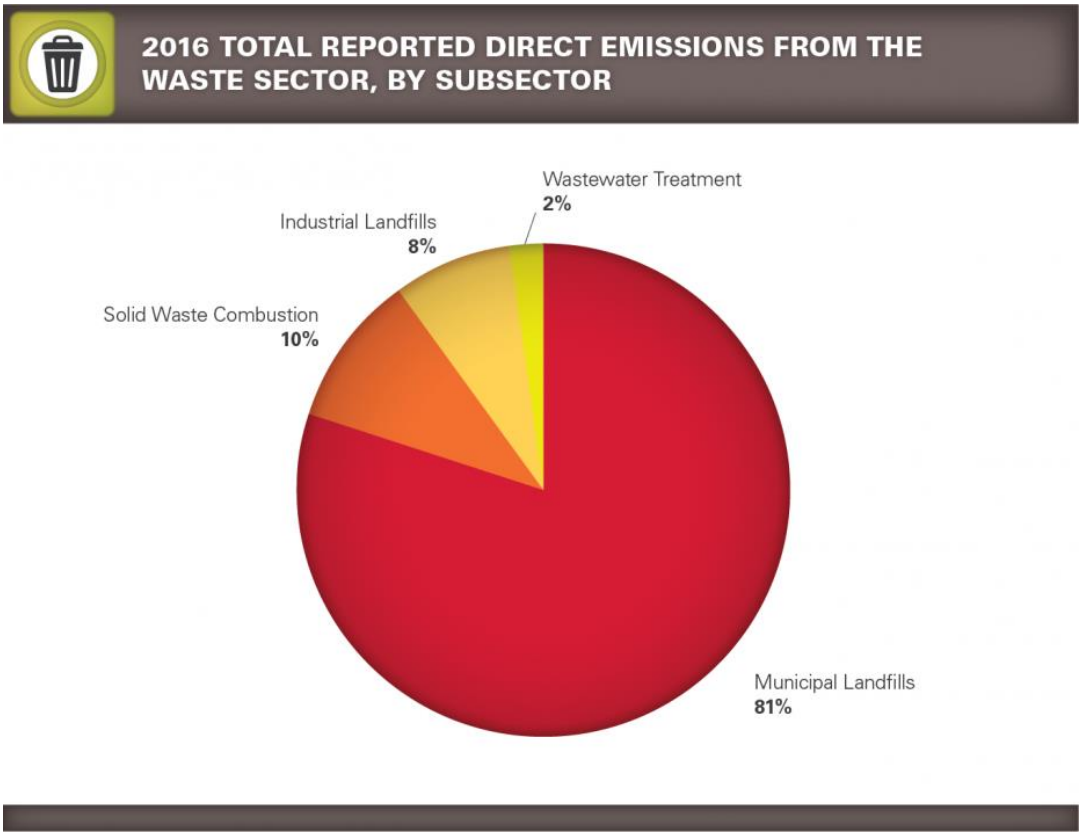
Totals may not equal sum of individual GHGs due to independent rounding.

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

Number of reporters and 2016 emissions (CO_2e) per waste industry subsector

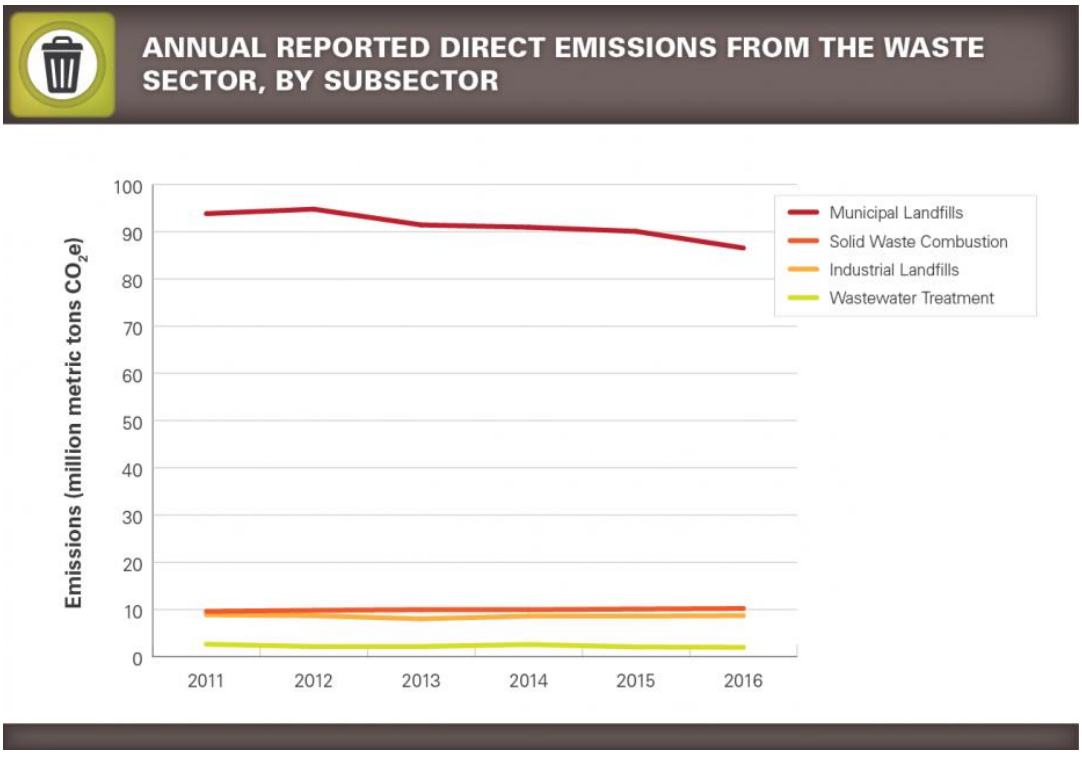
Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e per year)
MSW Landfills	1,137	86.6
Industrial Wastewater Treatment	140	2.0
Industrial Waste Landfills	172	8.7
Solid Waste Combustion	63	10.2

2016 Total Reported Direct Emissions from Waste, by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

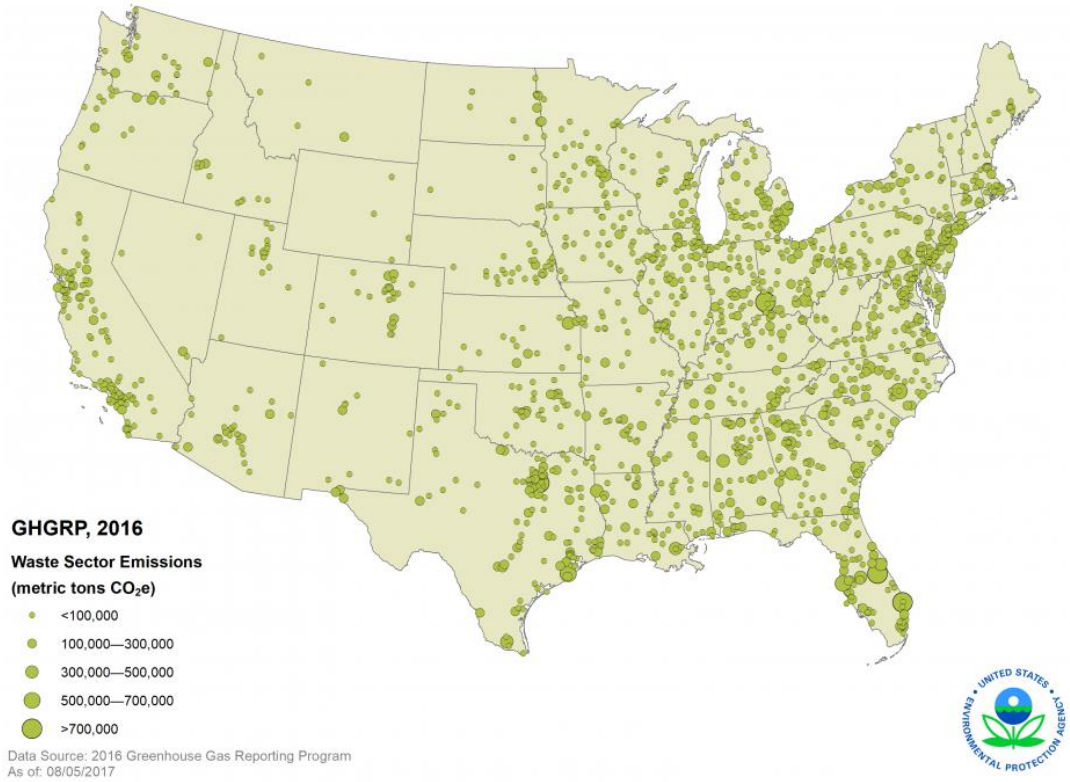
Trend of Annual Reported GHG Emissions by Subsector (as of 8/5/17).

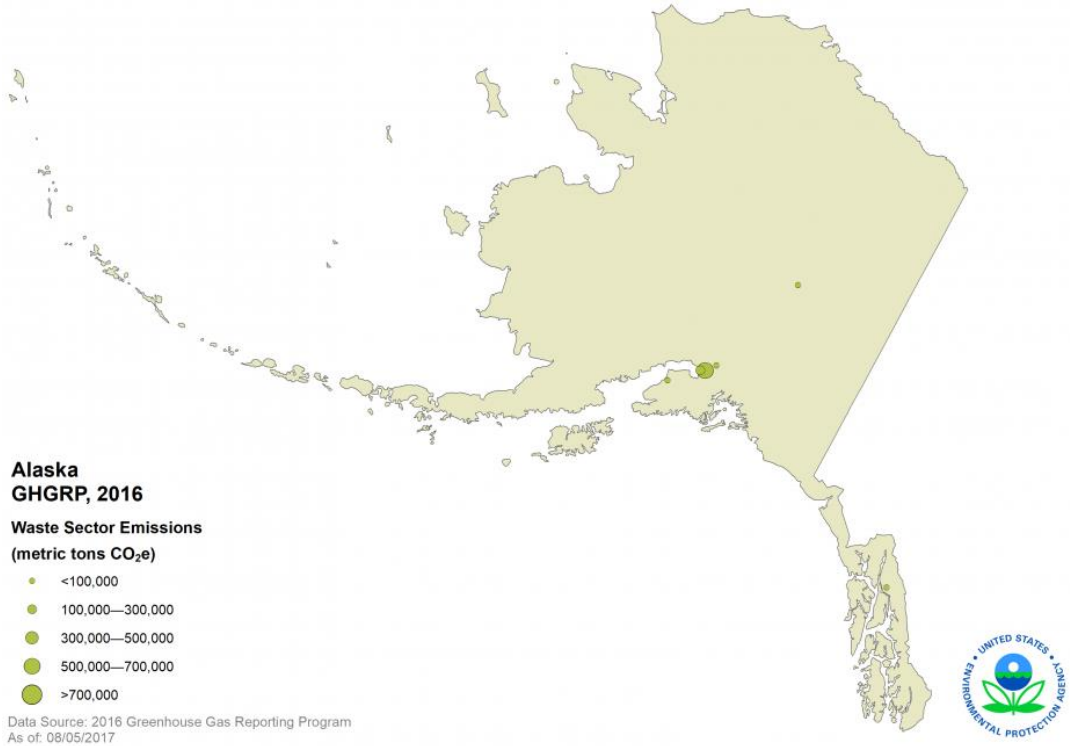


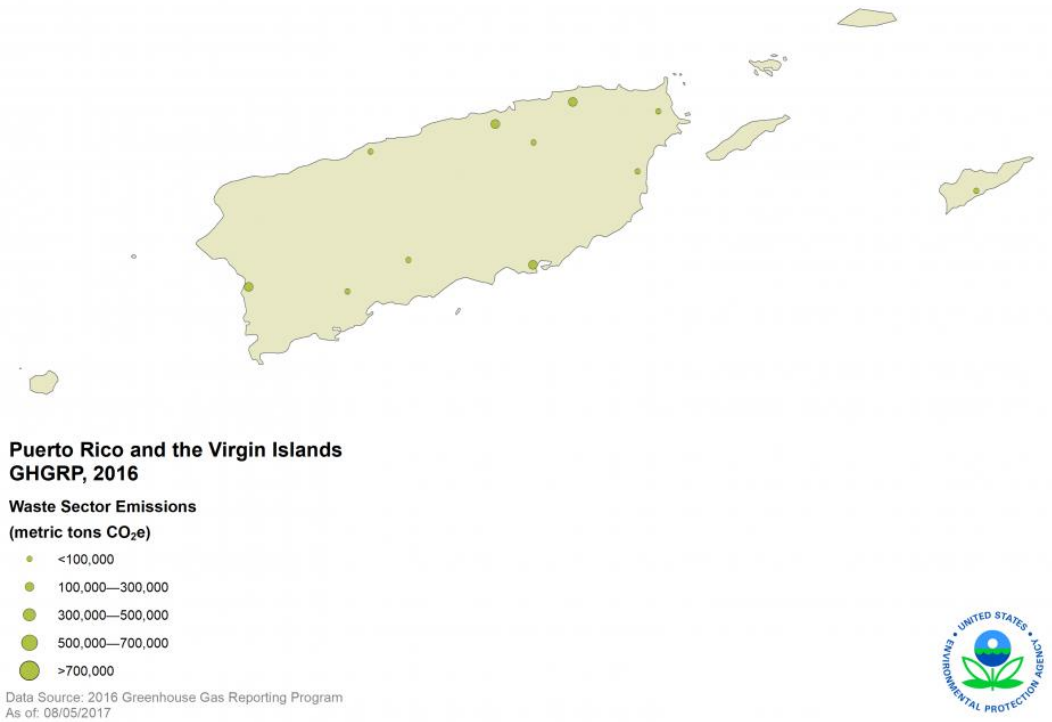
What factors influenced the trend in emissions for the waste sector?

Location and emissions range for each reporting facility in the waste sector (as of 8/5/17).

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.







Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Metals

The metals sector consists of metal production facilities that smelt, refine, and/or cast ferrous and nonferrous metals, including primary aluminum, ferroalloy, iron and steel, lead, magnesium, and zinc, from ore, pig, or scrap using electrometallurgical and other methods. The sector also includes foundries and any other metal production facility operating under NAICS codes beginning with 331 (Primary Metal Manufacturing). Primary aluminum, ferroalloy, iron and steel, lead, magnesium, and zinc production facilities report GHG emissions from metal smelting, refining, and/or casting activities, as well as from stationary fuel combustion sources. All other metal production facilities report only the GHG emissions from stationary fuel combustion sources.

Metals Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	299	301	302	304	299	298
Total emissions (CO_2e):	112.0	106.8	106.9	104.4	90.8	86.7
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	107.0	102.5	102.8	101.0	87.9	84.4
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	**	**	**	**	**
• Hydrofluorocarbons (HFCs):	**	**	0.1	0.1	0.1	0.1
• Perfluorocarbons (PFCs):	3.5	2.9	3.0	2.5	2.0	1.3
• Sulfur hexafluoride (SF_6):	1.5	1.3	1.0	0.7	0.7	0.8

Totals may not equal sum of individual GHGs due to independent rounding.

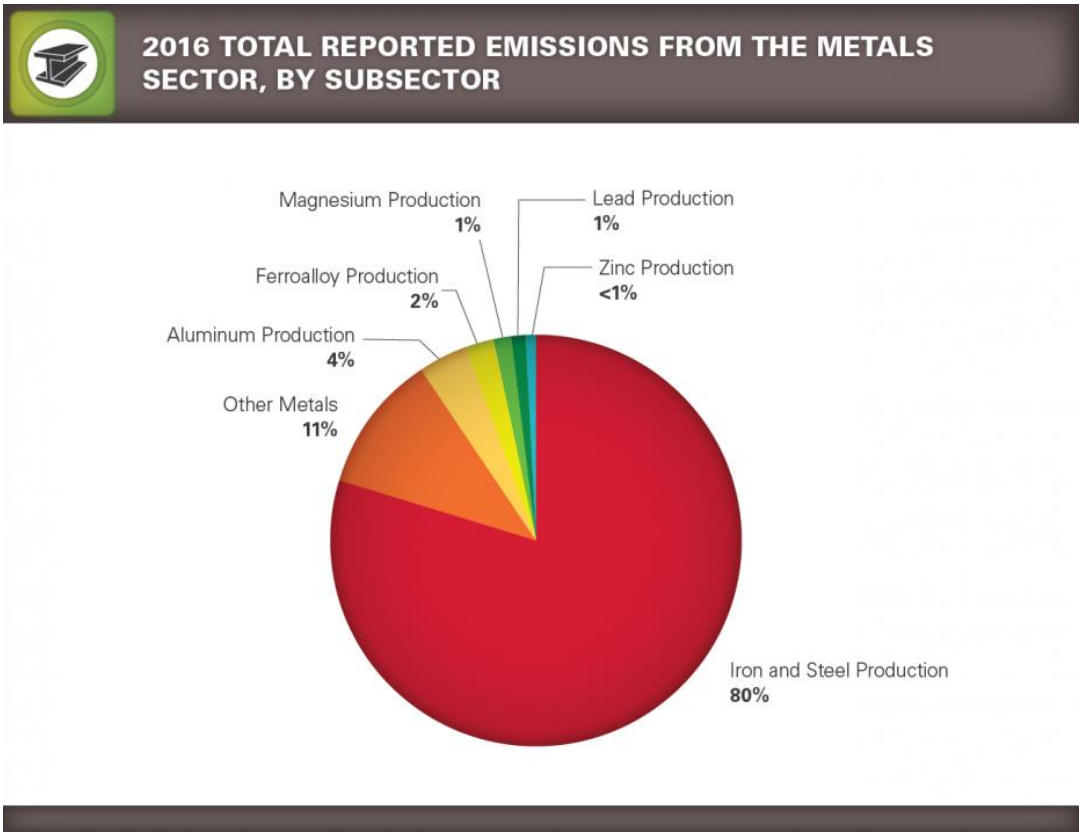
** Total reported emissions are less than 0.05 million metric tons CO_2e.

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

Number of reporters and 2016 emissions (CO2e) per metal industry subsector

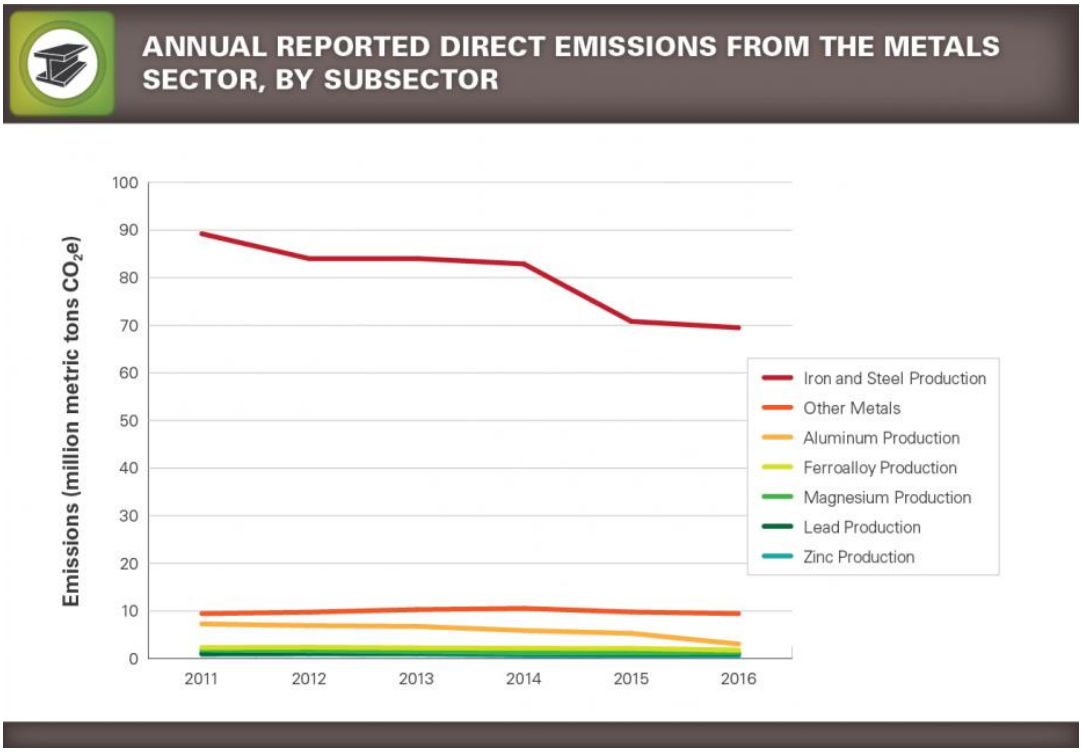
Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e per year)
Aluminum Production	8	3.1
Ferroalloy Production	10	1.8
Iron and Steel Production	124	69.5
Lead Production	11	1.0
Magnesium Production	10	1.2
Zinc Production	5	0.6
Other Metals	130	9.4

2016 Total Reported Direct Emissions from Metals, by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

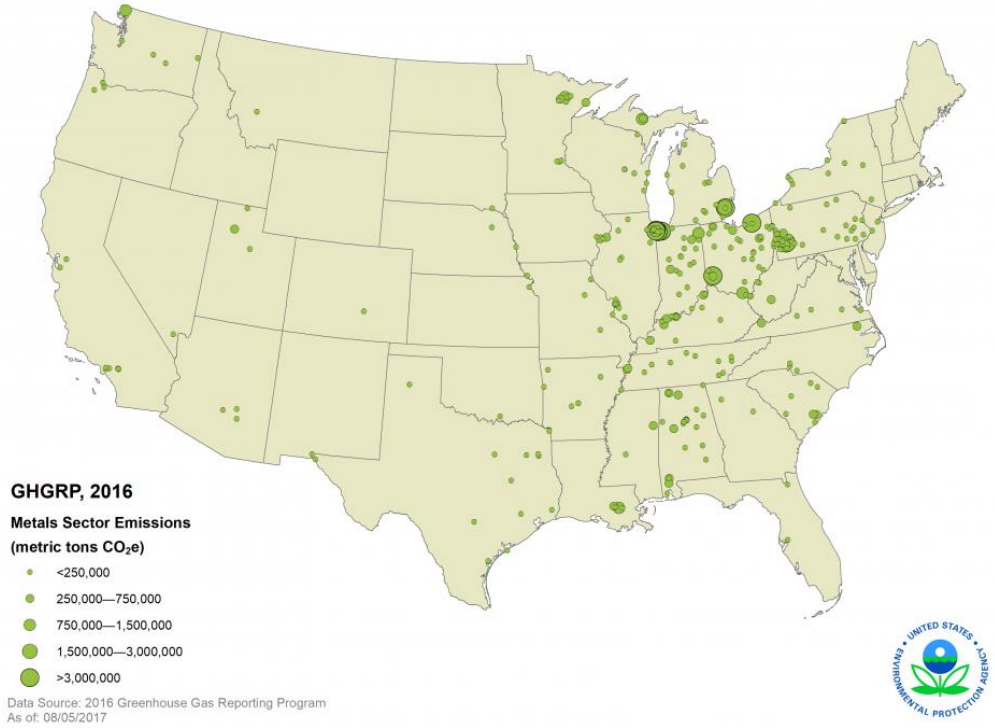
Trend of Annual Reported GHG Emissions by Subsector (as of 8/5/17).



What factors influenced the trend in emissions for metals production?

Location and emissions range for each reporting facility in the metals sector in 2016 (as of 8/5/17).

This map shows the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.



Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Minerals

The minerals sector consists of cement production, glass production, lime manufacturing, soda ash manufacturing, and any other mineral production facility operating under NAICS codes beginning with 327 (Non-metallic Mineral Product Manufacturing). Facilities under this sector transform mined or quarried non-metallic minerals — such as sand, gravel, stone, clay, and refractory materials — into products for intermediate or final consumption. Glass, cement, soda ash and lime facilities report both process emissions from the calcination of carbonate-based raw materials and GHG emissions from stationary fuel combustion sources. All other mineral production facilities report only GHG emissions from stationary fuel combustion sources. A small number of facilities in this sector collect CO_2 either for use in their other production processes (e.g., sugar refining), to transfer to other users, or to sequester or otherwise inject underground. This sector includes the CO_2 emissions reported for those processes.

Minerals Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

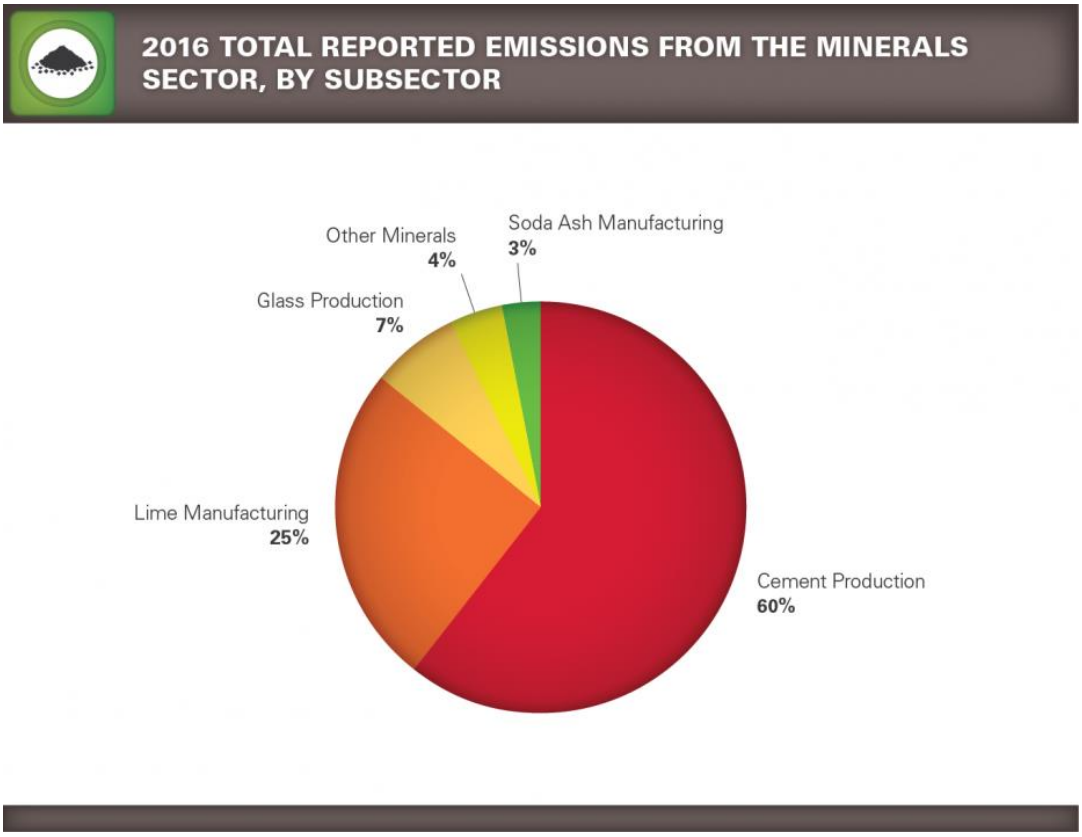
	2011	2012	2013	2014	2015	2016
Number of facilities:	367	369	378	381	380	370
Total emissions (CO_2e):	103.2	107.5	111.5	116.6	115.7	109.9
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	102.9	107.2	111.2	116.2	115.4	109.6
• Methane (CH_4):	0.1	0.1	0.1	0.1	0.1	0.1
• Nitrous oxide (N_2O):	0.2	0.2	0.2	0.3	0.2	0.2

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

Number of reporters and 2016 emissions (CO_2e) per minerals industry subsector

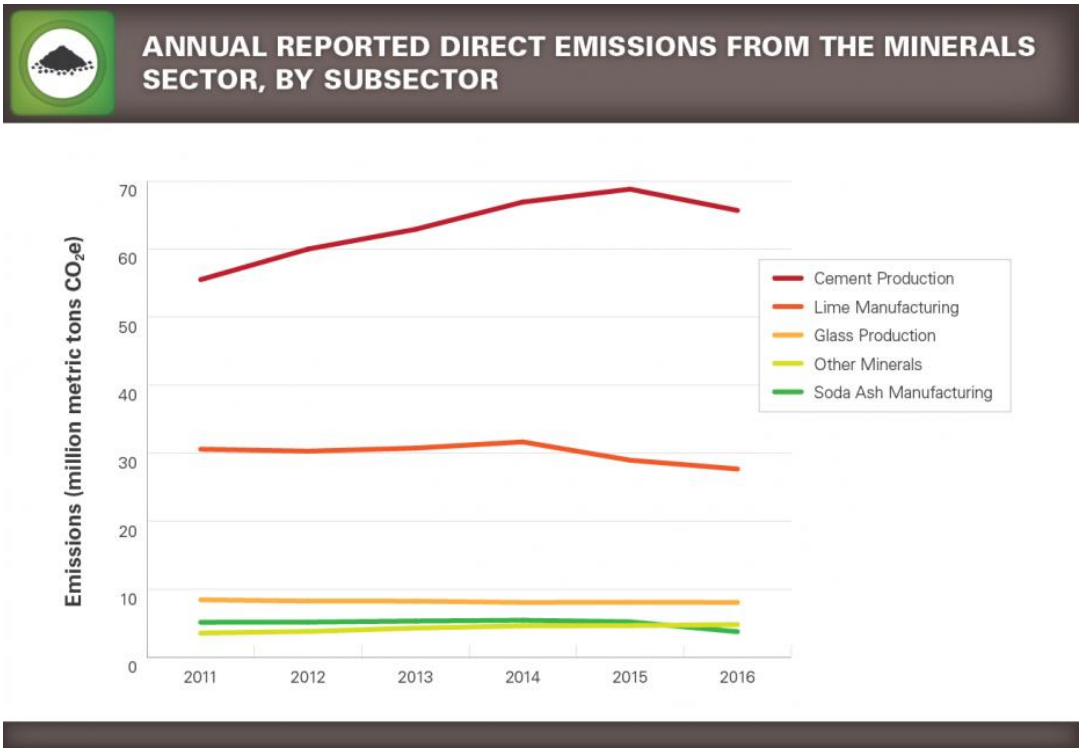
Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e per year)
Cement Production	95	65.7
Lime Production	75	27.7
Glass Production	102	8.1
Soda Ash Manufacturing	3	3.8
Other Minerals	97	4.8

Total Reported Direct Emissions from Minerals, by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

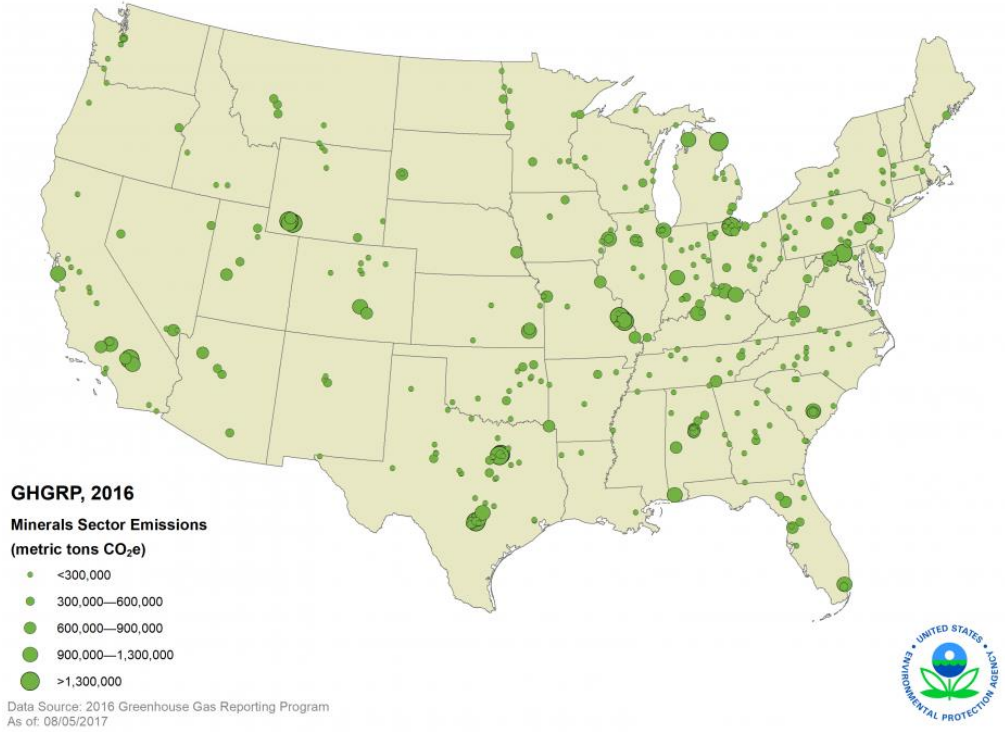
Trend of Annual Reported GHG Emissions by Subsector (as of 8/5/17).



What factors influenced the trend in emissions for minerals production?

Location and emissions range for each reporting facility in the minerals sector (as of 8/5/17).

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.



Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Pulp and Paper

The pulp and paper sector consists of facilities that produce market pulp or that manufacture pulp and paper. Facilities that have pulping processes report the GHG emissions from chemical recovery units, lime kilns, and stationary fuel combustion units. In addition to emissions from pulp production processes, the sector includes combustion emissions from facilities that produce paper products from purchased pulp, produce secondary fiber from recycled paper, convert paper into paperboard products, operate coating and laminating processes, print products (such as books, labels, business cards, stationery, and business forms), and perform support activities (such as data imaging, plate-making services, and bookbinding). Emissions from industrial landfills and industrial wastewater treatment at these facilities are included in the waste sector.

Pulp and Paper Sector — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	233	232	233	234	232	228
Total emissions (CO_2e):	44.2	42.7	39.4	39.3	38.4	37.7
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	41.2	39.8	38.6	38.5	37.6	37.0
• Methane (CH_4):	1.1	1.1	0.2	0.2	0.2	0.2
• Nitrous oxide (N_2O):	1.9	1.9	0.6	0.6	0.6	0.5

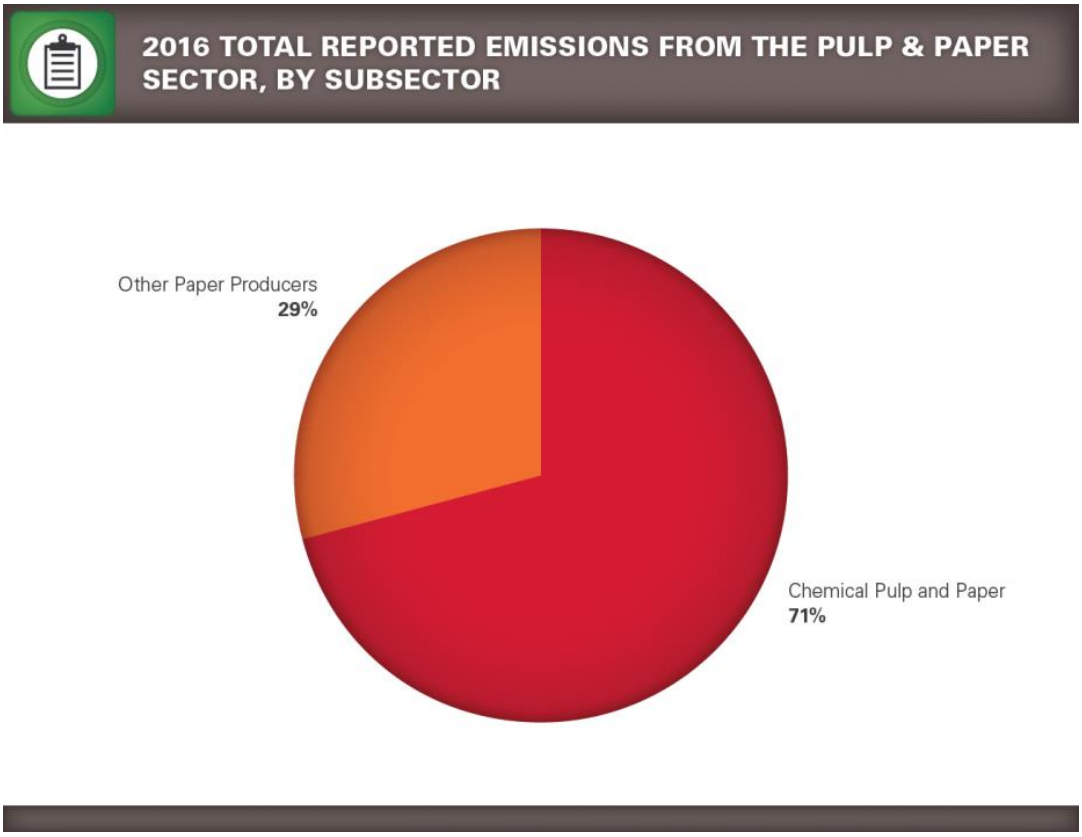
Totals may not equal sum of individual GHGs due to independent rounding.

CO_2 emissions from the combustion of biomass are NOT included in emissions totals provided above.

Number of reporters and 2016 emissions (CO_2e) per pulp and paper industry subsector

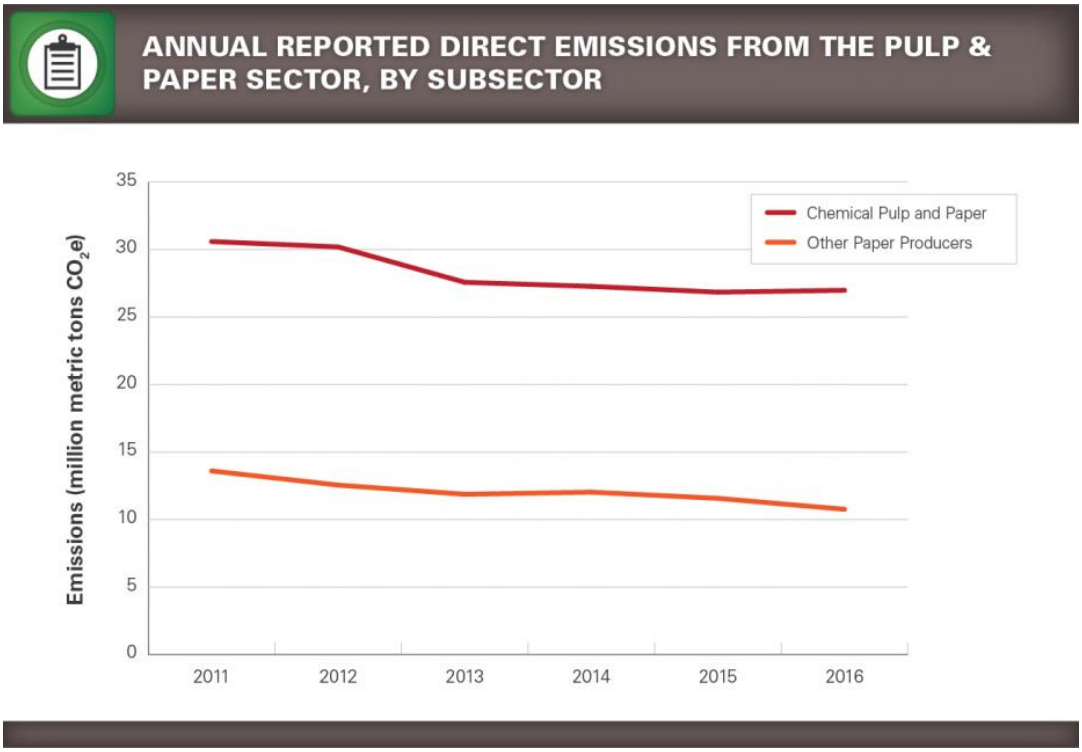
Industry Sector	2016 Number of Reporters	2016 Emissions (million metric tons CO_2e)
Chemical Pulp and Paper Production	107	27.0
Other Paper Producers	121	10.8

2016 Total Reported Direct Emissions from Pulp and Paper, by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

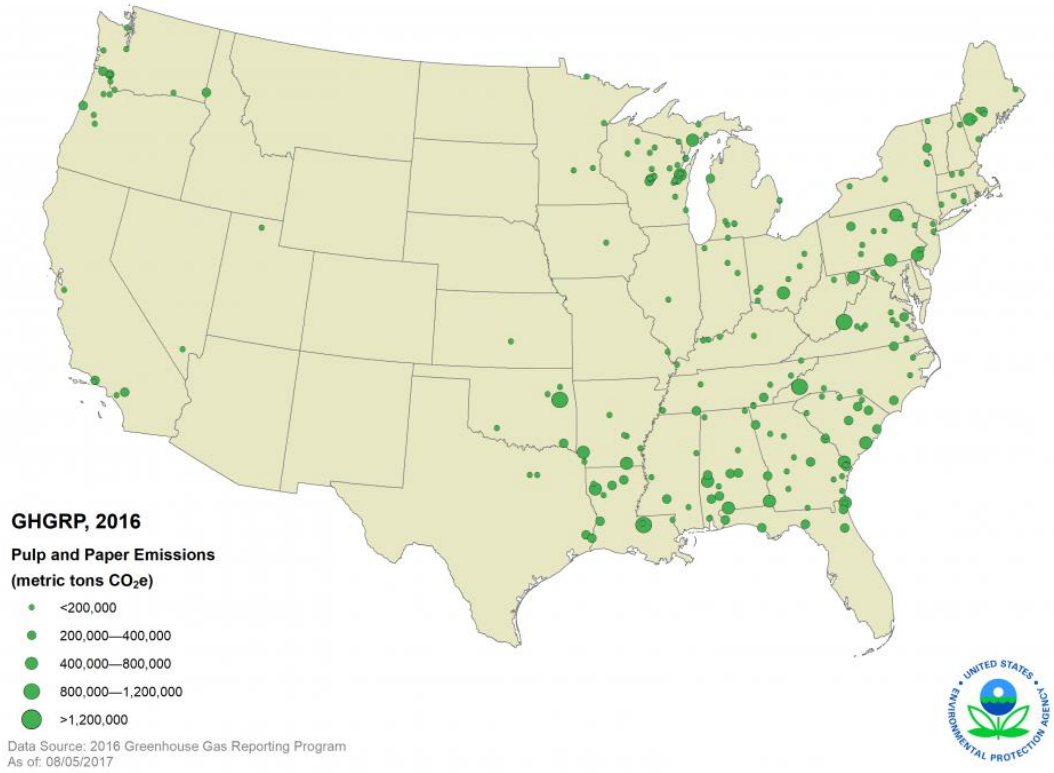
Trend of Annual Reported GHG Emissions by Subsector (as of 8/5/17)



What factors influenced the trend in emissions for pulp and paper?

Location and emissions range for each reporting facility in the pulp and paper sector (as of 8/5/17).

This map shows the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.



Other EPA Resources

- U.S. Greenhouse Gas Inventory Report

GHGRP 2016: Miscellaneous Combustion

Miscellaneous Combustion comprises facilities that reported GHG emissions from stationary fuel combustion sources only and that are not part of any other sector. This category includes food processing, ethanol production, manufacturing operations, universities, military installations, and any combustion sources not included elsewhere, such as mining operations and hospitals.

Miscellaneous Combustion — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

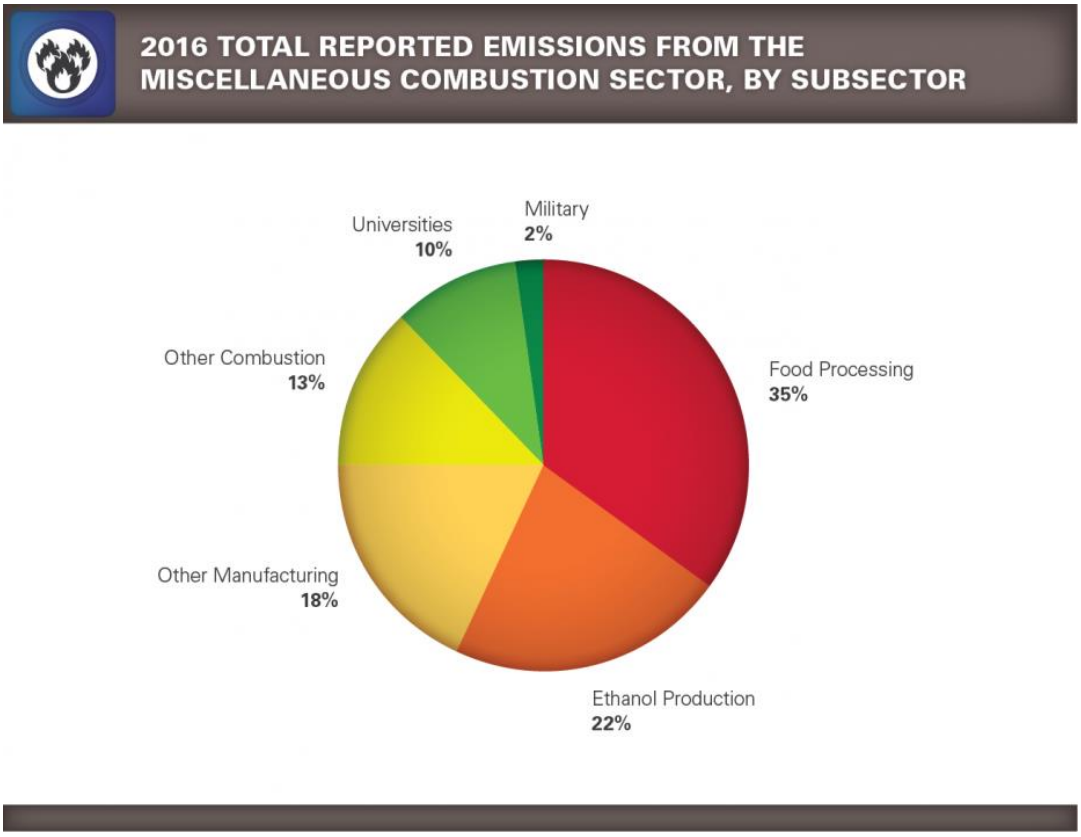
	2011	2012	2013	2014	2015	2016
Number of facilities:						
• Food Processing	317	327	332	340	344	338
• Ethanol Production	163	166	164	172	176	172
• Other Manufacturing	287	291	293	297	290	279
• Universities	112	115	114	117	116	114
• Military	43	44	43	43	38	34
• Other Combustion	161	171	175	183	180	173
Total emissions (CO_2e):						
• Food Processing	31.2	31.1	31.3	32.1	30.9	29.9
• Ethanol Production	18.2	17.3	17.1	18.3	18.5	19.1
• Other Manufacturing	16.9	16.0	16.5	16.8	15.6	15.1
• Universities	9.5	9.0	9.2	9.4	9.0	8.7
• Military	2.7	2.6	2.5	2.5	1.9	1.7
• Other Combustion	11.0	11.2	11.3	11.3	11.4	10.7
Emissions by greenhouse gas (CO_2e) Food Processing						
• Carbon dioxide (CO_2):	31.0	30.9	31.1	31.9	30.7	29.7
• Methane (CH_4):	0.1	0.1	0.1	0.1	0.1	0.1
• Nitrous oxide (N_2O):	0.1	0.1	0.1	0.1	0.1	0.1
Ethanol Production						
• Carbon dioxide (CO_2):	18.2	17.2	17.1	18.3	18.5	19.1
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	0.2	**	**	**	**
Other Manufacturing						
• Carbon dioxide (CO_2):	16.8	15.9	16.4	16.8	15.5	15.0
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	0.1	0.1	0.1	0.1	**	**
Universities						
• Carbon dioxide (CO_2):	9.4	9.0	9.2	9.4	9.0	8.7
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	**	**	**	**	**
Military						

	2011	2012	2013	2014	2015	2016
• Carbon dioxide (CO_2):	2.7	2.6	2.5	2.5	1.9	1.7
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	**	**	**	**	**
Other Combustion						
• Carbon dioxide (CO_2):	10.9	11.2	11.2	11.3	11.4	10.6
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	**	**	**	**	**

Totals may not equal sum of individual GHGs due to independent rounding.

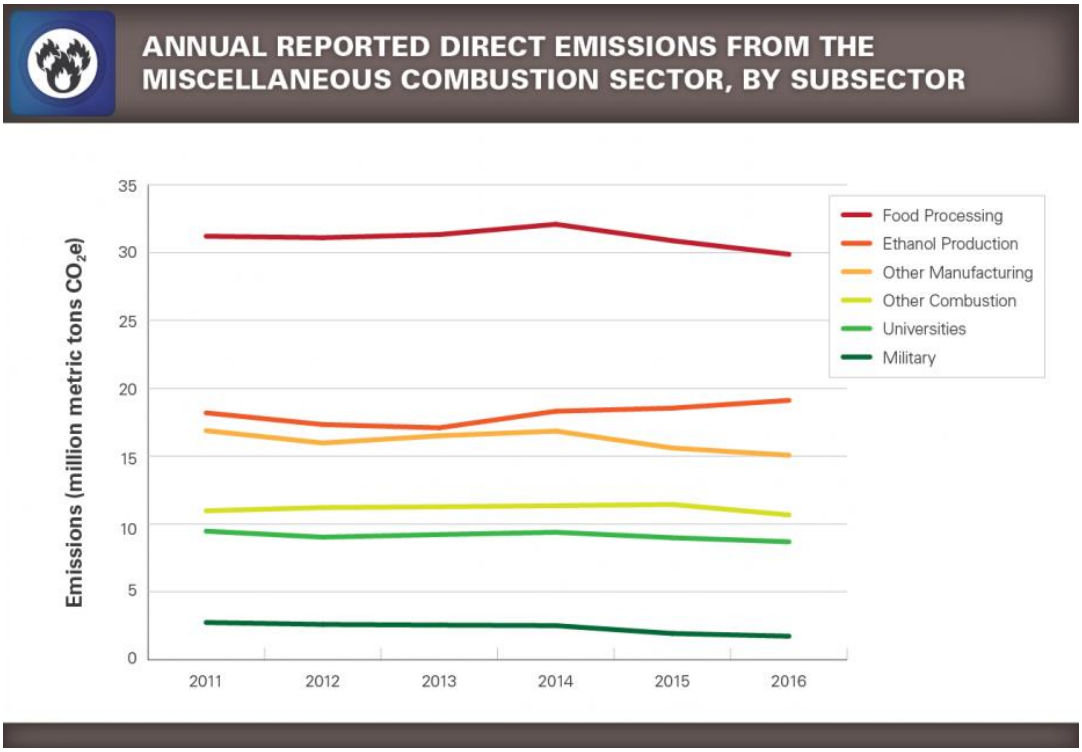
** Total reported emissions are less than 0.05 million metric tons CO_2e.

2016 Total Reported Direct Emissions from Miscellaneous Combustion, by Subsector (as of 8/5/17).



Sum of percentages may not equal 100% due to independent rounding.

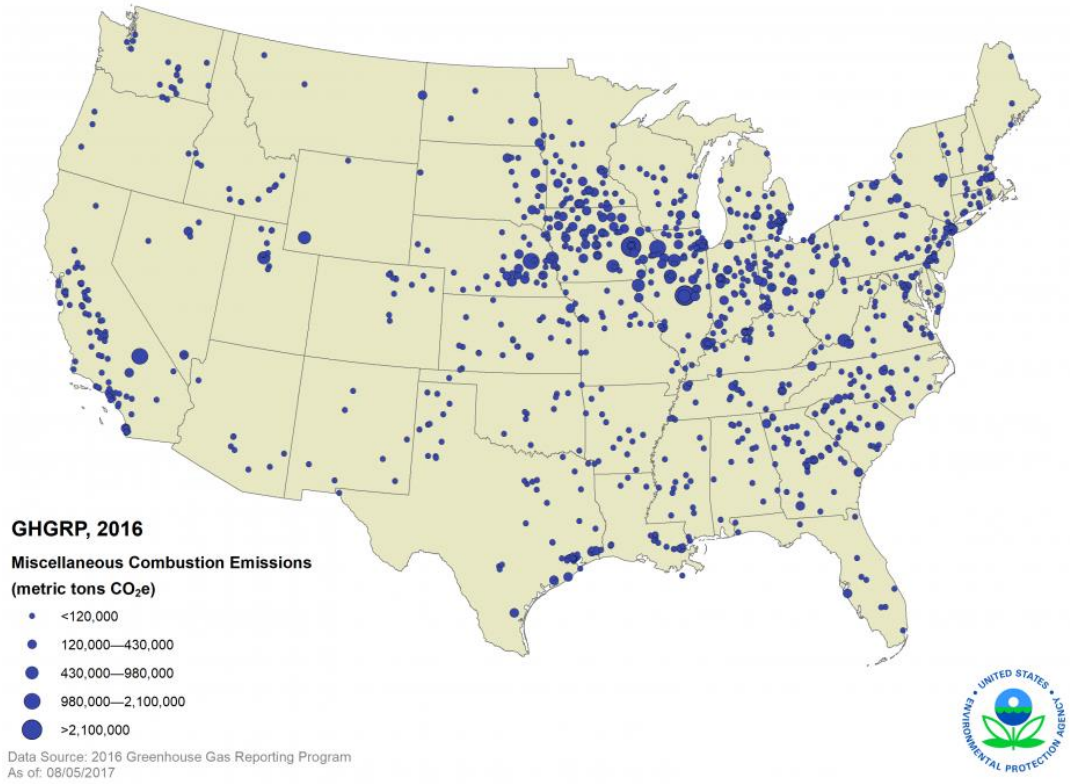
Trend of Annual Reported GHG Emissions from Miscellaneous Combustion, by Subsector (as of 8/5/17).

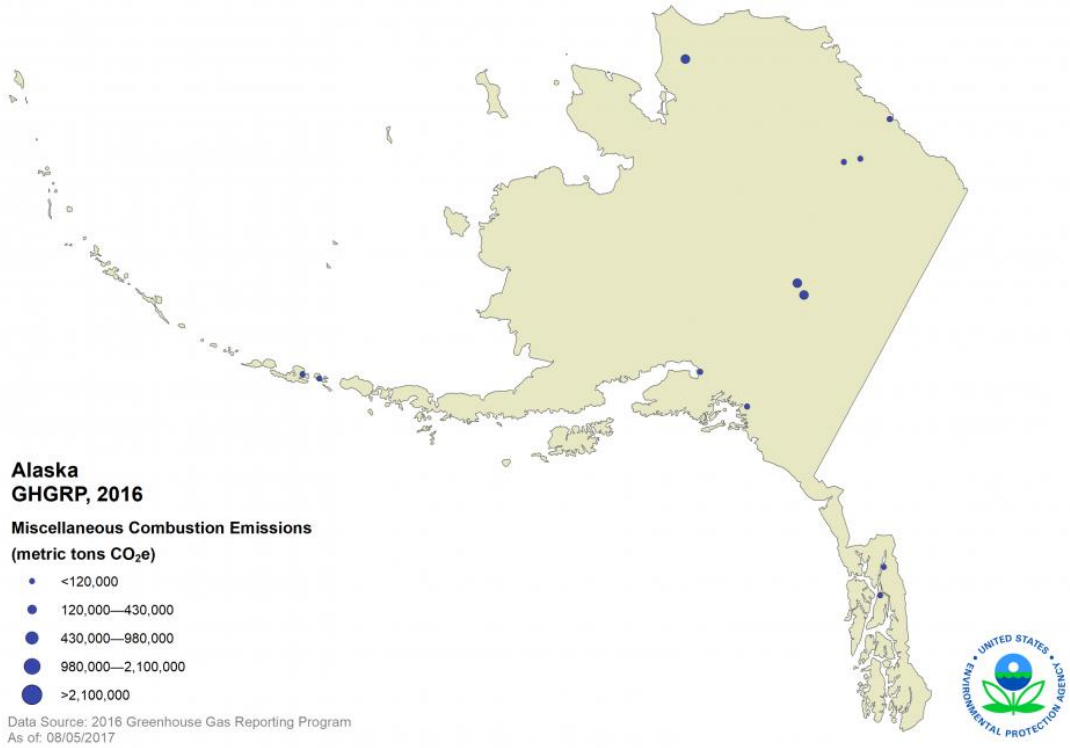


What factors influenced the trend in emissions for miscellaneous combustion?

Location and emissions range for each reporting facility in the Miscellaneous Combustion sector (as of 8/5/17).

These maps show the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.


GHGRP, 2016
Miscellaneous Combustion Emissions
(metric tons CO_2e)
<120,000
120,000—430,000
430,000—980,000
980,000—2,100,000
>2,100,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Alaska
GHGRP, 2016
Miscellaneous Combustion Emissions
(metric tons CO_2e)
<120,000
120,000—430,000
430,000—980,000
980,000—2,100,000
>2,100,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Hawaii
GHGRP, 2016
Miscellaneous Combustion Emissions
(metric tons CO_2e)
<120,000
120,000—430,000
430,000—980,000
980,000—2,100,000
>2,100,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017


Puerto Rico and the Virgin Islands
GHGRP, 2016
Miscellaneous Combustion Emissions
(metric tons CO_2e)
<120,000
120,000—430,000
430,000—980,000
980,000—2,100,000
>2,100,000
Data Source: 2016 Greenhouse Gas Reporting Program
As of: 08/05/2017

GHGRP 2016 : Underground Coal Mines

The Underground Coal Mines sector consists of all underground coal mines that liberate 36,500,000 actual cubic feet of methane (equivalent to approximately 17,579 metric tons CO_2e) or more per year. Facilities in this sector include both underground coal mines under development and those categorized by the Mine Safety and Health Administration as active mines. Surface mines and abandoned mines are excluded from this category. Facility owners or operators must report the total annual methane liberated from ventilation and degasification systems as well as GHG emissions from any other source categories at the facility, such as stationary combustion devices.

Underground Coal Mines — Greenhouse Gas Emissions Reported to the GHGRP

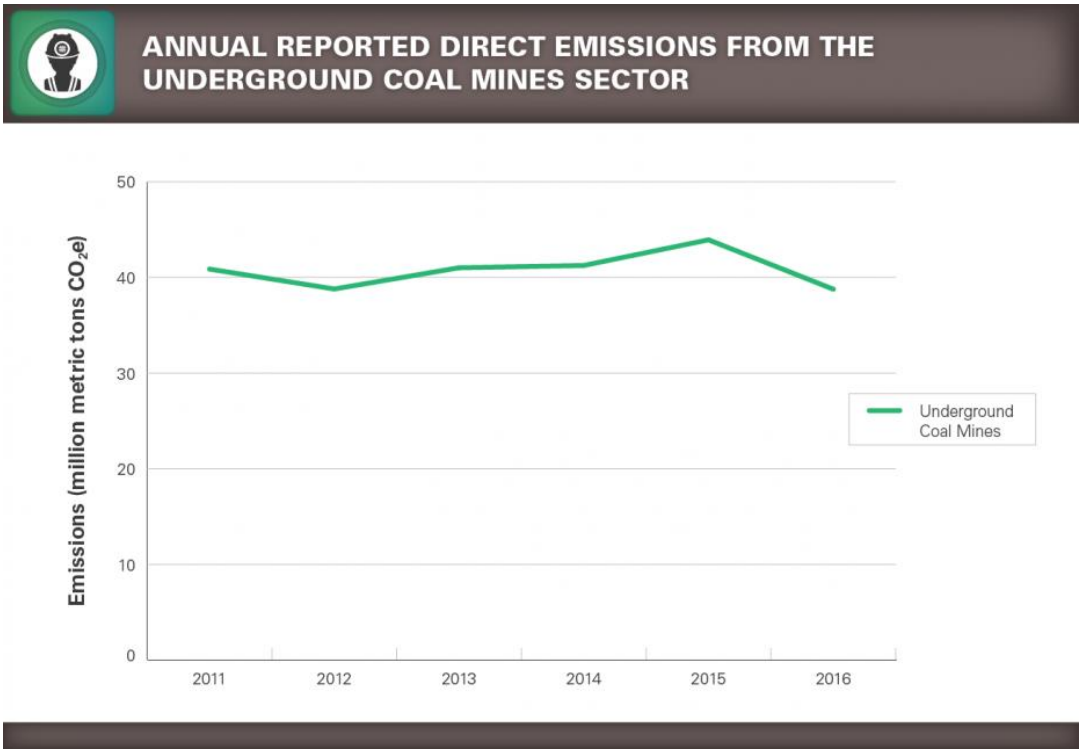
(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:	117	118	131	130	124	94
Total emissions (CO_2e):	40.9	38.8	41.0	41.2	43.9	38.8
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	0.2	0.2	0.2	0.5	0.3	0.2
• Methane (CH_4):	40.7	38.6	40.8	40.8	43.7	38.6
• Nitrous oxide (N_2O):	**	**	**	**	**	**

** Total reported emissions are less than 0.05 million metric tons CO_2e.

CO_2 emissions from the combustion of biomass are NOT included in the emissions totals provided above.

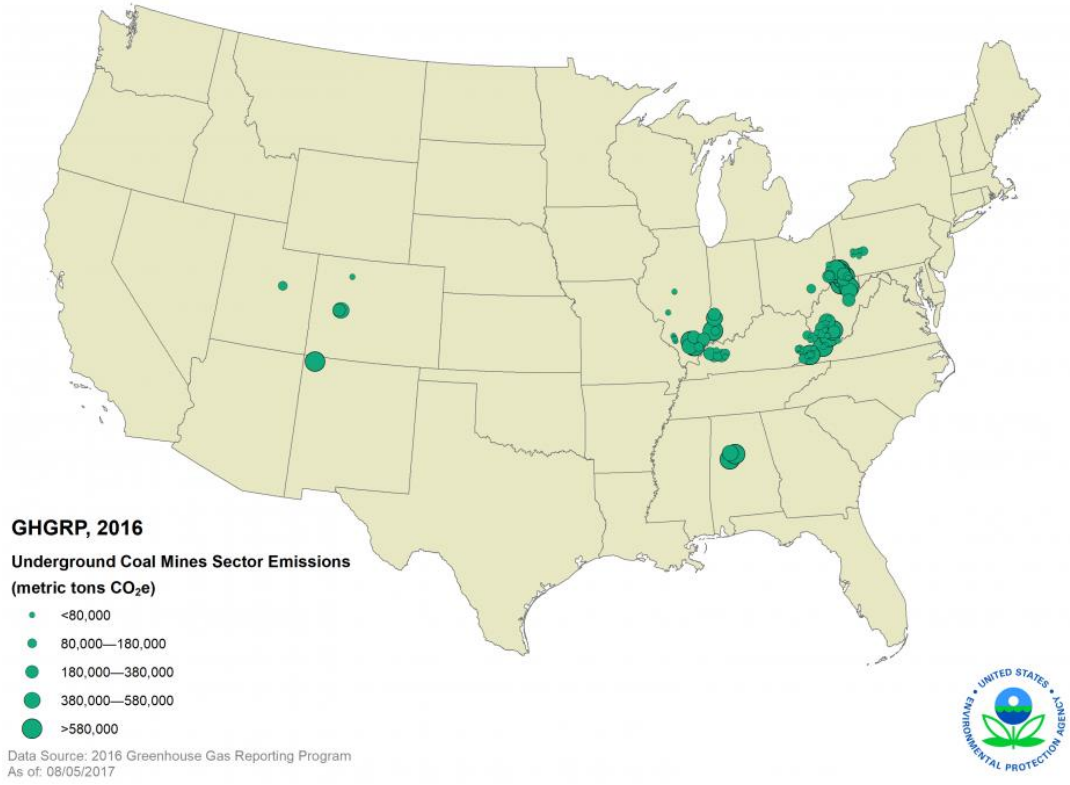
Trend of Annual Reported Direct Emissions from the Underground Coal Mines Sector (as of 8/5/17).



What factors influenced the trend in emissions for underground coal mines?

Location and emissions range for each reporting facility in the underground coal mines sector (as of 8/5/17).

This map shows the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.



GHGRP 2016 : Electronics Manufacturing

This source category includes, but is not limited to, facilities that manufacture semiconductors (including light-emitting diodes), micro-electromechanical systems (MEMS), liquid crystal displays (LCDs), and photovoltaic cells (PV). Specifically, this subsector consists of electronics manufacturing facilities with production processes that use plasma-generated fluorine atoms and other reactive fluorine-containing fragments to etch thin films, clean chambers for depositing thin films, clean wafers, or remove residual material. The source category also includes electronics manufacturing facilities with chemical vapor deposition processes or other production processes that use N_2O, and with processes that use fluorinated GHGs as heat transfer fluids (HTF) to control temperature or clean surfaces.

Electronics Manufacturing — Greenhouse Gas Emissions Reported to the GHGRP

(all emissions values presented in million metric tons CO_2e)

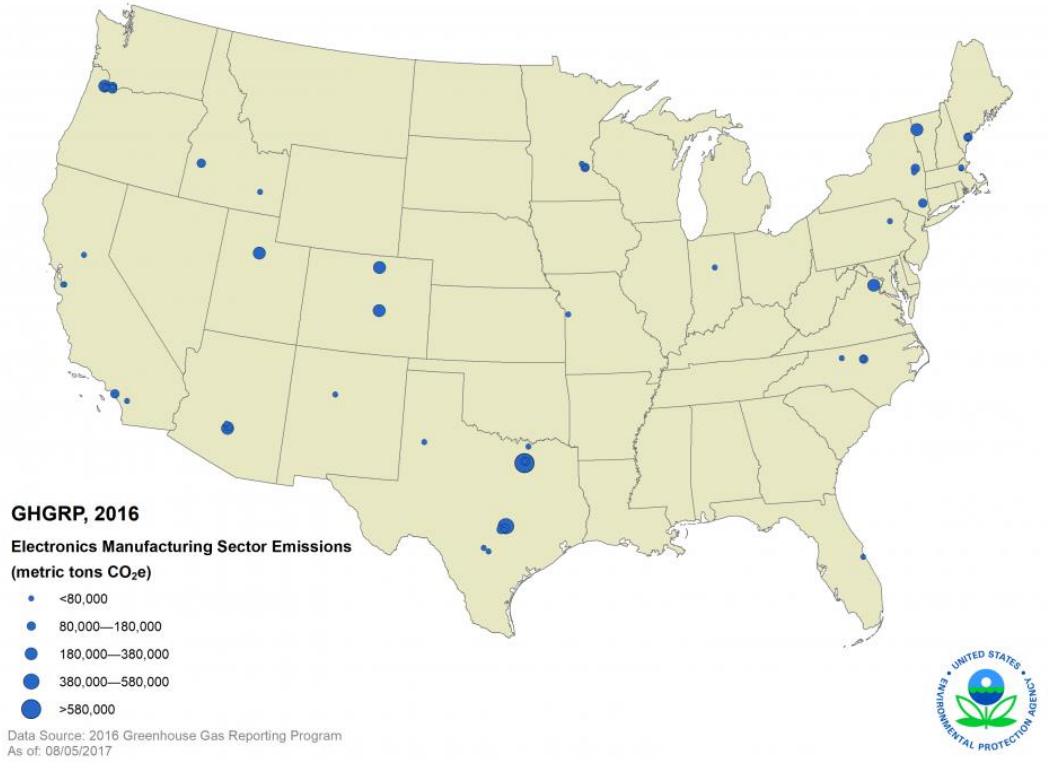
	2011	2012	2013	2014	2015	2016
Number of facilities:	56	56	58	59	58	53
Total emissions (CO_2e):	7.0	6.4	5.2	6.2	6.3	6.2
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	1.6	1.5	0.7	0.7	0.8	0.7
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	0.2	0.2	0.2	0.2	0.2	0.2
• Hydrofluorocarbons (HFCs):	0.2	0.2	0.2	0.3	0.3	0.3
• Hydrofluoroethers (HFEs):	**	**	**	**	**	**
• Perfluorocarbons (PFCs):	3.2	2.8	2.7	3.0	3.0	2.9
• Sulfur hexafluoride (SF_6):	0.3	0.3	0.3	0.7	0.7	0.8
• Nitrogen trifluoride (NF_3):	0.6	0.6	0.5	0.5	0.6	0.6
• Other Fully Fluorinated GHGs	0.7	0.8	0.6	0.8	0.7	0.6
• Very short-lived compounds	**	**	**	**	**	**

Emissions of CO_2 and CH_4 are from stationary fuel combustion sources.

What factors influenced the trend in emissions for electronics manufacturing?

Location and emissions range for each reporting facility in the Electronics Manufacturing sector (as of 8/5/17).

This map shows the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility.



GHGRP 2016: Electrical Equipment Production and Use

This source category includes electrical transmission and distribution systems and facilities that manufacture or refurbish electrical equipment.

The electrical transmission and distribution subsector consists of all electric transmission and distribution equipment insulated with or containing sulfur hexafluoride (SF_6) or perfluorocarbons (PFCs) within an electric power system. This equipment includes but is not limited to gas-insulated substations; circuit breakers; switchgear, including closed-pressure and hermetically sealed-pressure switchgear; gas-insulated lines containing SF_6 or PFCs; and gas containers such as pressurized cylinders, gas carts, electric power transformers, and other containers of SF_6 or PFCs. Emissions occur during installation, use, servicing, and decommissioning of the equipment.

The electrical equipment manufacturing subsector includes facilities that manufacture or refurbish electrical equipment. At these facilities, emissions occur during equipment testing and filling.

Production and Use of Electrical Equipment — Greenhouse Gas Emissions Reported to the GHGRP

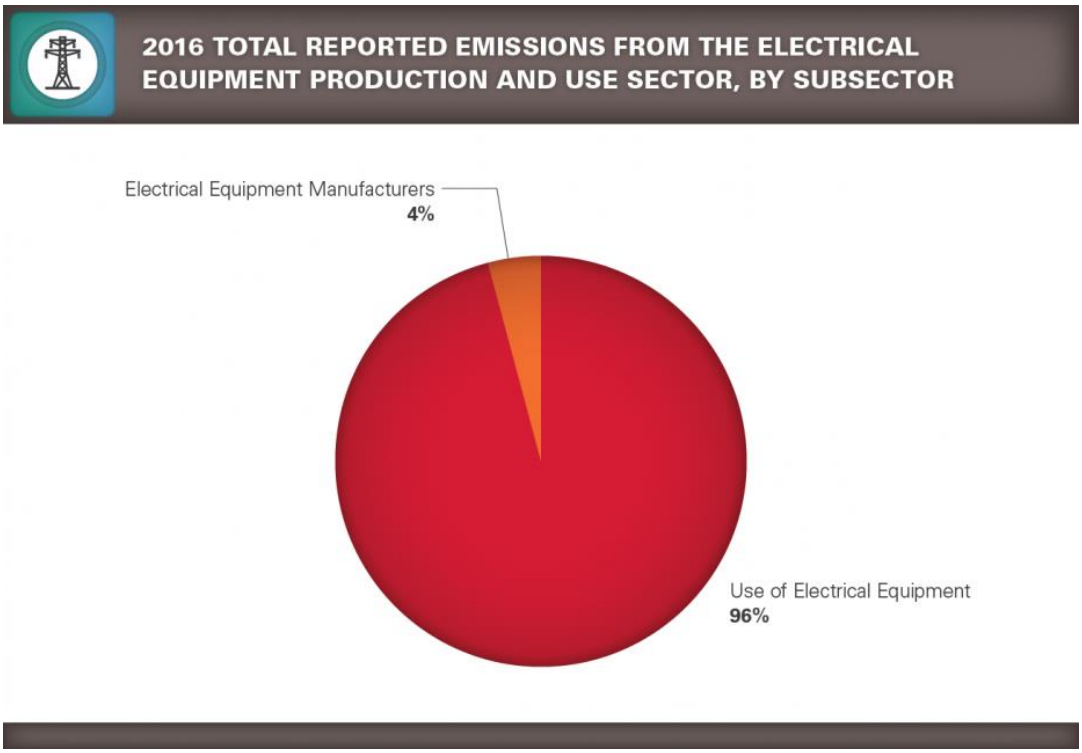
(all emissions values presented in million metric tons CO_2e)

	2011	2012	2013	2014	2015	2016
Number of facilities:						
• Use of Electrical Equipment	121	122	121	118	105	88
• Electrical Equipment Manufacturers	6	6	6	7	7	7
Total emissions (CO_2e):						
• Use of Electrical Equipment	3.9	3.2	3.2	3.1	2.8	3.0
• Electrical Equipment Manufacturers	0.3	0.2	0.2	0.2	0.2	0.1
Emissions by greenhouse gas (CO_2e)						
• Carbon dioxide (CO_2):	**	**	**	**	**	**
• Methane (CH_4):	**	**	**	**	**	**
• Nitrous oxide (N_2O):	**	**	**	**	**	**
• Perfluorocarbons (PFCs):	**	**	**	**	**	**
• Sulfur hexafluoride (SF_6):	4.3	3.4	3.4	3.3	2.9	3.1

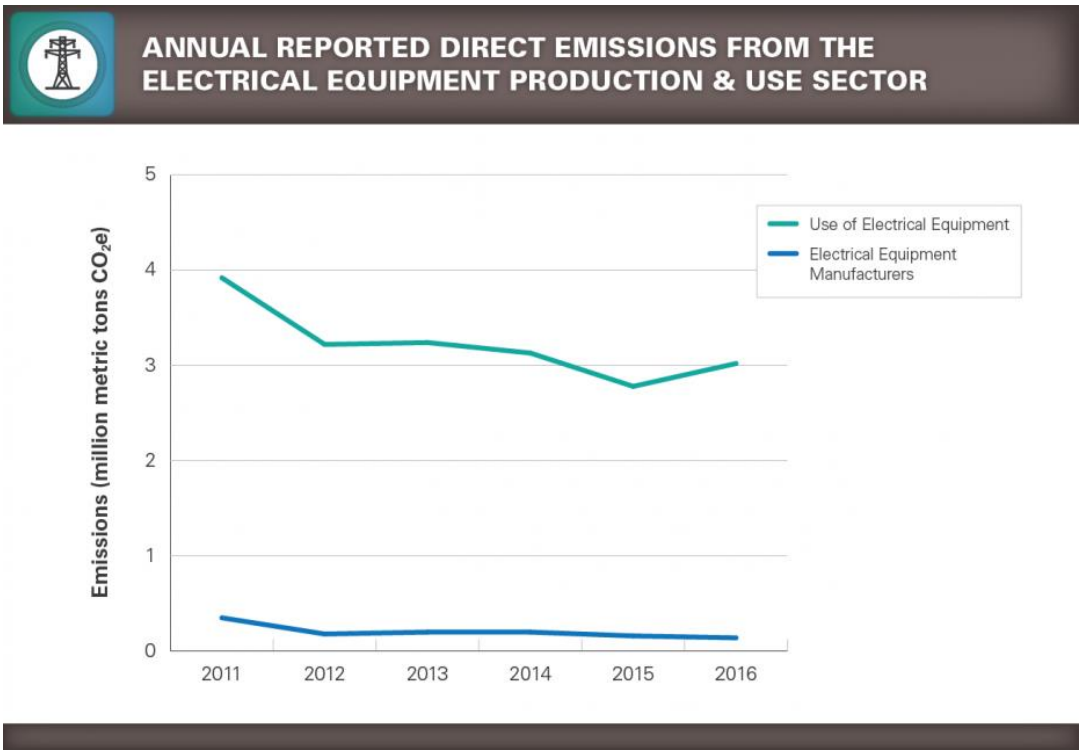
Totals may not equal sum of individual GHGs due to independent rounding.

** Total reported emissions are less than 0.05 million metric tons CO_2e.

2016 Total Reported Direct Emissions from Production and Use of Electrical Equipment Sector, by Subsector (as of 8/5/17).



Trend of Annual Reported GHG Emissions from the Electrical Equipment Production & Use Sector, by Subsector (as of 8/5/17)



What factors influenced the trend in emissions for electrical equipment production and use?

GHGRP 2016: Supplier Highlights

For reporting year (RY) 2016, over 900 suppliers of fuels and industrial gases reported to EPA's Greenhouse Gas Reporting Program (GHGRP).

Suppliers do not report direct emissions, but instead report the quantity of GHGs that would be emitted if the fuels and industrial GHGs that they produce, import, or export each year were combusted, released, or oxidized. Emissions associated with these fuels and industrial gases do not occur at the supplier's facility but instead occur throughout the country, wherever they are used. An example of this is gasoline, which is supplied into the U.S. economy by a relatively small number of entities and consumed by many individual vehicles throughout the country.

The GHG quantity reported by suppliers might not always result in GHG emissions, and the emissions might not take place during that particular reporting year. However, the data from suppliers provide important information on the structure and flow of products through the economy and these products may ultimately result in greenhouse gas emissions. In addition, data reported by fossil fuel and industrial gas suppliers can account for greenhouse gases emitted by the numerous sources that use these products but do not report under the GHGRP due to their low individual emissions (passenger vehicles, for example). Emissions reported by suppliers can be accessed through the suppliers section of FLIGHT.

For 2016, 971 suppliers submitted a GHG report. The majority of GHG emissions associated with the transportation, residential, and commercial sectors are accounted for by these suppliers.

Table 1: Number of Suppliers that Reported (2016)

Industry Sector	Number of Reporters[9]
Suppliers of Coal-Based Liquid Fuels	1
Suppliers of Petroleum Products	231
Suppliers of Natural Gas and Natural Gas Liquids	
• *Natural Gas Local Distribution Companies*	370
• *Natural Gas Liquids Fractionators*	123
Suppliers of Industrial GHGs and Products Containing GHGs	
• *Industrial GHG Suppliers*	72
• *Imports and Exports of Equipment Pre–charged with Fluorinated GHGs or Containing Fluorinated GHGs in Closed–cell Foams*	42
Suppliers of Carbon Dioxide	132

[9] Totals sum to more than 971, because suppliers that fall into more than one sector are counted multiple times.

GHGRP 2016: Suppliers of Natural Gas and Natural Gas Liquids

This sector consists of entities that supply natural gas and natural gas liquids. Natural gas supply is reported by Local Distribution Companies (LDCs) and natural gas liquids (NGL) supply is reported by fractionators.

NGL Fractionators are installations that receive natural gas or bulk natural gas liquids from producers, fractionate these raw inputs into individual products (ethane, propane, normal butane, isobutane, or pentanes plus), and then supply those products into the economy.

Local Distribution Companies receive natural gas from a transmission pipeline company and physically deliver the gas to end users.

These Suppliers report the quantity of CO_2 that would be emitted if the fuels they supply each year were combusted. Emissions associated with these fuels do not occur at the supplier's facility but instead occur throughout the country, wherever they are used. The full GHG quantity reported by suppliers might not always result in GHG emissions, and the emissions might not take place during the year in which they are reported. An example is ethane supplied by NGL fractionators, which is often used to produce plastics.

The GHG quantities reported by suppliers can be accessed through the suppliers section of FLIGHT. Some natural gas and natural gas liquids suppliers also report direct emissions from petroleum and natural gas operations.

Natural Gas and Natural Gas Liquids Suppliers Sector – Carbon Dioxide Quantity Reported to the GHGRP
(million metric tons CO2)

	2011	2012	2013	2014	2015	2016
Local Distribution Companies						
Number of reporters:	379	385	383	381	378	371
CO_2 Quantity	715.3	708.9	771.3	791.5	766.0	751.8
Natural Gas Liquids Fractionators						
Number of reporters:	116	119	125	128	124	123
CO_2 Quantity[10] [a]	211.4	234.2	222.7	261.4	292.1	309.0

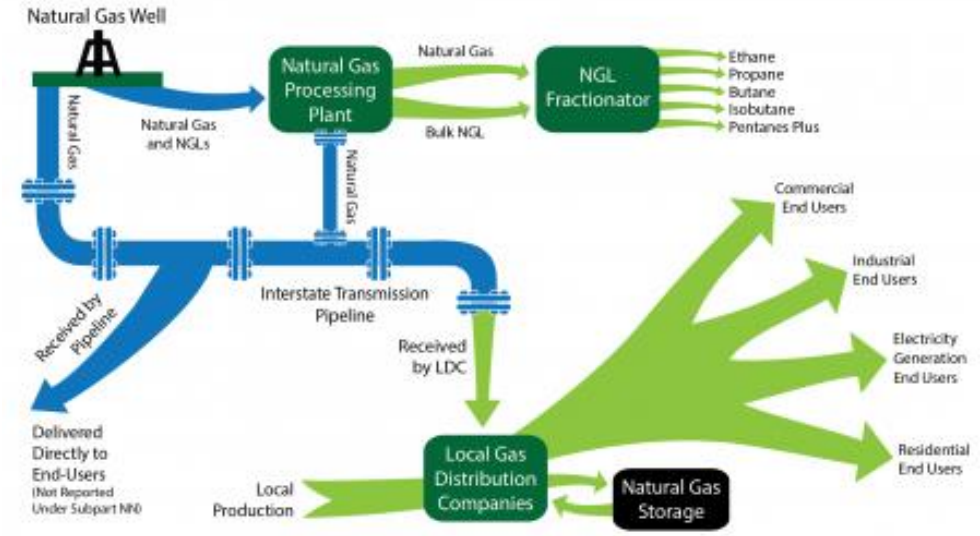
Natural Gas Deliveries Reported by LDCs (Mscf)

End-User	2011	2012	2013	2014	2015	2016
Total Reported Deliveries	**12,833,353,747**	**12,814,244,074**	**13,958,995,931**	**14,392,260,021**	**13,890,305,597**	**13,554,453,178**
Residential Customers	4,639,182,835	4,085,716,741	4,848,338,922	5,005,395,419	4,543,538,683	4,294,092,205
Commercial Customers	3,040,460,385	2,807,075,083	3,195,575,018	3,371,751,621	3,107,862,222	2,993,163,627
Industrial Customers	3,294,130,257	3,518,276,435	3,673,517,656	3,778,742,353	3,685,015,380	3,746,049,216
Electricity Generating Facilities	1,859,580,270	2,403,175,815	2,241,564,335	2,236,370,627	2,553,889,311	2,521,148,130

[10] Excludes CO_2 reported by NGL Fractionators whose reported quantities are classified as confidential business information (CBI).

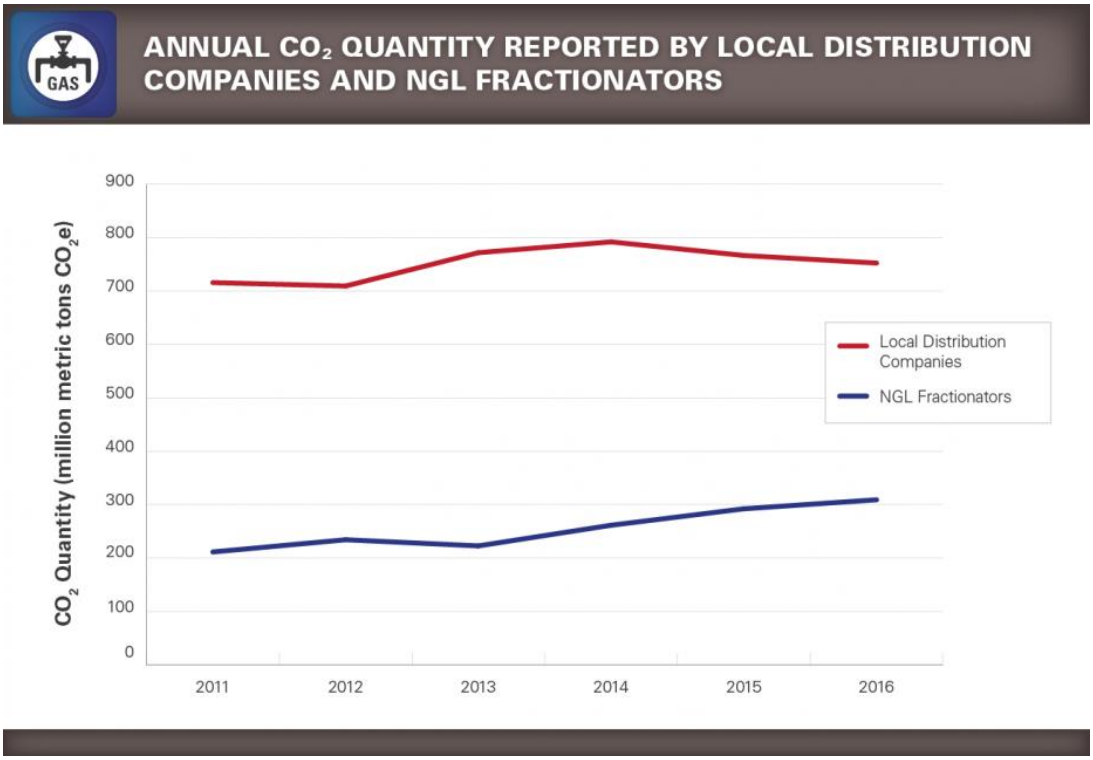
Msfc means thousand standard cubic feet of gas.

Graphic of the natural gas and NGL supply chain



Quantities marked with green arrows are reported to EPA by NGL Fractionators or Local Distribution Companies under Subpart NN.

Trend of annual reported CO2 quantity associated with natural gas and NGL supply



What factors influenced the trends in emissions for suppliers of natural gas and natural gas liquids?

GHGRP 2016: Suppliers of Petroleum Products

This sector comprises petroleum refineries and importers and exports of petroleum products and natural gas liquids. These suppliers do not report direct emissions, but instead report the quantity of CO_2 that would be emitted if the fuels and other products they supply each year were combusted. Petroleum refineries also report the volume of all feedstocks entering the refinery.

Emissions associated with these products do not occur at the supplier's facility but instead occur throughout the country, wherever they are used. The full GHG quantity reported by suppliers might not always result in GHG emissions, and the emissions might not take place during that particular reporting year. An example is ethylene, which is a byproduct from petroleum refining that is often used to produce plastics.

The GHG quantities reported by suppliers can be accessed through the suppliers section of FLIGHT. Petroleum refineries also report direct emissions under other applicable subparts.

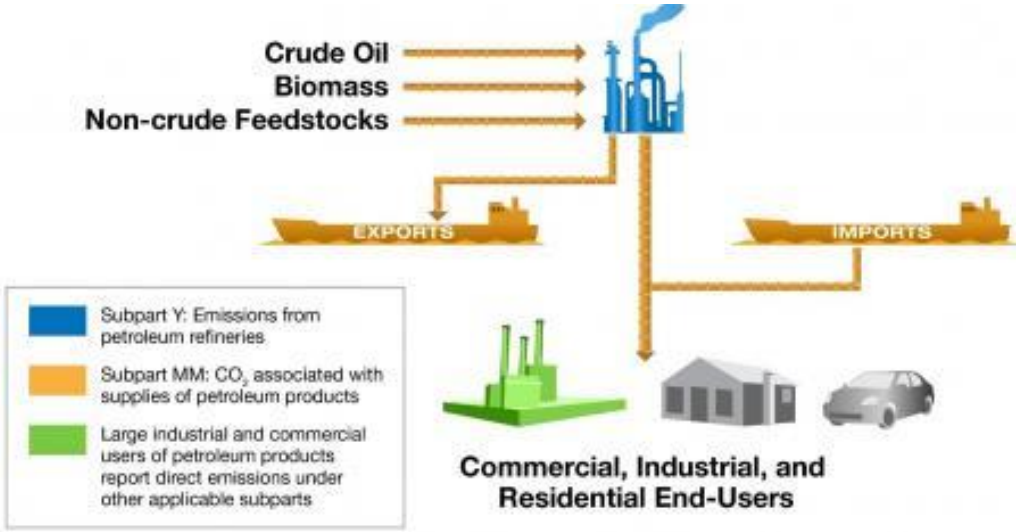
Petroleum Product Suppliers Sector - Number of Reporters

	2012	2013	2014	2015	2016
Importers	84	85	86	87	84
Exporters	58	59	61	60	64
Petroleum Refineries	137	136	136	137	136

Petroleum Refineries – CO_2 Quantity Associated with Supplied Products[11]
(million metric tons CO2)

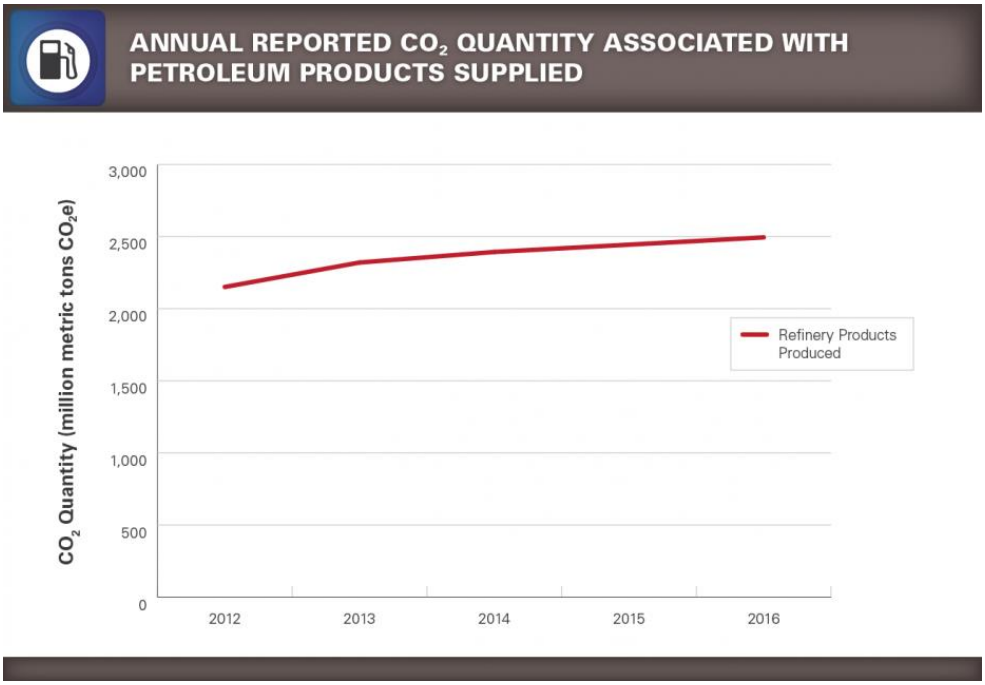
	2012	2013	2014	2015	2016
Petroleum Refineries	2,150.7	2,320.2	2,393.3	2,443.9	2,494.4

Graphic of the petroleum product supply chain



[11] Carbon dioxide quantities shown in this table exclude petroleum refineries whose carbon dioxide quantities are considered confidential business information.

Trend of Annual Reported CO_2 Quantity Associated with Refinery Petroleum Products Produced as of (8/5/17)



GHGRP 2016: Suppliers of Industrial GHGs and Products Containing GHGs

This sector comprises industrial greenhouse gas (GHG) suppliers and entities that import or export certain products that contain fluorinated greenhouse gases. These suppliers do not report direct emissions, but instead report the equivalent quantity of CO_2 that would be emitted if the gases that they produce, import, or export each year were released to the atmosphere.

Industrial GHG Suppliers. Entities that manufacture, import, or export fluorinated greenhouse gases or nitrous oxide in bulk report as suppliers of industrial GHGs under Subpart OO of the GHGRP. The number of reporters displayed in the table below includes all reporters subject to Subpart OO, not just those reporting supply of the specific compounds listed in the table titled Quantity (Net Supply) of GHGs Reported.

Importers and Exporters of (1) equipment that is pre-charged with fluorinated greenhouse gases (e.g., electrical equipment and air conditioners) and (2) closed cell foams containing fluorinated greenhouse gases (e.g., insulation contained inside refrigerators; insulation boardstock) report under Subpart QQ.

Number of Reporters Subject to Subparts OO and QQ

Industry Sector	2010	2011	2012	2013	2014	2015	2016
Industrial GHG Suppliers (OO)	47	64	72	71	74	74	72
Producers (Facilities)	21	24	25	24	22	22	22
Importers	25	39	43	43	48	45	47
Exporters	19	24	26	25	26	26	25
Importers and Exporters of Fluorinated Gases in Products (QQ)	N/A[a]	37	42	43	43	43	42
Importers	N/A[a]	29	35	35	37	37	35
Exporters	N/A[a]	27	31	32	33	32	30

[a] Importers and Exporters of Fluorinated Gases in Products were not required to report 2010 data.

The total number of suppliers reporting under OO (and QQ) is less than the sum of the producers, importers, and exporters reporting under OO (and QQ) because some reporters qualify as multiple types of suppliers.

Quantity (Net Supply) of GHGs Reported
(Quantities are presented in million metric tons per year of net CO_2e[a])

Industry Sector	2010	2011	2012	2013	2014	2015	2016
Industrial GHG Suppliers							
Saturated HFCs, excluding HFC-23[b]	235	241	227	278	254	264	240
Sulfur hexafluoride (SF_6)	c	c	35[d]	c	c	c	c
Other GHGs	c	c	c	c	c	c	c
Importers and Exporters of Fluorinated Gases in Products	N/A[e]	c	c	c	c	c	c

[a] Net supply or net CO_2e means CO_2e quantities of bulk gas produced + imported – exported – transformed – destroyed.

[b] As of 12/18/17 for 2016, 8/13/16 for 2015, and 9/25/15 for the other years in this row.
[c] To avoid revealing sensitive business information, these quantities have not been published. EPA is investigating which reported quantities may be aggregated and released to the general public.
[d] As of 8/16/15.
[e] Importers and Exporters of Fluorinated Gases in Products were not required to report 2010 data.

GHGRP 2016: Capture, Supply, and Underground Injection of Carbon Dioxide

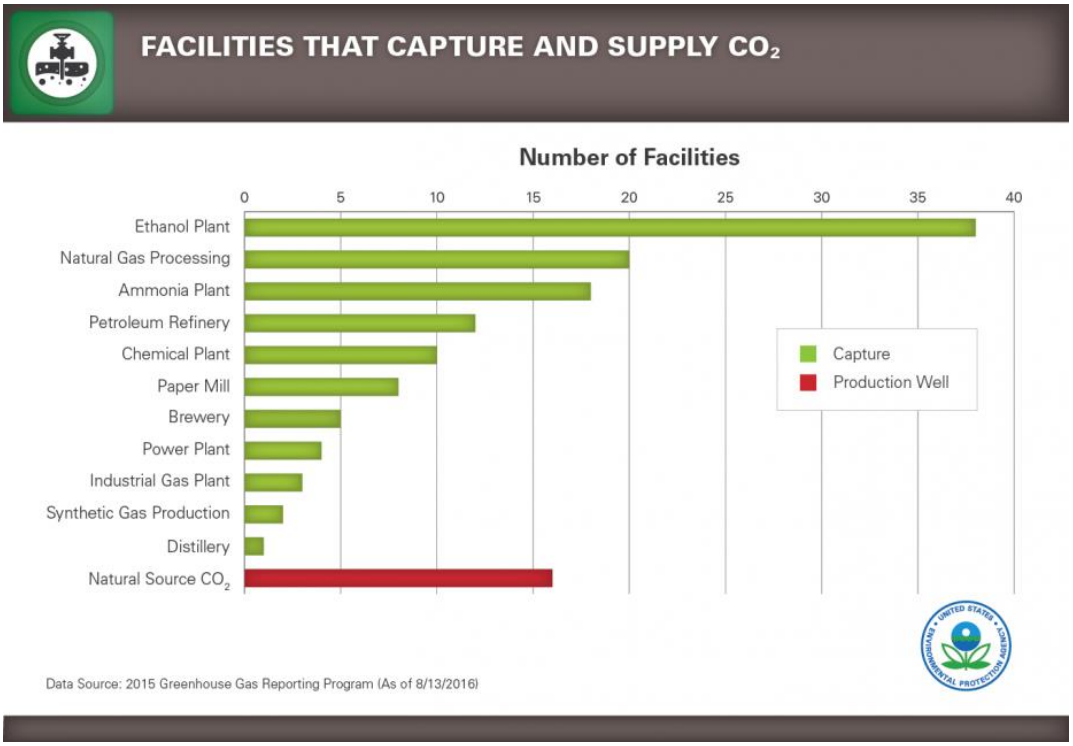
EPA's Greenhouse Gas Reporting Program (GHGRP) collects key information regarding the capture, supply, and underground injection of carbon dioxide (CO_2) in the United States. Greenhouse gas (GHG) data from these activities are reported under the following GHGRP subparts:

- Suppliers of CO_2 (subpart PP) covers facilities that capture CO_2 from industrial sources and processes or extract it from natural CO_2-bearing formations for supply into the economy.
- Underground injection of CO_2 (subpart UU) covers facilities that inject CO_2 underground for enhanced oil and gas recovery (ER), acid gas injection/disposal, carbon storage research and development (R&D), or for any other purpose other than geologic sequestration.
- Geologic sequestration of CO_2 (subpart RR) provides a mechanism for facilities to monitor and report to EPA amounts of CO_2 sequestered. Facilities submit a plan for monitoring, reporting and verifying CO_2 sequestered underground. Once the plan is approved, facilities report basic information on CO_2 received for injection, data related to the amounts of CO_2 sequestered, and annual monitoring activities. EPA approved the first "monitoring, reporting, and verification" plan in December 2015 and data will be reported starting in the 2016 reporting year.

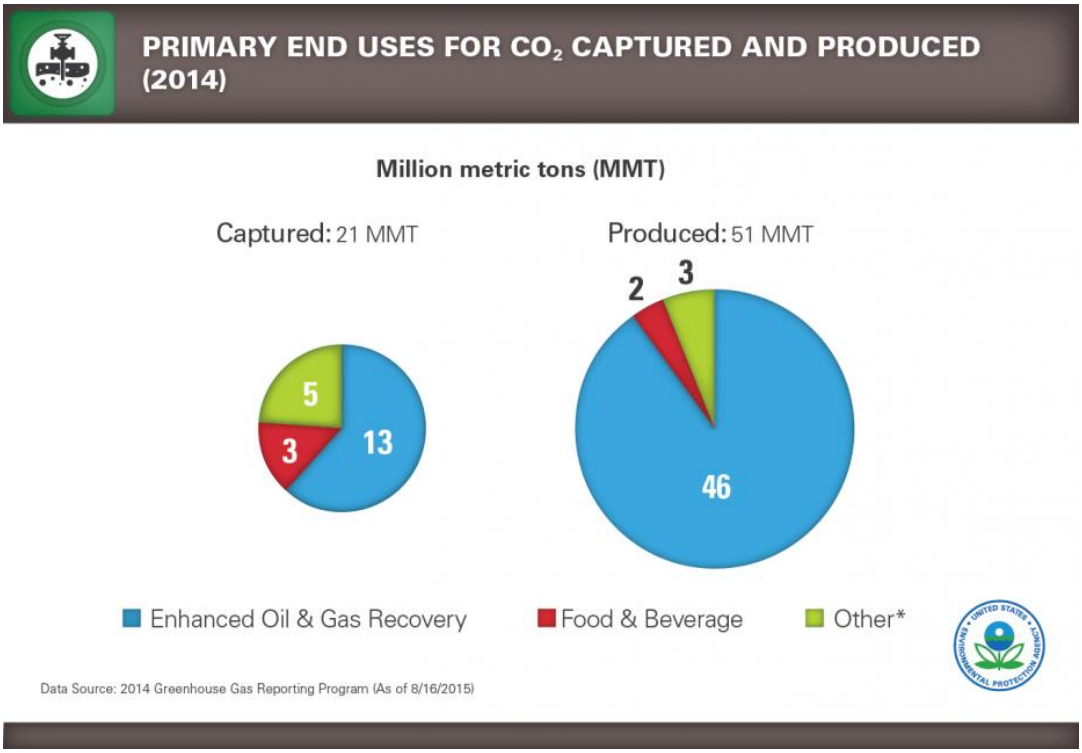
GHGRP, 2014*		
Capture and Supply of CO_2*	**Amount (MMT***)**	**Reporting Facilities**
Total CO_2 captured and produced	*72*	*139*
CO_2 captured (industrial sources)	21	123
CO_2 produced (natural sources)	51	16
Underground Injection of CO_2	**Amount (MMT***)**	**Reporting Facilities**
Total CO_2 received for underground injection	*64*	*96*
CO_2 received for ER	63	86
CO_2 received for acid gas injection/disposal, carbon storage R&D, and other purposes	1	10
* As of 8/16/15 ** The GHGRP also collects data from importers and exporters of carbon dioxide. These data are not provided in the table but these reporters can be identified through FLIGHT. *** Million Metric Tons		

Capture and Supply of CO2

Ethanol, natural gas, and ammonia production are among the top three industrial facility types that capture CO_2 for supply into the economy.



In 2014,[12] most of the CO_2 captured from industrial processes (64 percent) and nearly all of the CO_2 produced from natural sources (91 percent) was used for ER. Food and beverage manufacturing is the second most common end use, followed by other end uses such as pulp and paper manufacturing, fire-fighting equipment, and metal fabrication.



[12] As of 8/16/15.

* Includes cleaning and solvent use, fumigants and herbicides, transportation and storage of explosives, fire-fighting equipment, industrial and municipal water/wastewater treatment, pulp and paper, metal fabrication, greenhouse plant growth and unknown (which may include ER).

** Note that some CO_2 suppliers reported the primary end use for captured or produced CO_2 as "unknown." It is believed that the quantities reported by CO_2 suppliers as "unknown" account for the difference between CO_2 received for ER and CO_2 supplied for ER.

Underground Injection of CO_2

After CO_2 is captured or produced, it can be compressed and transported to a site where it is injected underground. Some facilities both capture or produce CO_2 and inject it underground onsite.

The primary use of carbon dioxide is for ER. ER helps to mobilize oil and gas in underground hydrocarbon reservoirs, thereby increasing production. While most CO_2 captured or produced is supplied to facilities that conduct ER, a smaller portion is injected underground for other purposes.