State Air Trends & Successes

AAPCA
THE ASSOCIATION OF AIR POLLUTION CONTROL AGENCIES

The StATS Report

2021 EDITION

AAPCA
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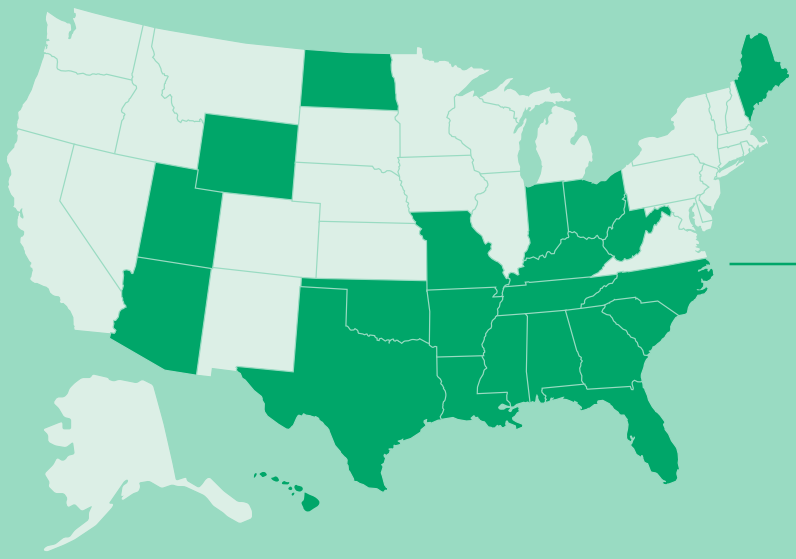
The Association of Air Pollution Control Agencies, or AAPCA, is a national, non-profit, consensus-driven organization focused on assisting state and local air quality agencies and personnel with implementation and technical issues associated with the federal Clean Air Act. Created in 2012, AAPCA represents 48 state and local air pollution control agencies, and senior officials from 22 state environmental agencies currently sit on the AAPCA Board of Directors. AAPCA is housed in Lexington, Kentucky as an affiliate of The Council of State Governments. More information about AAPCA can be found on the Association's website: **www.cleanairact.org**.

State Environmental Agencies Currently Represented on the AAPCA Board of Directors



Alabama
Arizona
Arkansas
Florida
Georgia
Hawaii
Indiana
Kentucky
Louisiana
Maine
Mississippi
Missouri
North Carolina
North Dakota
Ohio
Oklahoma
South Carolina
Tennessee
Texas
Utah
West Virginia
Wyoming

Footprint of AAPCA Member States

State members of the AAPCA Board of Directors have primary responsibility for protecting air quality for a significant portion of the country, reflected in the following statistics:

AN ESTIMATED
151.5 million
AMERICANS,

about 46% of the nation's total population.

FROM 2000 TO 2019, AN
average population growth of 24%,
COMPARED TO
national population growth of 17%
FOR THE SAME TIME PERIOD.

ALMOST **40%** **of U.S. Gross Domestic Product in 2019.**

Nearly 47% of U.S. Total Manufacturing Output in 2019, and **5.6 million** manufacturing jobs as of December 2020.

An estimated 50% of vehicle miles traveled in the United States.

About 66% of the nation's **operable petroleum refining capacity** in 2019.

In 2018, **65% of total energy production** in the United States, as well as:

- **74%** of crude oil production in Dec. 2020
- **56%** of total net electricity generation in Dec. 2020
- **47%** of wind generation in 2020
- **76%** of coal production in 2019
- **67%** of natural gas production in 2019

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Foreword

Dear Readers,

The past year has been a challenge and transition for the entire country, including air quality agencies. Without a reference manual, all of our organizations needed to learn to operate during a pandemic. Not only did we have the challenge of quickly converting most of our office staff to a remote working environment, we needed to develop protocols for our monitoring personnel to continue mission critical work while minimizing risk to staff. The pandemic has modified the manner in which we operate, but we continue our function of protecting air quality.

We continue to make progress in the nation's air quality, where state and local agencies, including the membership of Association of Air Pollution Control Agencies (AAPCA), have dedicated significant time and resources to their missions. AAPCA is a consensus-driven organization of 48 state and local air agencies focused on assisting members with implementation of technical issues associated with the federal Clean Air Act. Comprised of senior officials from 22 state environmental agencies, AAPCA's Board of Directors is geographically diverse, providing a unique forum of perspectives to engage as we work to improve air quality for the more than 150 million Americans we represent. AAPCA's Member States also guide the Association on a consensus-basis, seeking to engage our federal co-regulator partners on common principals as we implement the federal Clean Air Act.

Importantly, state and local air agencies are responsible for developing strategies for air pollution control while accommodating local economic and social factors. I am excited to unveil the 2021 edition of AAPCA's *State Air Trends & Successes: The StATS Report*, which highlights the significant progress that has been achieved in air quality in the United States. A few statistics from this year's report:

- From 1970 through 2019, the United States reduced by 77 percent the combined emissions of the six criteria air pollutants.
- Reported toxic air releases declined 325 million pounds (35 percent) from 2009 to 2019, with AAPCA Member States overseeing nearly 60 percent of the overall reductions.
- In the electricity sector from 1990 to 2019, emissions of sulfur dioxide were down 14.7 million tons (94 percent) and nitrogen oxide emissions were down 5.5 million tons (86 percent). AAPCA Member States were responsible for almost 70 percent of sulfur dioxide emissions reductions and 64 percent of nitrogen oxide emissions reductions.
- Nationally, energy-related carbon dioxide emissions were reduced nearly 10 percent from 1998 through 2018, a period in which total energy production grew 34 percent.
- In the two-decade period from 1999 to 2019, AAPCA Member States reduced the aggregate emissions of the six criteria air pollutants by 50 percent, while experiencing a 49 percent increase in Gross Domestic Product, a 28 percent increase in population, and a 48 percent increase in energy production (through 2018).

As Air Directors, we are proud of the progress that has been made and is highlighted in *The StATS Report*. We also look forward to continuing our important work as we engage federal partners and other stakeholders to improve air quality across the nation.

Thank you for reading.

ROBERT HODANBOSI
Chief, Division of Air Pollution Control
Ohio Environmental Protection Agency
President, AAPCA

Introduction

State Air Trends & Successes: The StATS Report is an **annual report** by the Association of Air Pollution Control Agencies (AAPCA) that catalogues important air quality metrics and trends. In the fifth year of publication, *The StATS Report* continues to center on two core components: first, that the nation's air pollution control efforts are largely a story of success that has seen air quality improve in virtually every measure over the past half-century; and, second, that this progress has been achieved due to the Clean Air Act's reliance on collaboration between federal, state, local, and tribal agencies. Taken together, these components provide both historical context and an informational foundation for continued progress.

The 2021 edition of *State Air Trends & Successes: The StATS Report* looks at U.S. air quality in three primary sections. The first, "AAPCA Member State Air Trends and Successes," details trends in AAPCA's 22 Member States, which are responsible for protecting air quality for more than 150 million Americans. These states have seen above-average growth and economic activity while continuing to improve air quality, often outperforming national metrics. The second section, "American Air Quality in an International Context," provides insight into the remarkable air quality progress that the United States has made in comparison to its global peers. The final section, "Air Quality Trends in the United States," catalogues some of the key air quality trends – all of which show marked and sustained progress resulting in cleaner, clearer air.

State and Local Air Agencies

As noted, state and local air agencies are central to the United States' environmental goals and progress. In its **current strategic plan**, the U.S. Environmental Protection Agency (EPA) states that, "The idea that environmental protection is a shared responsibility between the states, tribes, and the federal government is embedded in our environmental laws," and that "Local governments also have a unique relationship with EPA as partners and often as innovative problem solvers. EPA works with local governments to build stronger and more robust partnerships and bring local concerns forward into Agency decision making." U.S. EPA's recognition of these vital partnerships acknowledges the role of state and local agencies in helping the Agency fulfill its mission.

In addition to Clean Air Act-delegated permitting, planning, enforcement, and regulatory efforts, state and local agencies are often the first point of contact with citizens. Regular interaction with their communities provides these agencies with a deep knowledge – and early starting point – when communicating about new problems and developing solutions. Understanding and improving strategies around issues like environmental justice, local air toxics issues, and wildfires requires the exact type of community engagement and public information campaigns that state and local agencies are adept at undertaking.

Air agencies are also well positioned to understand the complex, often multi-layered impacts of decision-making, and able to bring to bear informed technical and process expertise that helps improve citizen input.

Environmental Data and Communicating with the Public

Transparency is critical when communicating with the public about the environment. Often, the public only reads or a hears a story about the environment when the news is concerning, such as when a community is being alerted to an issue that may affect the local populace. These reports likely have an impact on public perceptions of the environment, which may be reflective in recent polling data. For example, Gallup's most recent **poll on the environment**, conducted in March 2021, shows that a majority (75 percent) of Americans personally worry a 'Great deal' (46 percent) or a 'Fair amount' (29 percent) about the quality of the environment, and 52 percent think the quality of the environment in the country as a whole is 'Getting worse' (running somewhat counter to at least a portion of the March 2020 respondents, with 82 percent stating that a 'Great deal' or 'Only some' progress has been made in dealing with environmental problems over the past 50 years).

In terms of air pollution, 41 percent of respondents indicated they worry a 'Great deal', 32 percent a 'Fair amount', 20 percent 'Only a little', and 8 percent 'Not at all'. Coupled with the aforementioned polling data implying the public think the quality of the environment is getting worse, these public concerns run counter to readily available data and reports. This gap makes evident an opportunity for better communication about air quality – and environmental – trends.

The StATS Report relies on publicly accessible data from agencies like the U.S. EPA to provide information on the Clean Air Act's cornerstone national ambient air quality standards, or NAAQS, program as well as toxic air releases, visibility information for national parks and wilderness areas, compliance and enforcement activities, and greenhouse gases (see page 6 of this report, "Types of Air Quality Data and Metrics"). Further, air quality has improved substantially while the United States has experienced significant economic and social growth over the past several decades. When applicable, this report also provides several economic and social indicator trends, such as Gross Domestic Product (GDP), to provide additional context.

The Work Continues

By highlighting the historical work and success of air agencies, *The StATS Report* aims to help bridge the gap between air quality data and public perception. Despite evolving budget priorities, state and local agencies continue to meet their mission of protecting air quality and public health through proven methods and procedures as well as collaboration with U.S. EPA, community stakeholders, and regulated entities. As outlined in this report, state and local air agencies are also innovative, developing creative programming and best practices that improve processes and air quality outcomes and meet demands on limited resources. While work continues to reduce emissions and improve air quality, state and local air quality agencies have an established history as leaders that are adept at strategizing for emergent issues and meeting the needs of their communities.

Types of Air Quality Data and Metrics

This report primarily relies on data from the U.S. Environmental Protection Agency (EPA) and other federal agencies, such as the U.S. Energy Information Administration (EIA), to evaluate air quality trends. These trends include metrics for criteria air pollutants, air toxics and hazardous air pollutants, visibility progress in National Parks and wilderness areas, and greenhouse gases, with sources provided below each chart or graph and in the notes for each section. Also included in this report are case studies and short excerpts from other relevant analyses, which include links to their source and data.

Criteria Air Pollutant Data

Trends and indicators of air quality can be measured in a variety of ways, but an important group of data to analyze is that of the air pollutants that are regulated under the federal Clean Air Act. Section 109 of the Clean Air Act requires EPA to establish both primary and secondary national ambient air quality standards, or NAAQS. Primary NAAQS are "standards the attainment and maintenance of which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health," while secondary NAAQS "specify a level of air quality the attainment and maintenance of which … is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air."[1]

NAAQS have been set for six "criteria" pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), ground-level ozone (O_3), particulate matter (PM), lead (Pb), and nitrogen dioxide (NO_2). Individual NAAQS may differ in form (for example, annual fourth-highest daily maximum 8-hour concentration average over three years, for ozone), level[2] (often measured in parts per billion or micrograms per cubic meter), and averaging time (from one hour up to one year).[3] U.S. EPA and the Clean Air Scientific Advisory Committee, or CASAC, review the adequacy of the NAAQS according to the statute.[4]

Nationally, ambient air pollution data from thousands of monitors across the United States is collected by U.S. EPA and state, local, and tribal air pollution control agencies and provided to the Air Quality System, or AQS. These data are used to "assess air quality, assist in attainment/non-attainment designations, evaluate State Implementation Plans [SIPs] for non-attainment areas, perform modeling for permit review analysis, and prepare reports for Congress as mandated by the Clean Air Act."[5]

U.S. EPA reports on long-term air quality trends by preparing data analyses that show the overall trend lines for pollutant concentrations and emissions. Primary sources that inform this report include:

- Criteria air pollutant concentration data that are pulled from EPA's analysis of the AQS that looks at long-term trends in air quality.[6]
- Data showing emissions trends of the criteria pollutants are pulled from U.S. EPA's Air Pollutant Emissions Trends Data,[7] which relies on the National Emissions Inventory (NEI). The NEI is "a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources … released every three years based primarily upon data provided [to the Emissions Inventory System (EIS)] by State, Local, and Tribal air agencies for sources in their jurisdictions and supplemented by data developed by the US EPA."[8]
- Design values, which are computed and published annually by U.S. EPA and defined as "a statistic that describes the air quality status of a given location relative to the level of the NAAQS … typically used to designate and classify nonattainment areas, as well as to assess progress towards meeting the NAAQS."[9]

Other Air Quality Data

In addition to tracking criteria air pollutants, U.S. EPA also maintains data and develops analyses on multiple other federal air quality programs, including:

- The Toxic Release Inventory (TRI), which provides a consistent set of data over time for hazardous air pollutants (or air toxics).[10]
- Visibility progress is tracked as part of the Regional Haze Program, with long-term trends available in U.S. EPA's annual air quality trends report.[11]
- In an annual progress report, the U.S. EPA publishes power sector emissions data for SO_2, nitrogen oxides (NO_x), and hazardous air pollutants, as well as carbon dioxide (CO_2).[12]

Additionally, greenhouse gas data are pulled primarily from U.S. EPA's annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks*[13] and U.S. EIA reports, such as the *Annual Energy Outlook*, which includes CO_2 emissions data from energy sources.[14]

NOTES

[1] **42 U.S.C. §7409(b).**

[2] U.S. EPA **states:** "Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$)."

[3] A chart of the primary and secondary NAAQS by pollutant, which includes averaging time, level, and form, can be found **here.**

[4] **42 U.S.C. §7409(d).**

[5] U.S. EPA, **Air Quality System**. U.S. EPA notes that the AQS "also contains meteorological data, descriptive information about each monitoring station (including its geographic location and its operator), and data quality assurance/quality control information."

[6] Links to data summary files for national criteria pollutant trends can be found **here.**

[7] Data can be found **here**. U.S. EPA notes: "The latest version of the 1970 – 2020 data show the trends for Tier 1 categories which distinguish pollutant emission contributions among major source types … As inventory methods are improved over time, for some emission sources and improved estimation method may be applied 'backwards' to previous year trend estimates."

[8] More information on the NEI can be found **here**. U.S. EPA states that "The NEI is built using the **Emissions Inventory System** (EIS) first to collect the data from State, Local, and Tribal air agencies and then to blend that data with other data sources."

[9] U.S. EPA, **Air Quality Design Values**.

[10] U.S. EPA, **Toxics Release Inventory (TRI) Program**. Annual *TRI National Analysis* **here**. EPA notes that the TRI "is a resource for learning about toxic chemical releases and pollution prevention activities reported by industrial and federal facilities. TRI data support informed decision-making by communities, government agencies, companies, and others. Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) created the TRI Program."

[11] U.S. EPA, **National Air Quality: Status and Trends of Key Air Pollutants**. See also: U.S. EPA, ***Our Nation's Air: EPA Celebrates 50 Years!***, June 2020 (Section: "**Visibility Improves in Scenic Areas**").

[12] U.S. EPA, **Power Sector Programs—Progress Report**.

[13] U.S. EPA's **annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks*** is released April each year. See also: U.S. EPA's **Greenhouse Gas Inventory Data Explorer**.

[14] U.S. EIA, ***Annual Energy Outlook 2021***, February 3, 2021.

AAPCA Member State Air Trends and Successes

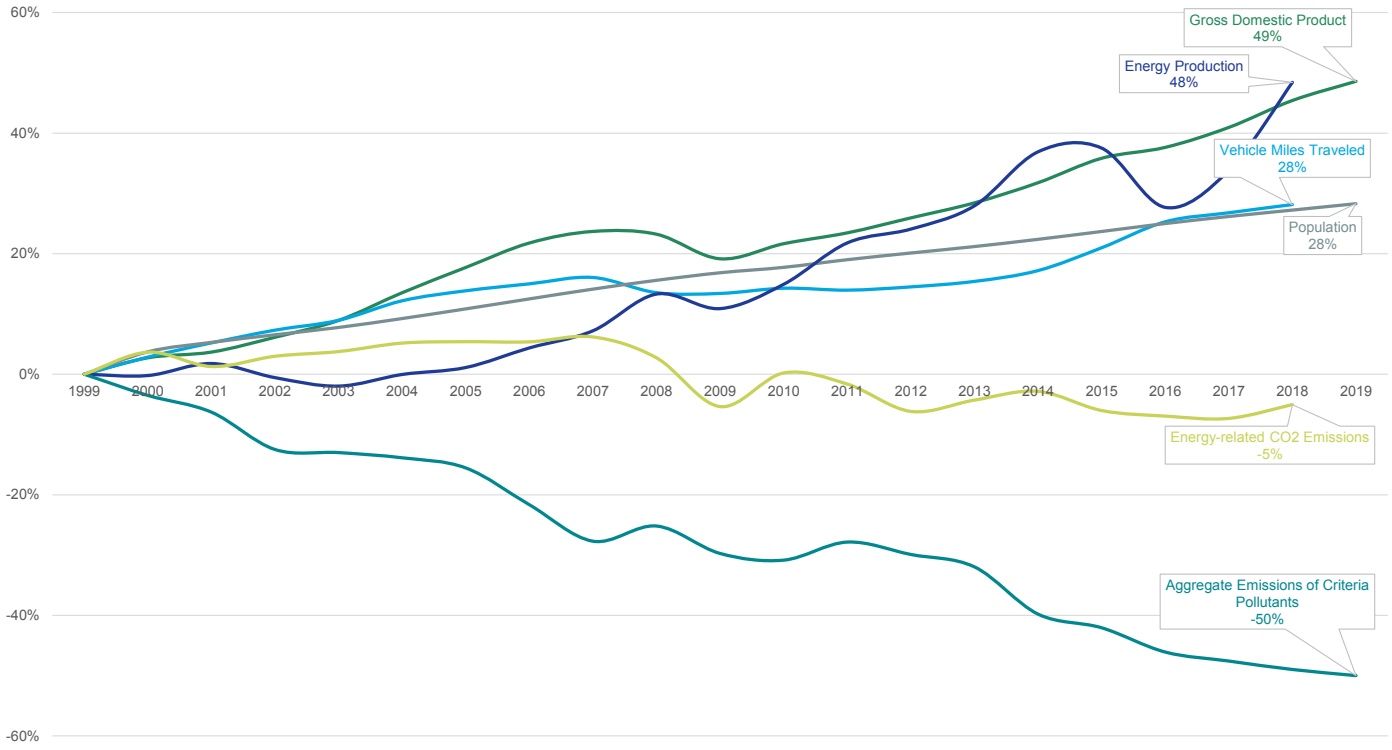
Economic Growth and Air Quality in AAPCA Member States

Over the past two decades, AAPCA Member States have overseen a 50 percent reduction in the combined emissions of the pollutants (or pollutant precursors) for which there are national ambient air quality standards, or NAAQS.[1] These significant decreases have improved air quality during the following trends in economic and social growth indicators:

- A 49 percent increase in Gross Domestic Product (GDP) from 1999 through 2019, accounting for nearly 40 percent of total U.S. GDP in 2019[2];
- A 28 percent increase in vehicle miles traveled in from 1999 to 2018[3]; and,
- A population increase of 28 percent in the 20 years from 1999 to 2019, representing 46 percent of the total U.S. population in 2019.[4]

Further, states in AAPCA's membership saw a 48 percent increase in energy production from 1999 through 2018, and produced nearly 65 percent of total U.S. energy in 2018.[5] During the same period, AAPCA Member States were also responsible for a 5 percent reduction in energy-related carbon dioxide (CO_2) emissions.[6]

AAPCA Member States: Comparison of Growth Indicators and Emissions Trends 1999–2019



Sources: U.S. Bureau of Economic Analysis, data available **here;** U.S. Energy Information Administration, **State Energy Data System (SEDS): 1960–2018**; U.S. Office of Highway Policy Information, data available **here**; U.S. Census Bureau, data available **here**; U.S. EIA, **Energy-Related CO_2 Emission Data Tables.** Table 2. State energy-related carbon dioxide emissions by year, adjusted (1990–2018); U.S. EPA, **Air Pollutant Emissions Trends Data** (data file: "State Tier 1 CAPS Trends").

"It makes sense for state and local air pollution agencies to take the lead in carrying out the Clean Air Act. They are able to develop solutions for pollution problems that require special understanding of local industries, geography, housing, and travel patterns, as well as other factors ... State, local, and tribal governments also monitor air quality, inspect facilities under their jurisdictions and enforce Clean Air Act regulations."

U.S. EPA, ***The Plain English Guide to the Clean Air Act***, April 2007.

Air Quality | Fine Particulate Matter

U.S. EPA's online *Green Book* "provides detailed information about area [NAAQS] designations, classifications and nonattainment status."[7] According to the online database, a total of 39 areas were designated non-attainment or maintenance for the 1997 fine particulate matter ($PM_{2.5}$) NAAQS of 15 micrograms per cubic meter ($\mu g/m^3$), measured by the three-year average annual mean concentration.[8]

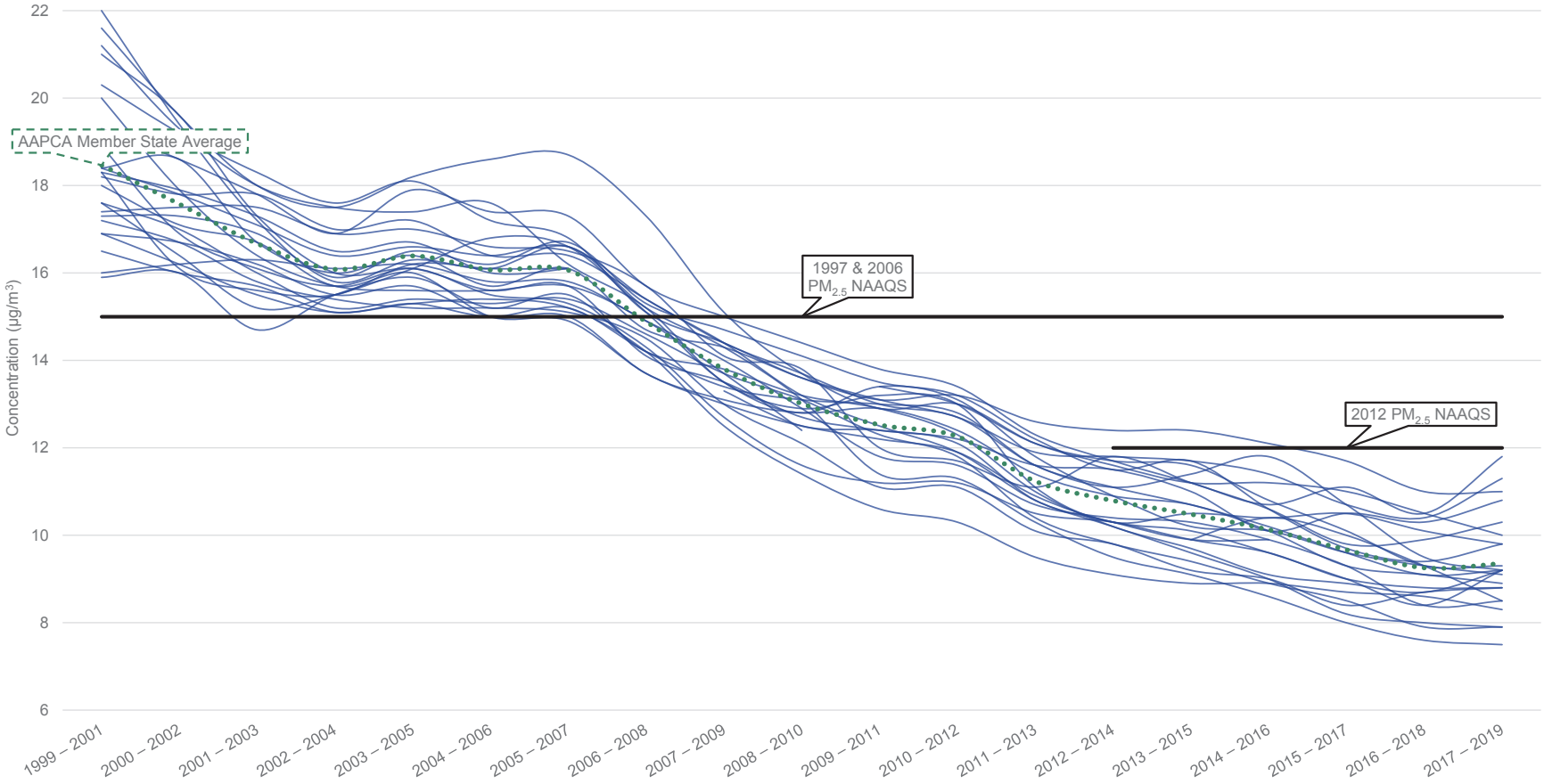
U.S. EPA develops design values[9] based on monitoring data from the Agency's Air Quality System.[10] The table below lists the percent change in design values from 1999 to 2019 for the 24 designated areas that are partially or completely within AAPCA Member States, which oversaw an average reduction in $PM_{2.5}$ concentrations of nearly 50 percent.[11]

Designated Area	Percent Change in $PM_{2.5}$ Concentrations, 1999 to 2019
Atlanta, GA	-53.77%
Birmingham, AL	-53.70%
Canton-Massillon, OH	-49.18%
Charleston, WV	-57.07%
Chattanooga, TN-GA-AL	-53.44%
Chicago-Gary-Lake County, IL-IN	-48.57%
Cincinnati-Hamilton, OH-KY-IN	-38.86%
Cleveland-Akron-Lorain, OH	-45.81%
Columbus, OH	-48.89%
Dayton-Springfield, OH	-42.14%
Evansville, IN	-47.34%
Greensboro-Winston Salem-High Point, NC	-48.84%
Hickory-Morganton-Lenoir, NC	-50.89%
Huntington-Ashland, WV-KY-OH	-65.91%
Indianapolis, IN	-38.59%
Knoxville, TN	-57.50%
Louisville, KY-IN	-43.35%
Macon, GA	-48.30%
Martinsburg-Hagerstown, WV-MD	-46.88%
Parkersburg-Marietta, WV-OH	-55.11%
Rome, GA*	-45.90%
St. Louis, MO-IL	-40.80%
Steubenville-Weirton, OH-WV	-49.45%
Wheeling, WV-OH	-44.24%

*Data through 2014–2016.
Source: U.S. EPA, **Air Quality Design Values** (Data file: "$PM_{2.5}$ Design Values, 2019").

Air Quality | Fine Particulate Matter

AAPCA Member States: Design Value History for Areas Previously Designated Nonattainment or Maintenance for the 1997 $PM_{2.5}$ NAAQS 1999–2019



Source: U.S. EPA, **Air Quality Design Values** (Data file: "$PM_{2.5}$ Design Values, 2019"). For further details, please see AAPCA's **2020 StATS Report Interactive Webpage**.

Air Quality | Ozone

According to U.S. EPA's *Green Book*, 47 areas in the United States were designated nonattainment or maintenance for the 2008 ozone NAAQS of 0.075 parts per million (ppm), determined using the annual fourth-highest daily maximum 8-hour concentration, averaged over three years.[12]

Of the designated areas, 14 are located partially or fully in AAPCA Member States, with the chart below detailing the percent change in design values from 1998 to 2019, a period in which AAPCA Member States averaged a 27 percent reduction in ambient concentrations of ozone.[13]

Designated Area	Percent Change in Ozone Concentrations, 1998 to 2019
Atlanta, GA	-39.67%
Baton Rouge, LA	-26.04%
Charlotte-Rock Hill, NC-SC	-32.69%
Chicago-Naperville, IL-IN-WI	-19.35%
Cincinnati, OH-KY-IN	-25.25%
Cleveland-Akron-Lorain, OH	-23.16%
Columbus, OH	-28.42%
Dallas-Fort Worth, TX	-24.51%
Houston-Galveston-Brazoria, TX	-27.68%
Knoxville, TN	-37.50%
Memphis, TN-MS-AR	-28.87%
Phoenix-Mesa, AZ	-12.50%
St. Louis-St. Charles-Farmington, MO-IL*	-24.47%
Upper Green River Basin, WY	0.00%**

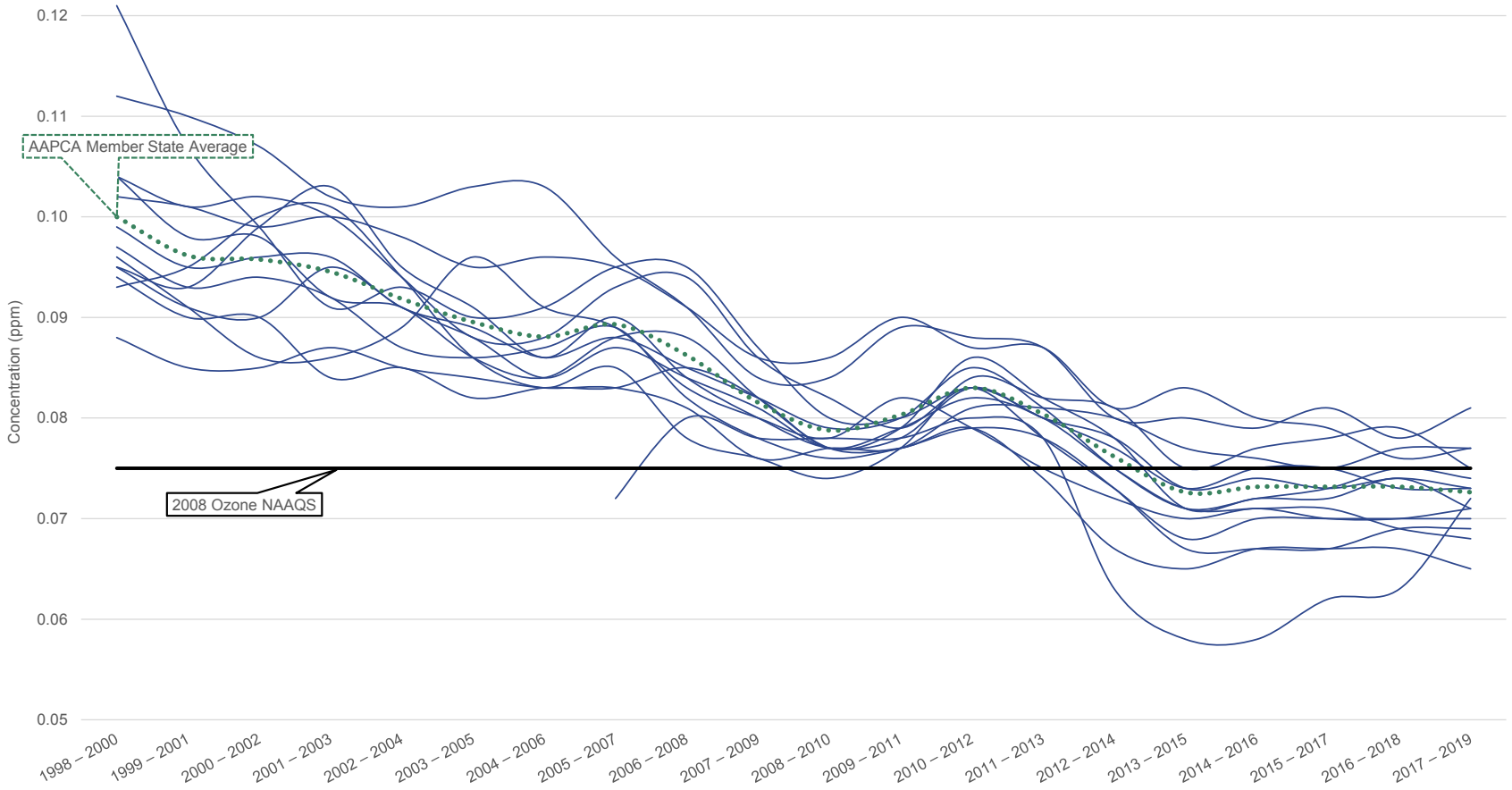
*For design value years 1998–2000, 1999–2001, and 2000–2002, this area was listed as St. Louis, MO-IL. Following 2001–2003, it was listed as St. Louis-St. Charles-Farmington, MO-IL.

** Upper Green River Basin, WY is calculated from the first year that data was available, design value year 2005–2007. This area is excluded from average calculations.

Source: U.S. EPA, **Air Quality Design Values**. Data file: "Ozone design values, 2019."

Air Quality | Ozone

AAPCA Member States: Design Value History for Areas Previously Designated Nonattainment or Maintenance for the 2008 Ozone NAAQS



Source: U.S. EPA, **Air Quality Design Values**. Data file: "Ozone design values, 2019." For further details, please see AAPCA's **2020 StATS Report Interactive Webpage**.

AAPCA Best Practices in Air Pollution Control

Each year, AAPCA awards Best Practices that identify ground-breaking technology, innovative approaches, and exemplary operations in the field of air pollution control, with particular focus on activities that are directly transferable to the operation of an air pollution control agency. Below are recipients of AAPCA Best Practices since 2015:

2020

Georgia PSD Emissions Inventory
Georgia Environmental Protection Division

2019

Data Verification Procedures
Georgia Environmental Protection Division

Ozone Design Value Predictor Tool
North Carolina Division of Air Quality

Louisville Community Workshop Series (Local Government Best Practice)
Louisville Metro Air Pollution Control District

2018

Georgia State Implementation Plan Processing Procedures
Georgia Environmental Protection Division, Air Protection Branch

Toxicity Factors Database
Texas Commission on Environmental Quality

Inventory, Monitoring, Permitting, and Compliance Tracking (IMPACT) Web-based Data System
Wyoming Department of Environmental Quality, Air Quality Division

2017

National Ambient Air Quality Standards (NAAQS) Exceedance Reports
Georgia Environmental Protection Division, Air Protection Branch

Pollutants of Concern Table Implementation
Kentucky Division for Air Quality

Standardization of an Engineer's Notebook for Title V Permitting
Wyoming Department of Environmental Quality, Air Quality Division

2016

Air Protection Branch 101 Training
Georgia Environmental Protection Division, Air Protection Branch

2015

AirCom: Florida Division of Air Resource Management's New Compliance and Enforcement Database and Field Inspection Tool
Florida Department of Environmental Protection

FAIR: Florida Air Inspector Reference
Florida Department of Environmental Protection

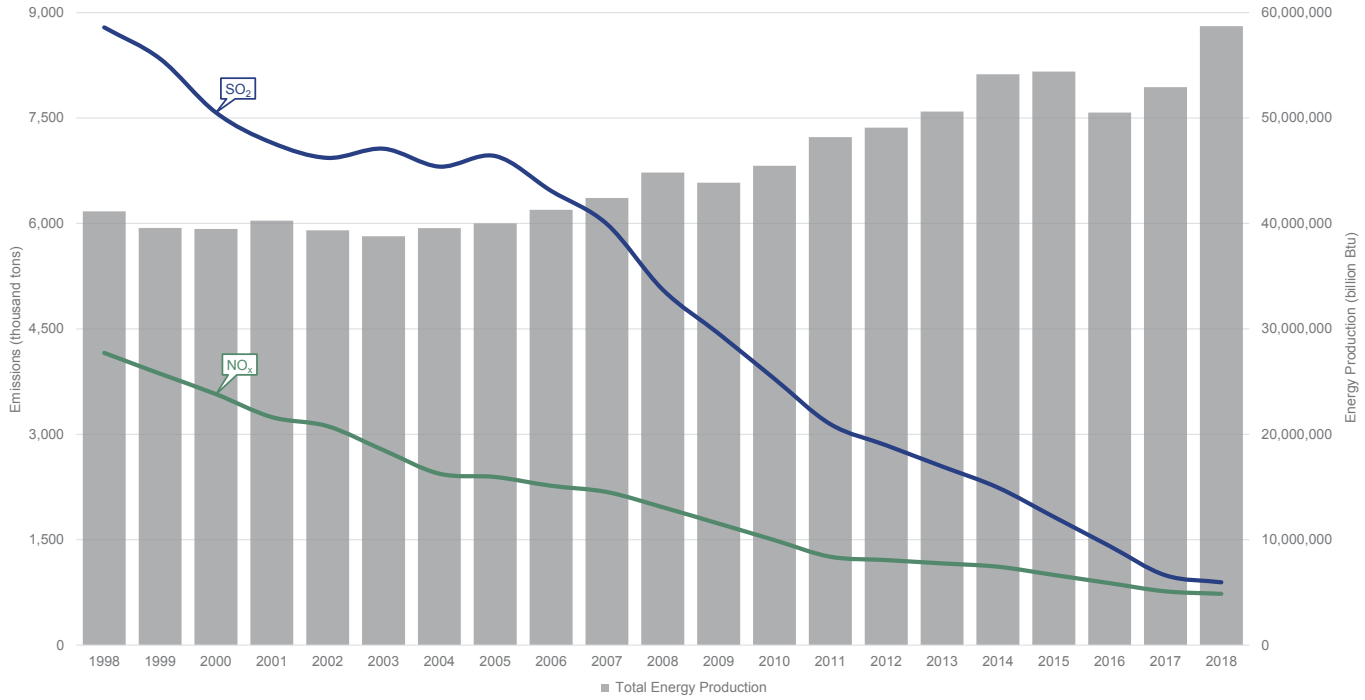
Promoting Energy Efficiency at Commercial and Industrial Facilities in North Carolina
North Carolina Division of Air Quality

Emissions Reductions in the Electricity Sector

In 2018, AAPCA Member States produced nearly 57,700,000 billion British thermal units (Btus) of energy, a more than 43 percent increase from 1998.[14] During the same 20-year period, AAPCA Member States oversaw significant reductions in the emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) from the electricity sector, specifically:

- SO_2 emissions decreased 92 percent, from 8,789,000 tons in 1998 to 684,000 tons in 2018; and,
- NO_x emissions went from 4,147,000 tons in 1998 to 627,00 tons in 2018, a decline of 85 percent.[15]

AAPCA Member States: Energy Production Compared to Electricity Sector SO_2 and NO_x Emissions 1998–2018



Sources: U.S. Energy Information Administration, **State Energy Data System (SEDS): 1960–2018**; U.S. EPA, **Air Pollutant Emissions Trends Data** (Data file: "State Average Annual Emissions Trend").

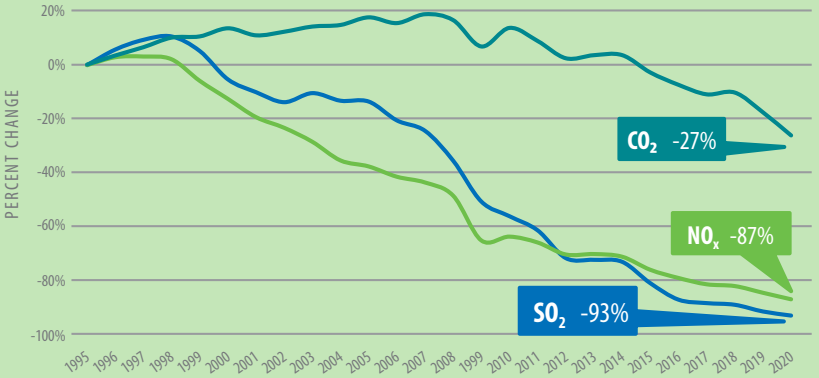
Power Plant Emissions Trends

In February 2021, U.S. EPA released the 2020 annual data for power plants, highlighting the following emissions trends compared to 2019:

- A 19 percent decline in SO_2 emissions, a 93 percent reduction from 1995 levels;
- A 16 percent decline in NO_x emissions, down 87 percent from 1995 levels; and,
- An 11 percent decline in carbon dioxide (CO_2) emissions, 27 percent below 1995 levels.

Source: U.S. EPA, "**EPA: 2020 Power Plant Emissions Continue to Demonstrate Significant Reductions**," February 16, 2021. Data available **here**.

Annual Percent Change of Emissions from Power Plants
1995–2020

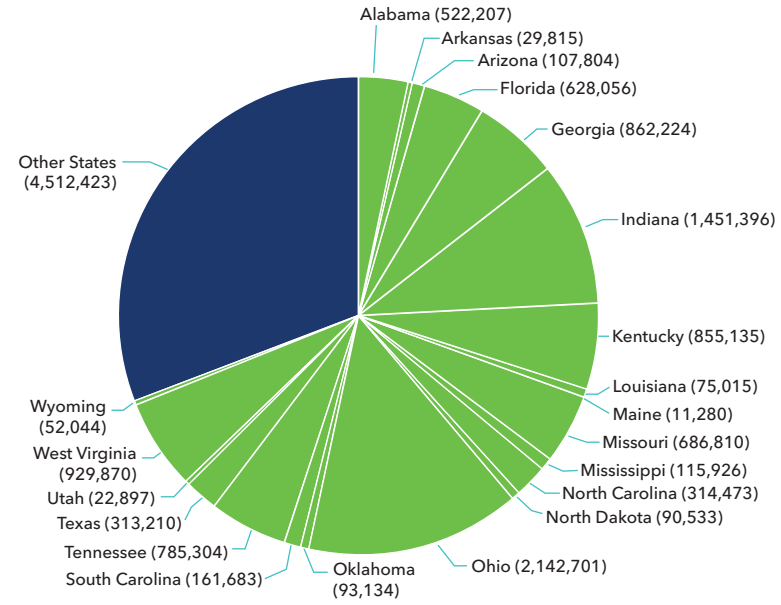


Emissions Reductions in the Electricity Sector

AAPCA Member States: Share of SO_2 Emissions Reductions in the Electricity Sector, 1990 – 2019 (tons of SO_2 reduced)

Data from U.S. EPA's Clean Air Markets Programs[16] show that the United States reduced electricity sector SO_2 emissions 94 percent from 1990 to 2019, from 15.7 million tons to 969 thousand tons—a 14.7 million ton decline. AAPCA Member States accounted for nearly 70 percent of these SO_2 emissions reductions, lowering SO_2 emissions from 10.9 million tons in 1990 to 676 thousand tons in 2019.[17]

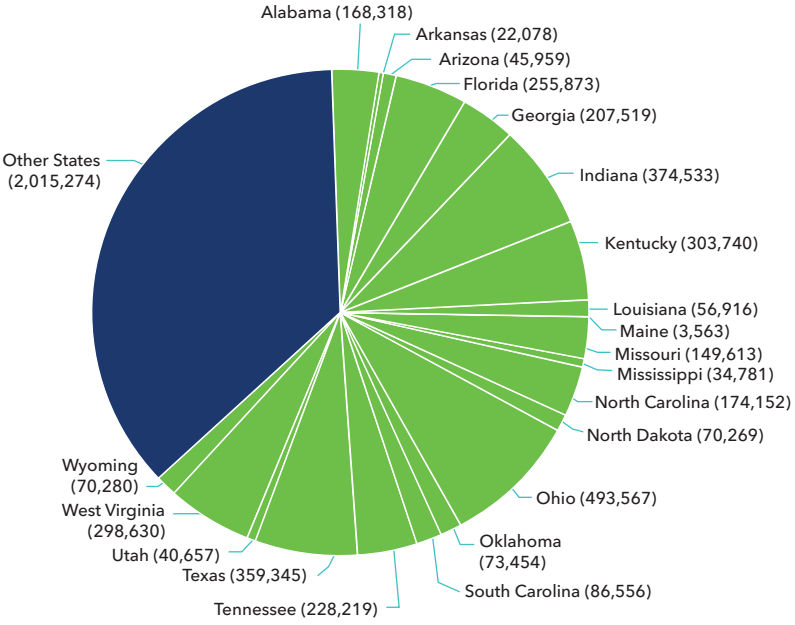
Source: U.S. EPA, "**State-by-State SO_2 Emissions from CAIR and ARP Sources, 1990-2019**," March 2020.



AAPCA Member States: Share of NO_x Emissions Reductions in the Electricity Sector, 1990–2019 (tons of NO_x reduced)

U.S. EPA's Clean Air Markets Programs data also reveal a national reduction in NO_x emissions from the electricity sector of 86 percent from 1990 to 2019, from 6.4 million tons to 877 thousand tons. Of the 5.5-million-ton decrease, AAPCA Member States accounted for 3.52 million tons (64 percent), from 4.13 million tons in 1990 to 614 thousand tons in 2019.[18]

Source: U.S. EPA, "**Annual NO_x Emissions from CSAPR and ARP Sources, 1990 –2019**," March 2020.



Greenhouse Gases and Energy

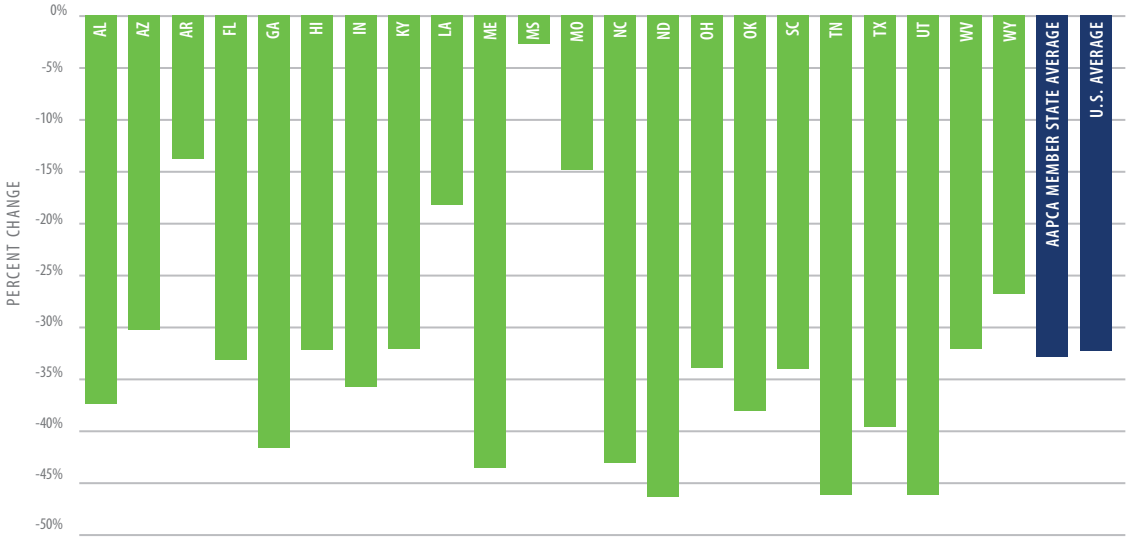
From 1998 to 2018, energy-related CO_2 emissions in AAPCA Member States declined 5 percent, from 3,111 million metric tons in 2000 to 2,961 million metric tons in 2018, while energy production increased 45 percent.[19]

AAPCA Member States: Total Energy Production Compare to Energy-Related CO_2 Emissions, 1998–2018

Source: U.S. Energy Information Administration (EIA), State Energy Data System (SEDS): 1960–2019; U.S. EIA, **Energy-Related CO_2 Emission Data Tables**, Table 2. State energy-related carbon dioxide emissions by year, adjusted (1990–2018).

Further, states in AAPCA's membership saw GDP increase 42 percent from 2000 to 2018 while overseeing an average decline in carbon intensity of the economy by 33 percent, whereas the national average was a 32 percent reduction.[20] On average, AAPCA Member States also reduced energy intensity by 22 percent.[21]

AAPCA Member States: Carbon Intensity of the Economy, 2000–2018



Source: U.S. Energy Information Administration, **Energy-Related CO_2 Emission Data Tables**. Table 8. Carbon intensity of the economy by state (1990–2018).

Regional Haze | Visibility Progress in Canyonlands National Park

In 1951, the superintendent of Arches National Park, Bates Wilson, ventured into a section of the Colorado Plateau where the Green and Colorado Rivers had sculpted an expanse of awe-inspiring canyons, mesas, cliffs, and spires. That year, Wilson started a campaign to map this area and turn it into a national park, which was finally established in 1964. Canyonlands National Park spans over 300,000 acres and is Utah's largest national park. One of five Class I areas in Utah, Canyonlands is located near the town of Moab and welcomes over 700,000 visitors a year. The park is also home to one of the most photographed landforms in the west, the Mesa Arch.

Figure 1: Mesa Arch, National Park Service.

Haze is one of the most basic forms of visibility-decreasing air pollution. Utah has been at the forefront of haze improvement and prevention since 1991 when the Grand Canyon Visibility Transport Commission (GCVTC) was formed. The GCVTC recognized haze as a regional issue prior to the creation of the Regional Haze Rule (RHR) in 1999 and was the first multi-state collaborative effort to address visual air quality issues. In recognition of the GCVTC, Section 309 of the RHR provided an early regional haze planning opportunity for states within the Colorado Plateau region. Utah is one of the five states to submit a complete §309 regional haze plan in 2003 and continues to be part of multiple interstate regional haze planning organizations.

Through the collaborative efforts of state, local, and federal entities, Canyonlands National Park's visibility has improved under the RHR. The rule requires that each Class I area achieve natural conditions for visibility by the year 2064 by steadily improving the number of most impaired days and keeping the number of clearest days from decreasing. Since 2005, sources in the region around Canyonlands National Park have reduced their SO_2 emissions by over 150,000 tons per year. The Utah Department of Environmental Quality and Federal Land Managers have cooperated on a prescribed fire plan that allows the needed forest rehabilitation to happen when the fires will have little to no impact on visibility. The Regional Haze program has been successful as visitors of the park can now enjoy unimpaired vistas that extend over 120 miles on the most impaired days and nearly 200 miles on the clearest days. That is an improvement of 22 miles and 27 miles respectively from 2005 to 2018. As of 2018, Canyonlands is over 10 years ahead of the Uniform Rate of Progress schedule for most impaired days as defined by EPA guidance.

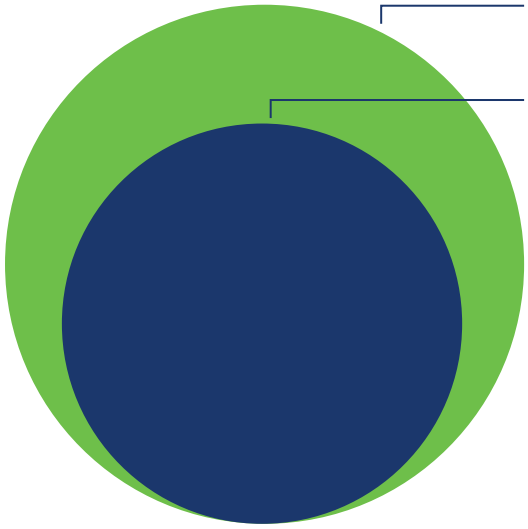
Figure 2: Projected Canyonlands Reasonable Progress Goals Glidepath.

Source: **Utah Division of Air Quality.**

Toxic Air Releases

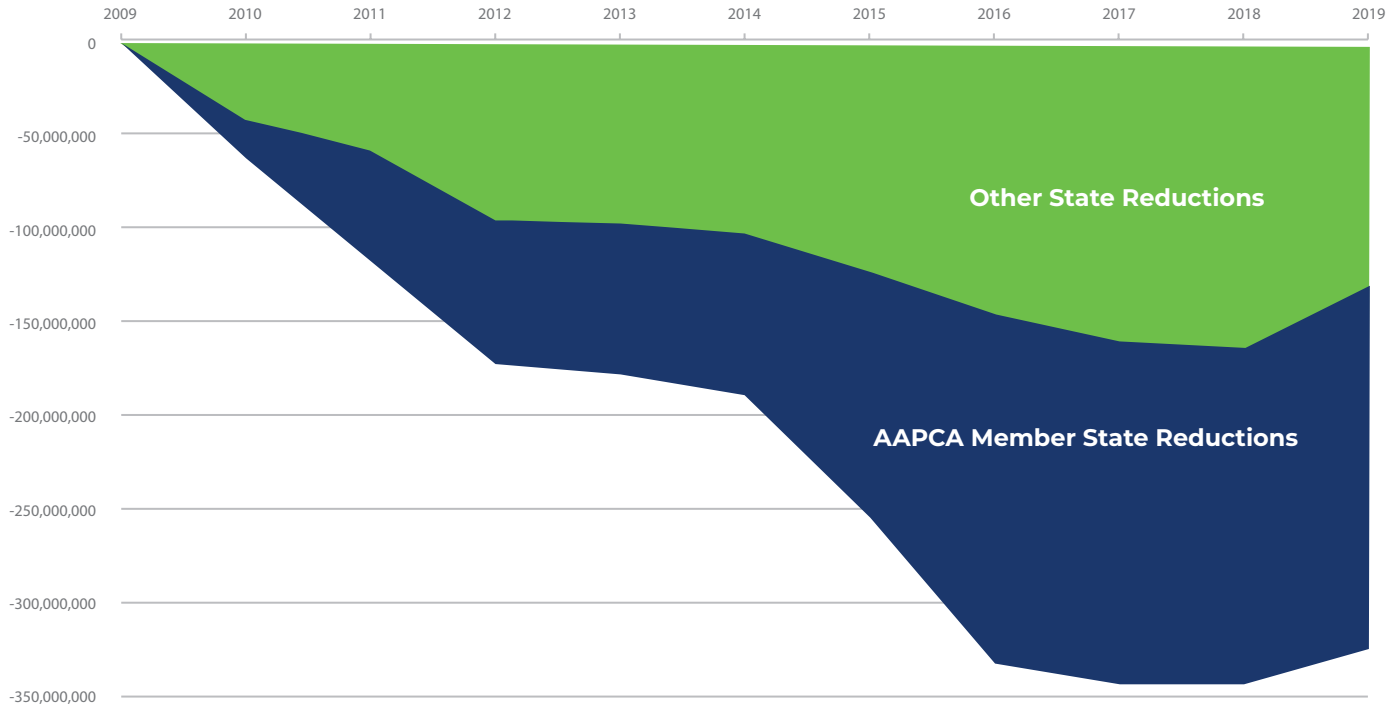
AAPCA Member States: Share of Total Reduction of Toxic Air Releases Reported to the Toxic Release Inventory, 2009–2019

U.S. EPA's *2019 Toxic Release Inventory (TRI) National Analysis* revealed a 35 percent reduction in reported toxic air releases compared to 2009, from 925.9 million pounds in 2009 to 600.2 million pounds in 2019.[22] Of the more than 325 million pound decrease in reported releases over the past 10 years, AAPCA Member States were responsible for 195 million pounds, nearly 60 percent.[23]



Source: U.S. EPA Toxic Release Inventory Explorer, **2019 TRI Factsheets**.

AAPCA Member States: Annual Share of National Reduction in Reported Toxic Air Releases 2009–2019



Source: U.S. EPA Toxic Release Inventory Explorer, **2019 TRI Factsheets**.

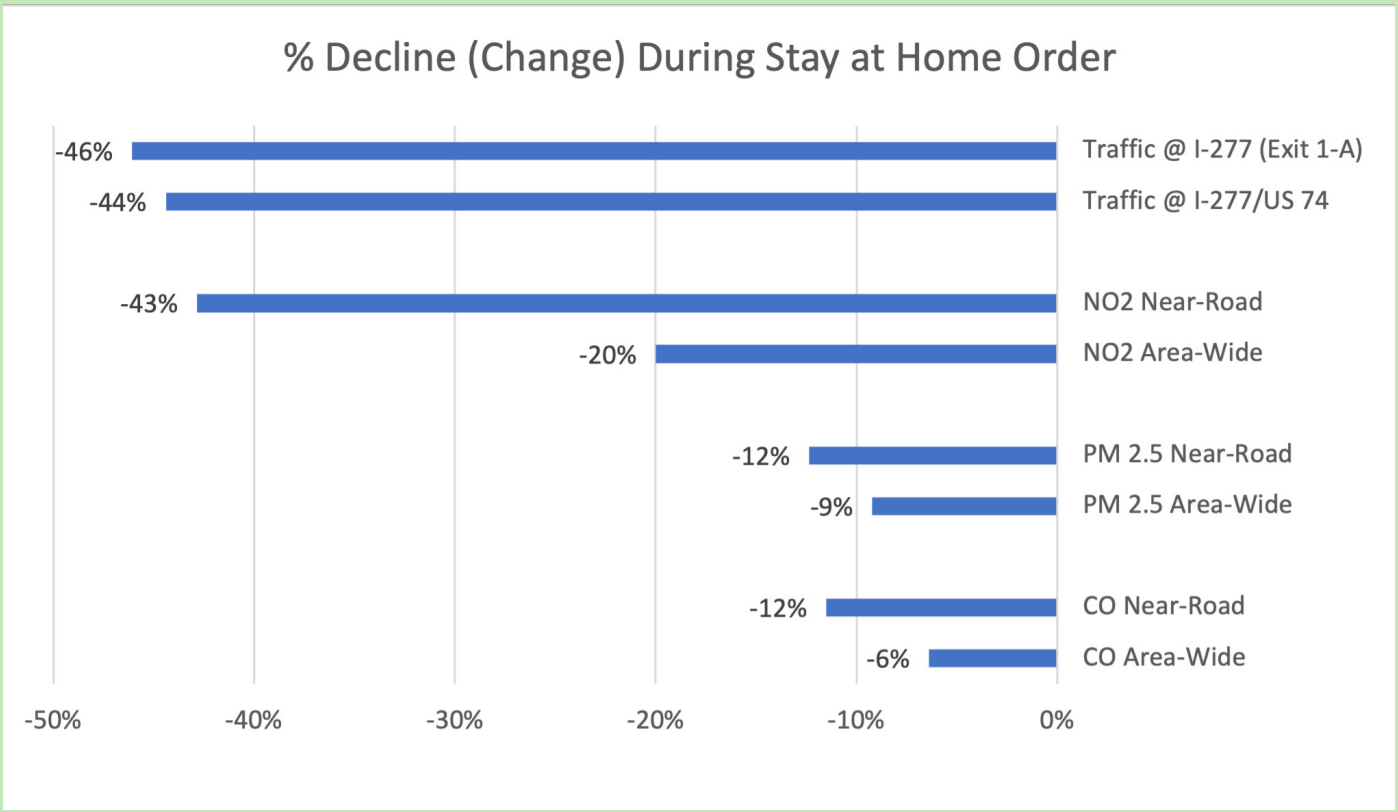
Local Program Case Study: Mecklenburg County, NC

Analysis of Air Pollution During Stay-at-Home Phase

Air Monitoring staff from Mecklenburg County Air Quality, a local program in Charlotte, North Carolina, analyzed data collected during the initial "Stay-at-Home" phase of the pandemic. The purpose was to investigate whether measured concentrations of local air pollution showed expected decreases during the time of reduced traffic.

Measured from March 26, 2020 to April 29, 2020, traffic on Interstate 77 and on Interstate -277/74 declined by approximately 40% when compared to the previous 4 years. Likewise, declines in air pollution were seen. Concentrations of fine particulate matter ($PM_{2.5}$), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2) and Ozone (O_3) were all lower than the average concentrations of the previous 4 years. It was also noted that near-road monitoring site concentrations exhibited greater declines than the area-wide monitoring site for $PM_{2.5}$, CO, and NO_2.

The full analysis can be found at **AirQuality.MeckNC.gov.** Mecklenburg County Air Quality intends to use this analysis in its outreach to the community to illustrate the significance of reducing single-occupancy vehicle trips as a strategy for improving air quality in the metropolitan area.



Source: **Mecklenburg County Air Quality**.

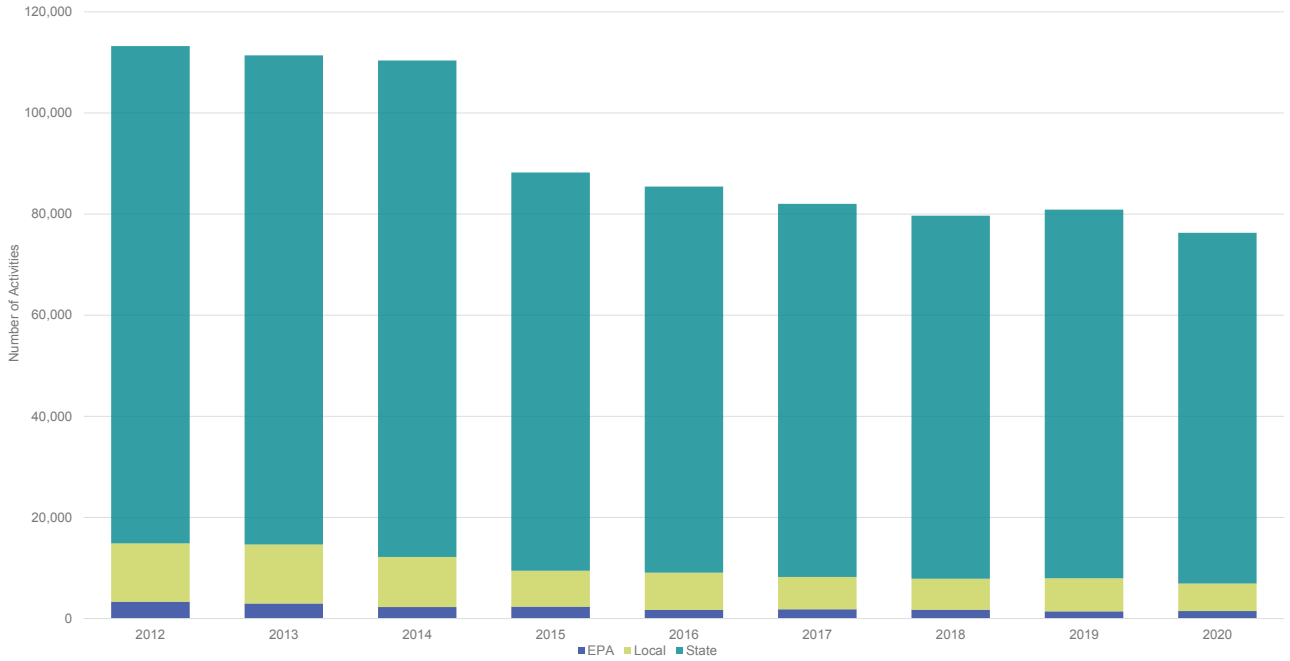
State Compliance and Enforcement Activity

U.S. EPA's Enforcement and Compliance History Online (ECHO) documents compliance monitoring activities undertaken by state and local air quality agencies and U.S. EPA since 2012. U.S. EPA's ECHO Dashboard shows the following distribution of compliance monitoring activities related to the Clean Air Act by lead agency[24]:

- In 2020, states were the lead agency on 69,395 activities, and averaged above 80,000 per year from 2012 through 2020;
- In 2020, local programs were the lead agency for 5,432 activities, with an average of more than 8,000 per year from 2012 through 2020; and,
- U.S. EPA was the lead agency for 1,480 activities, averaging about 2,000 per year since 2012.

Additionally in 2020, AAPCA Member States were the lead agency for a total of 37,088 compliance monitoring activities, or more than 53 percent of the state lead agency total.

Compliance Monitoring Activities by Lead Agency 2012–2020



Source: U.S. EPA, **Analyze Trends: State Air Dashboard**.

"States currently perform the vast majority of environmental protection tasks in America, including more than 90% of the enforcement and compliance actions and collection of the environmental quality data currently held by the U.S. EPA."

Environmental Council of States, "**Resolution 00-1: On Environmental Federalism,**" March 22, 2021.

Section Notes | AAPCA Member State Air Trends and Successes

[1] U.S. EPA, **Air Pollutant Emissions Trends Data**. Data file: "State Tier 1 CAPS Trends" (Criteria pollutants State Tier 1 for 1990–2020).

[2] U.S. Bureau of Economic Analysis, "**Gross Domestic Product by State, 4th Quarter 2020 and Annual 2020 (Preliminary)**," released March 26, 2021.

[3] U.S. Office of Highway Policy Information, data available **here**.

[4] U.S. Census Bureau, Population Estimates **1990–2000**; **2000–2010**; **2010–2019**.

[5] U.S. Energy Information Administration, **State Energy Data Systems (SEDS): 1960–2018**.

[6] U.S. EIA, **Energy-Related CO_2 Emission Data Tables**. Table 2. State energy-related carbon dioxide emissions by year, adjusted (1990–2018).

[7] U.S. EPA's *Green Book* can be found **here**.

[8] U.S. EPA's listing of areas designated nonattainment or maintenance for the 1997 annual $PM_{2.5}$ NAAQS can be found **here**. In 2012, the NAAQS for $PM_{2.5}$ was lowered to 12 µg/m^3, based on an annual arithmetic mean averaged over three years (the 2006 review maintained the 1997 NAAQS). In 2020, U.S. EPA **retained** the 2012 standard of 12 µg/m^3.

[9] U.S. EPA **defines a design value** as "a statistic that describes the air quality status of a given location relative to the level of the [NAAQS]." More information is available **here**.

[10] U.S. EPA's **Air Quality System** "contains ambient air pollution data collected by EPA, state, local, and tribal air pollution control agencies from over thousands of monitors."

[11] U.S. EPA, **Air Quality Design Values** (Data file: "$PM_{2.5}$ Design Values, 2019"). Data for this chart is based on overlapping three-year averages beginning with 1999–2001 and ending with 2017–2019.

[12] U.S. EPA's listing of areas designated nonattainment or maintenance for the 2008 ozone NAAQS can be found **here**. In 2015, U.S. EPA lowered the NAAQS for ozone to .070 parts per million (ppm), based on the annual fourth-highest daily maximum 8-hour average concentration, averaged over three years. In 2020, U.S. EPA **retained** the 2015 standard of .070 ppm.

[13] U.S. EPA, **Air Quality Design Values** (Data file: "Ozone Design Values, 2019"). Data for this chart is based on overlapping three-year averages beginning with 1998–2000 and ending with 2017–2019

[14] U.S. Energy Information Administration, **State Energy Data System (SEDS): 1960–2019**.

[15] U.S. EPA, **Air Pollutant Emissions Trends Data** (Data file: "State Annual Emissions Trend")

[16] More information on U.S. EPA Clean Air Markets Programs can be found **here**, and include the **Acid Rain Program** (ARP), the **Cross-State Air Pollution Rule** (CSAPR), and the **CSAPR Update**.

[17] U.S. EPA, "**State-by-State SO_2 Emissions from CAIR and ARP Sources, 1990–2019**," December 2019.

[18] U.S. EPA, "**State-by-State NO_x Emissions from CAIR and ARP Sources, 1990–2019**," December 2019.

[19] U.S. Energy Information Administration (EIA), **State Energy Data System (SEDS): 1960–2019**; U.S. EIA, **Energy-Related CO_2 Emission Data Tables**. Table 2. State energy-related carbon dioxide emissions by year, adjusted (1990–2018).

[20] U.S. Energy Information Administration, **Energy-Related CO_2 Emission Data Tables**. Table 8. Carbon intensity of the economy by state (1990–2018).

[21] U.S. Energy Information Administration, **Energy-Related CO_2 Emission Data Tables**. Table 6. Energy intensity by state (1990–2018).

[22] U.S. EPA, ***2019 Toxic Release Inventory (TRI) National Analysis***, January 2021.

[23] U.S. EPA Toxic Release Inventory Explorer, **2019 TRI Factsheets**.

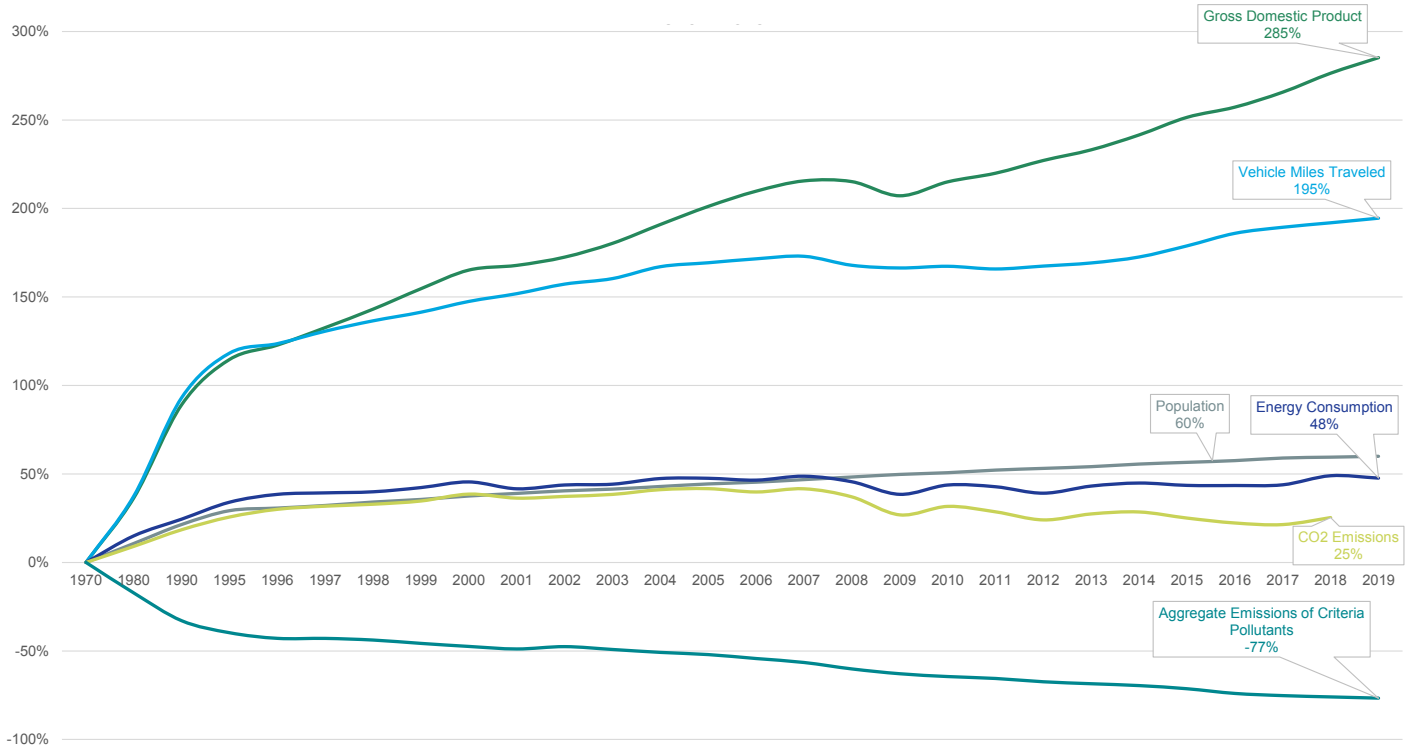
[24] See U.S. EPA's **State Air Dashboard**, part of Enforcement and Compliance History Online (ECHO).

American Air Quality in an International Context

Air Quality and Growth Indicator Trends in the United States

According to U.S. EPA's June 2020 report, *Our Nation's Air: EPA Celebrates 50 Years!*, the United States has reduced aggregate emissions of the six criteria air pollutants by 77 percent since 1970.[1] The substantial, sustained decline in emissions have led to improved air quality in the United States while Gross Domestic Product (GDP) rose 285 percent, vehicle miles traveled increased 195 percent, the nation's population grew 60 percent, and energy consumption went up 48 percent.[2]

Growth Indicators and Emissions Reductions in the United States 1970–2019



Source: U.S. EPA, ***Our Nation's Air: EPA Celebrates 50 Years!***, June 2020. (Section: "Economic Growth with Cleaner Air").

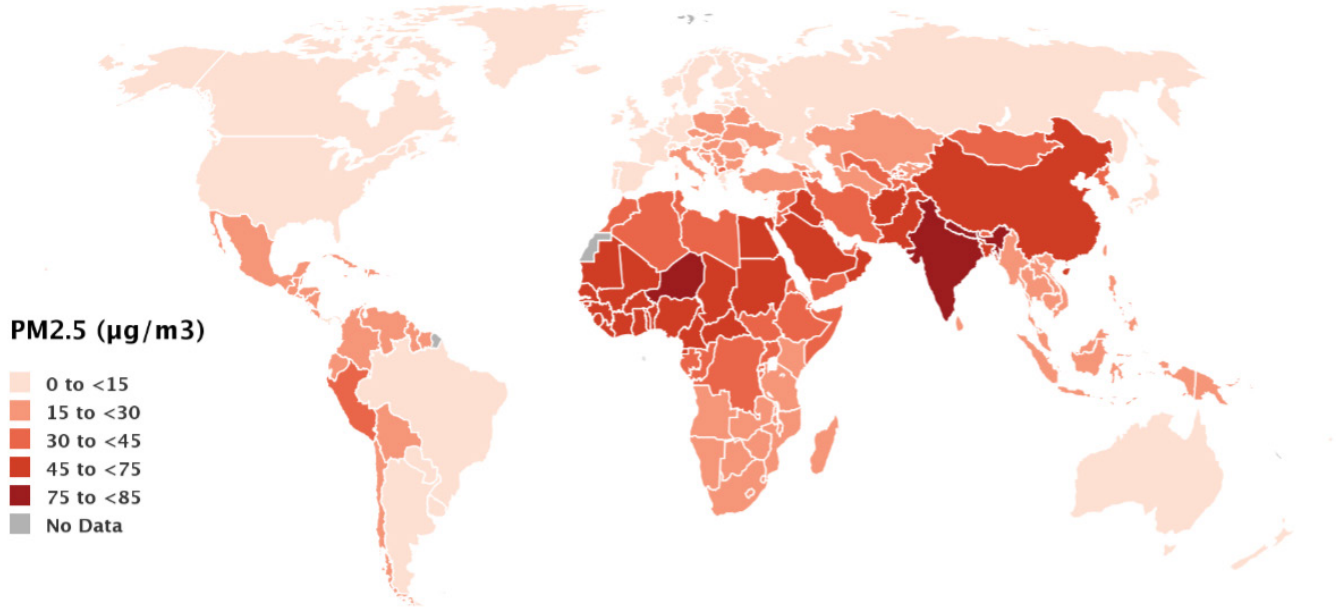
Internationally, the United States ranks:

- First in GDP, at $21.43 trillion in 2019,[3] representing nearly a quarter of gross world product[4] and nearly $7.2 trillion more than China, the country with the second-highest GDP in 2019.[5]
- Second in energy production, behind China, according to International Energy Agency (IEA) data.[6] From 1960 to 2018, the United States increased energy production approximately 125-percent[7] and, in 2018, was 97 percent energy self-sufficient.[8]
- Third in total population, behind China and India,[9] with a 60-percent increase in population from 1970 to 2019, from 203 million people to 328 million.[10]

International Trends | Fine Particulate Matter

In October 2020, the Health Effect Institute and Institute for Health Metrics published the *State of Global Air/2020* report. The report includes 2019 data mapped for average annual population-weighted fine particulate matter ($PM_{2.5}$) concentrations across the world and shows a U.S. concentration of 7.7 micrograms per cubic meter (µg/m^3) for the year.[11]

Average Fine Particulate Matter ($PM_{2.5}$) Concentrations in 2019

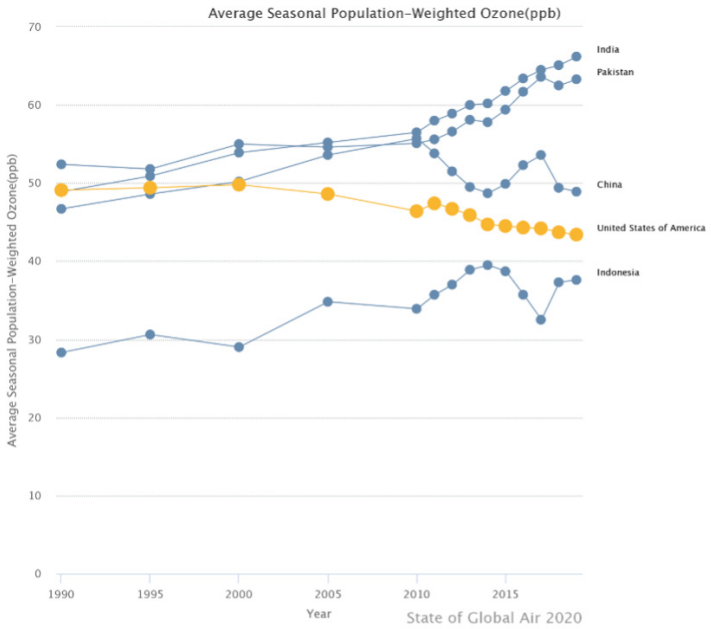


Source: Health Effects Institute and the Institute for Health Metrics and Evaluation, ***State of Global Air/2020***, October 2020.
To explore data, see **interactive map**: "Population-weighted annual average PM2.5 concentrations in 2019."

International Trends | Ozone

Comparing the top five countries by population, the interactive dataset accompanying the *State of Global Air/2020* shows that only Indonesia has lower average seasonal ozone concentrations than the United States.[12]

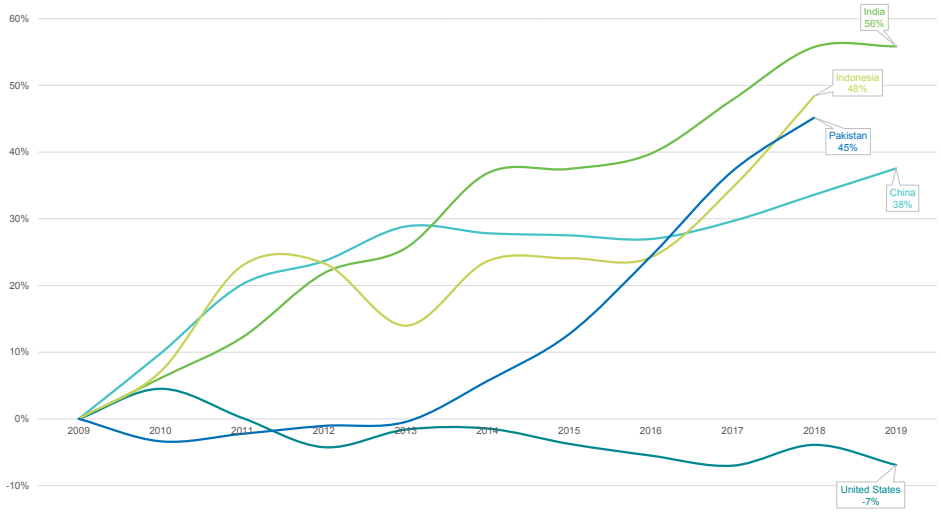
Source: Health Effects Institute and the Institute for Health Metrics and Evaluation, ***State of Global Air/2020***, October 2020. Data available **here.**



World Trends | Carbon Dioxide Emissions

Of the five most populous nations, the United States is the only one to reduce carbon dioxide (CO_2) emissions in the past decade. From 2009 to 2019, data from the IEA show that the United States reduced CO_2 emissions by 963.5 million metric tons (7 percent) while China and India, the next two most populous nations, increased CO_2 emission by 6.7 billion metric tons (38 percent) and 1.4 billion metric tons (56 percent), respectively.[13] Over the same 10-year period, the U.S. also decreased emissions per capita by 24 percent, while both China and India experienced significant per-person increases.[14]

CO_2 Emissions Change by Country Five largest countries by population (Baseline 2009)



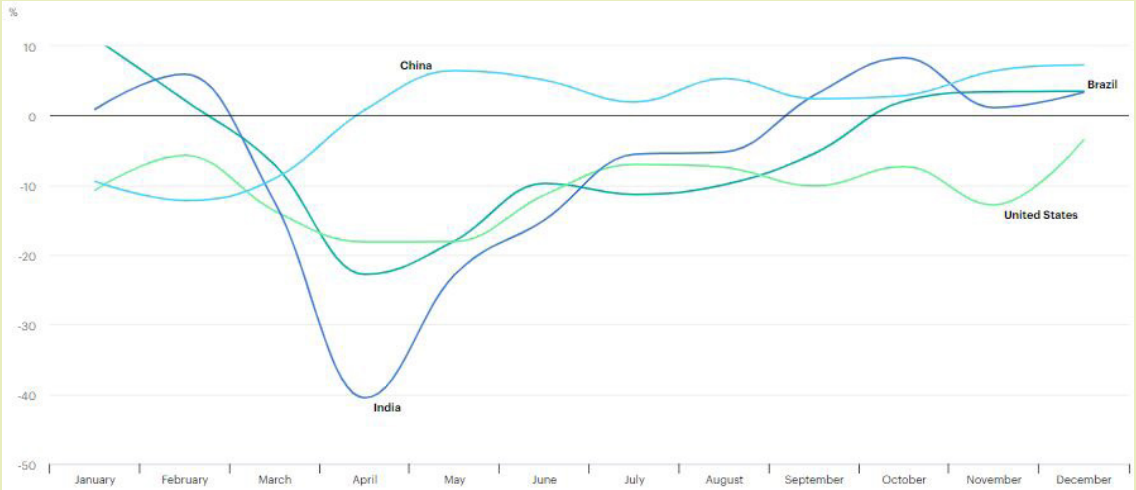
Source: IEA, **Data and Statistics** (Total CO_2 Emissions per Country).

Global Energy-Related CO_2 Emissions in 2020

Monthly evolution of CO_2 emissions in selected major economies, 2020 relative to 2019

The IEA report, *Global Energy Review: CO_2 Emissions in 2020*, states that "global energy-related CO_2 emissions fell by 5.8% according to the latest statistical data." The report charted the monthly change in CO_2 emissions in 2020 relative to 2019 in the United States, China, India, and Brazil.

Source: IEA, ***Global Energy Review: CO_2 Emissions in 2020***, March 2, 2021.



Section Notes | American Air Quality in an International Context

[1] U.S. EPA, ***Our Nation's Air: EPA Celebrates 50 Years!***, June 2020.

[2] U.S. EPA, ***Our Nation's Air: EPA Celebrates 50 Years!***, June 2020.

[3] U.S. Bureau of Economic Analysis, data available **here**.

[4] World Bank, **GDP Listings by Country**, February 2020.

[5] World Bank, **GDP Listings by Country**, February 2020.

[6] International Energy Agency, **IEA Energy Atlas**, 2018.

[7] U.S. Energy Information Administration, **State Energy Data System (SEDS): 1960-2019**, June 2020.

[8] International Energy Agency, **IEA Energy Atlas**, 2018.

[9] U.S. Census Bureau, **U.S. and World Population Clock**, February 2020.

[10] U.S. Census Bureau, **Current Population**.

[11] Health Effects Institute and the Institute for Health Metrics and Evaluation, ***State of Global Air/2020***, October 2020. For methodology, see "**How We Estimate $PM_{2.5}$ Exposure**," which states that "This method produces a population-weighted annual average concentration for a given country or region. Population-weighted annual average concentrations are better estimates of population exposures, because they give proportionately greater weight to the air pollution experienced where most people live."

[12] Health Effects Institute and the Institute for Health Metrics and Evaluation, ***State of Global Air/2020***, October 2020. Data explorer **here**. For methodology, see "**How We Estimate Ozone Exposure**," which states that "This method evaluates human exposure to ozone in terms of the population-weighted average seasonal 8-hour daily maximum concentration for a given country or region. Population-weighted annual average concentrations are better estimates of population exposures, because they give proportionately greater weight to the air pollution experienced where most people live."

[13] International Energy Agency, **World Energy Balances**.

[14] International Energy Agency, **World Energy Balances**.

Air Quality Trends in the United States

Criteria Air Pollutants | Concentration Trends

U.S. EPA's national-level analysis of 2019 monitoring data demonstrates the substantial reductions in ambient concentrations of all criteria pollutants over the past several decades. As the below chart indicates, the United States has seen at least a 35 percent decline in the ambient levels of carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), and sulfur dioxide (SO_2) since 1980. Available data show that fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}) levels have declined more than 40 percent since 2000. And more recent data point to a sustained trend of meaningful improvements, with monitored concentrations of all criteria pollutants down at least 10 percent over the past decade.[1]

Ambient Concentrations	1980 vs 2019	1990 vs 2019	2000 vs 2019	2010 vs 2019
Carbon Monoxide	-85%	-78%	-65%	-23%
Lead	-98%	-98%	-93%	-85%
Nitrogen Dioxide (annual)	-65%	-59%	-51%	-25%
Nitrogen Dioxide (1-hour)	-62%	-51%	-36%	-17%
Ozone (8-hour)	-35%	-25%	-21%	-10%
PM_{10} (24-hour)	---	-46%	-46%	-17%
$PM_{2.5}$ (annual)	---	---	-43%	-23%
$PM_{2.5}$ (24-hour)	---	---	-44%	-21%
Sulfur Dioxide (1-hour)	-92%	-90%	-82%	-71%

Source: U.S. EPA, **Air Quality—National Summary: Air Quality Trends** (updated November 23, 2020).

Criteria Air Pollutants | Emissions Trends

In coordination with state and local air agencies, tribes, and industry, U.S. EPA develops annual nationwide emissions estimates, which are "based on actual monitored readings or engineering calculations of the amounts and types of pollutants emitted by vehicles, factories, and other sources."[2] U.S. EPA's most recently published estimates, show that the emissions of all criteria pollutants and precursors declined at least 30 percent from 1990 through 2019, and at least 17 percent since 2010.[3]

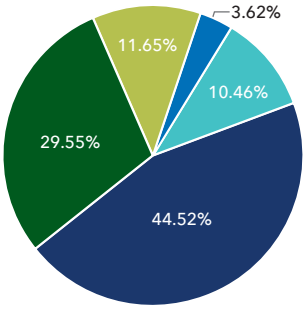
Emissions	1980 vs 2019	1990 vs 2019	2000 vs 2019	2010 vs 2019
Carbon Monoxide	-75%	-69%	-56%	-27%
Lead	-99%	-87%	-76%	-30%
Nitrogen Oxides (NO_x)	-68%	-65%	-61%	-41%
Volatile Organic Compounds (VOC)	-59%	-47%	-27%	-18%
Direct PM_{10}	-63%	-30%	-27%	-17%
Direct $PM_{2.5}$	---	-36%	-43%	-20%
Sulfur Dioxide	-92%	-91%	-88%	-73%

Source: U.S. EPA, **Air Quality—National Summary: Air Quality Trends** (updated November 23, 2020).

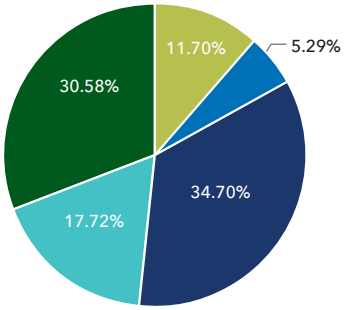
Criteria Air Pollutants | Emissions Sources

U.S. EPA tracks emissions from the following source categories: Stationary Fuel Combustion, Industrial, Transportation, Wildfires, and Miscellaneous. Included below are the sources of criteria air pollutant and precursor emissions for the year 2020.[4]

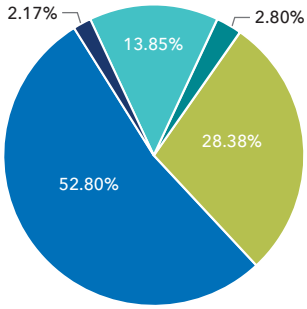
Fine Particulate Matter ($PM_{2.5}$)



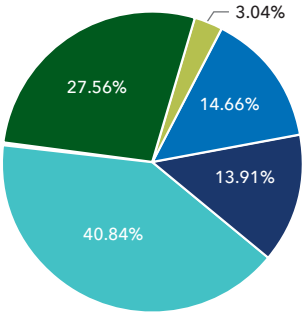
Coarse Particulate Matter (PM_{10})



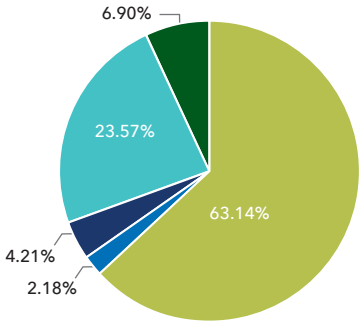
Oxides of Nitrogen (NO_x)



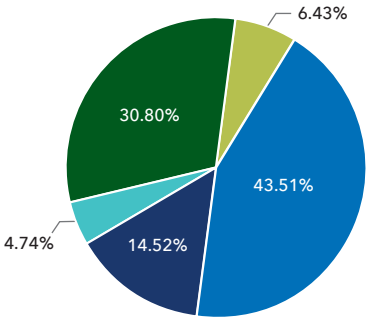
Volatile Organic Compounds (VOCs)



Sulfur Dioxide (SO_2)



Carbon Monoxide (CO)



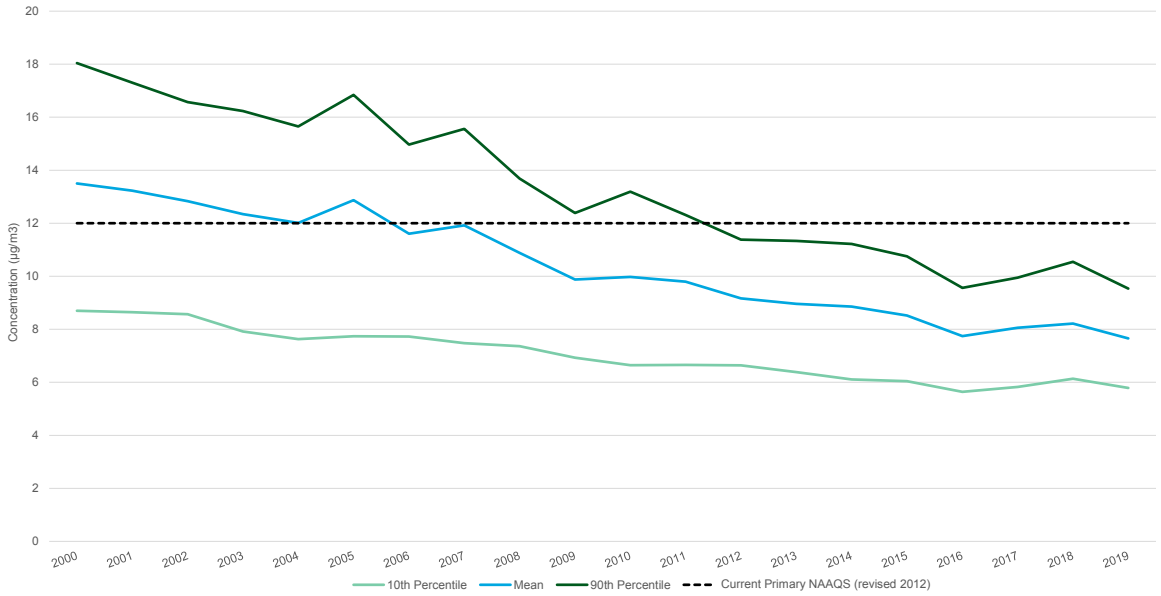
Stationary fuel combustion | Industrial | Transportation | Miscellaneous | Wildfires

Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970 – 2020").

Criteria Air Pollutant Trends | Fine Particulate Matter

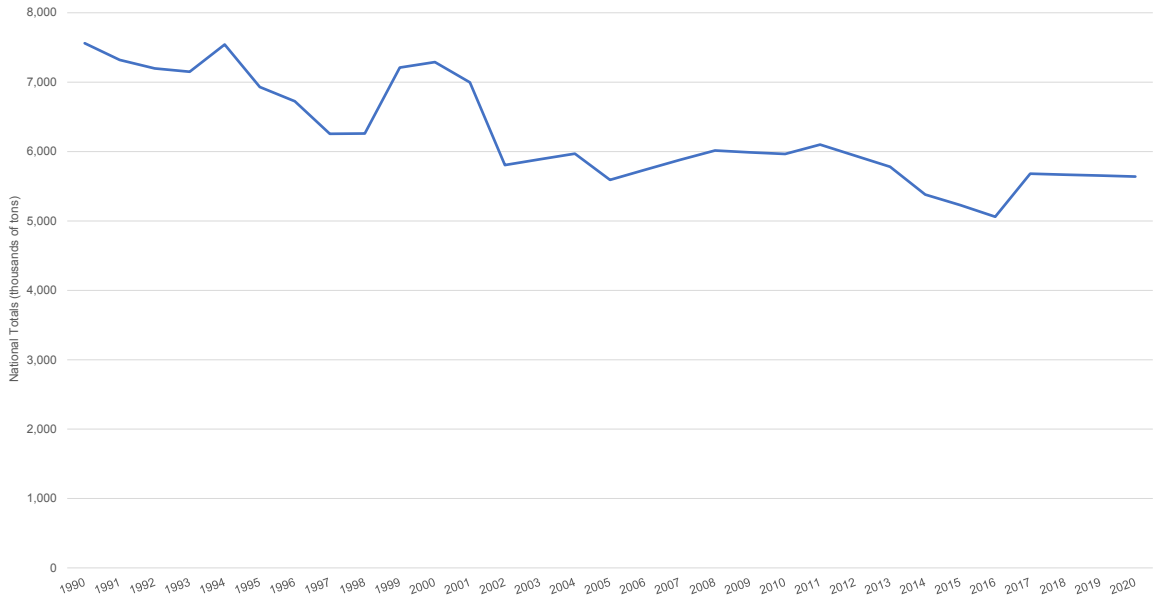
Fine Particulate Matter ($PM_{2.5}$) Air Quality, 2000–2019

(Seasonally Weighted Annual Average) National Trend based on 406 Sites



Source: U.S. EPA, **Particulate Matter ($PM_{2.5}$) Trends.**

Fine Particulate Matter ($PM_{2.5}$) Emissions 1990–2020

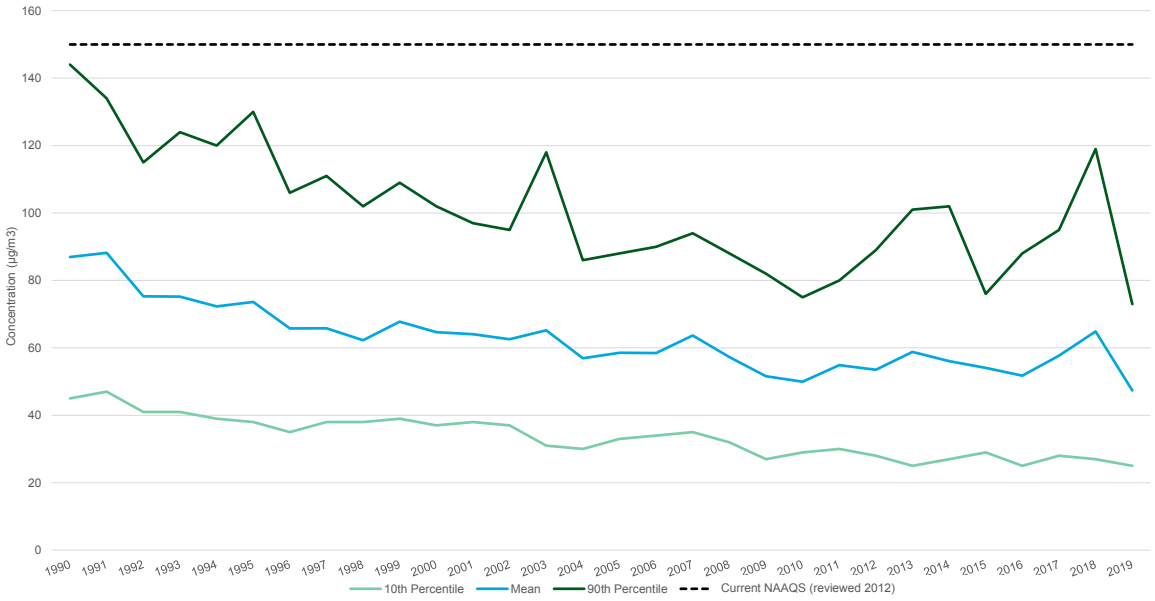


Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "National Annual Emissions Trend, Criteria pollutants National Tier 1 for 1970–2020").

Criteria Air Pollutant Trends | Coarse Particulate Matter

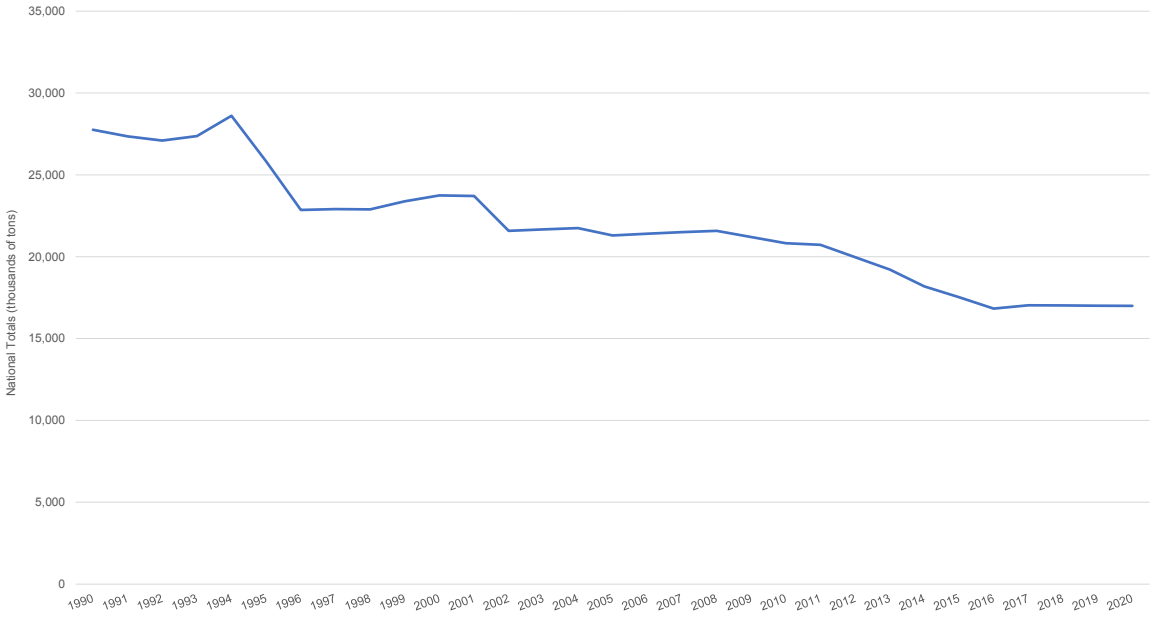
Coarse Particulate Matter (PM_{10}) Air Quality, 1990–2019

(Annual 2nd Maximum 24-Hour Average) Nation Trend Based on 111 Sites



Source: U.S. EPA, **Particulate Matter (PM_{10}) Trends.**

Coarse Particulate Matter (PM_{10}) Emissions 1990–2020

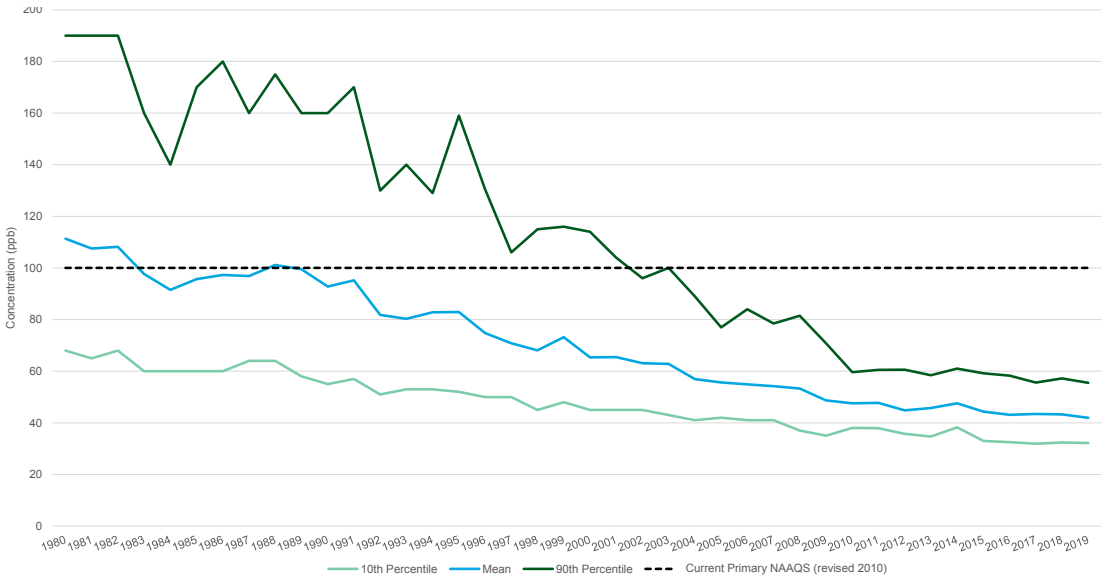


Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "National Annual Emissions Trend, Criteria pollutants National Tier 1 for 1970–2020").

Criteria Air Pollutant Trends | Nitrogen Dioxide

Nitrogen Dioxide (NO_2) Air Quality, 1980–2019

(Annual 98th Percentile of Daily Max 1-hour Average) National Trend based on 21 Sites

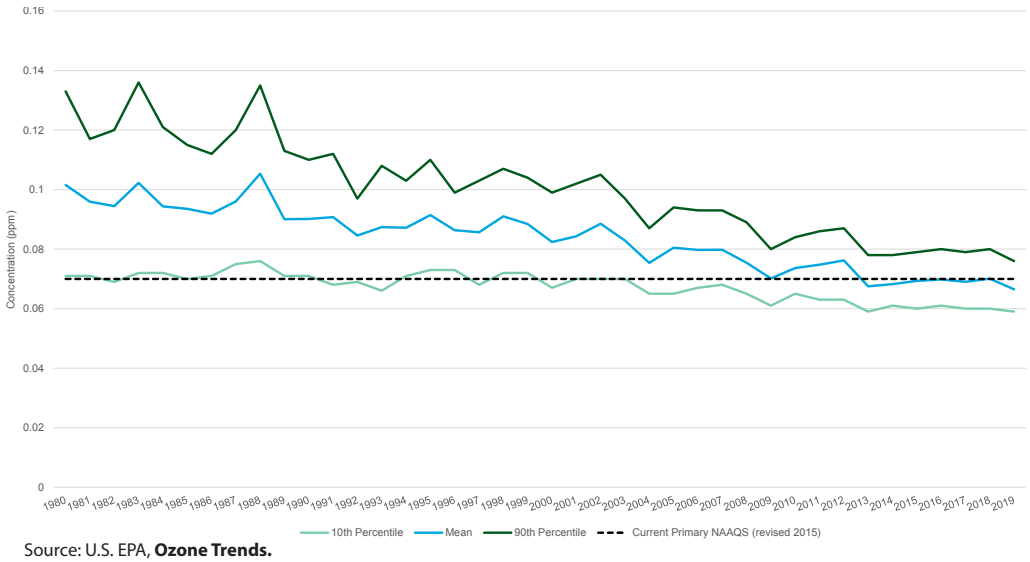


Source: U.S. EPA, **Nitrogen Dioxide Trends**.

Criteria Air Pollutant Trends | Ozone

Ozone Air Quality, 1980–2019

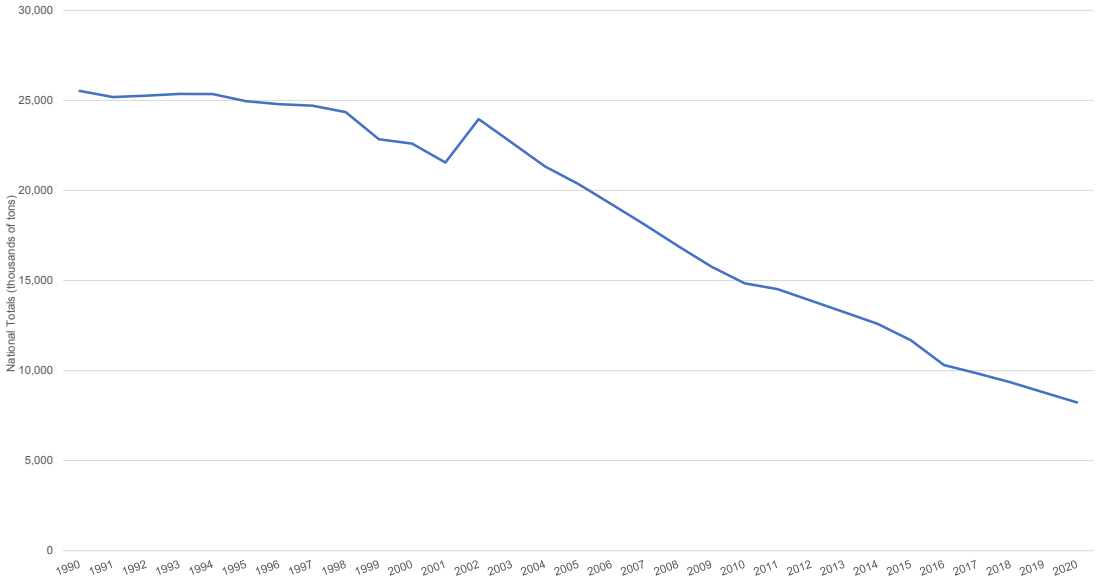
(Annual 4th Maximum Daily Max 8-Hour Average) National Trend based on 193 Sites



Source: U.S. EPA, **Ozone Trends.**

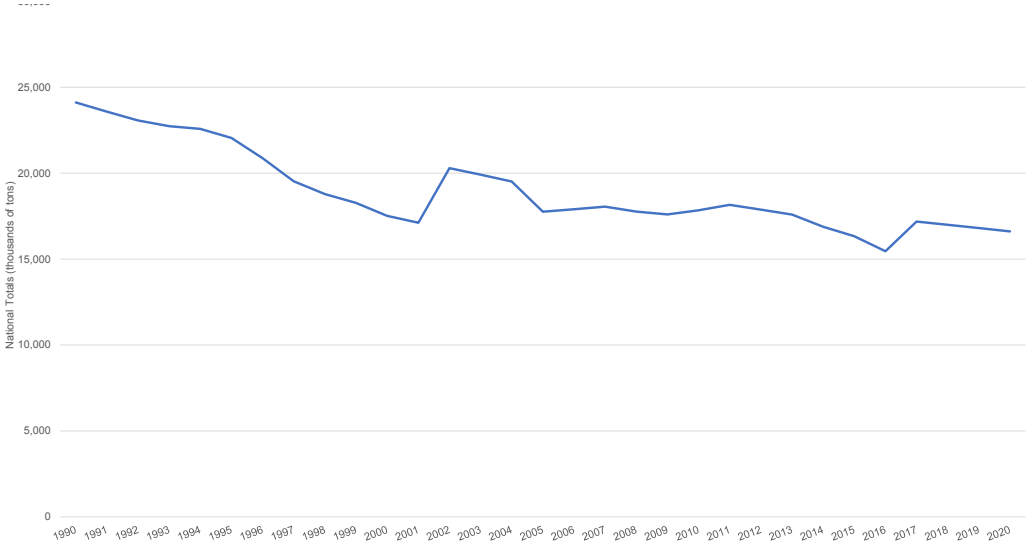
Criteria Air Pollutant Trends | Ozone Precursor Emissions

Oxides of Nitrogen (NO_x) Emissions 1990–2020



Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "National Annual Emissions Trend, Criteria pollutants National Tier 1 for 1970–2020").

Volatile Organic Compound (VOC) Emissions 1990–2020

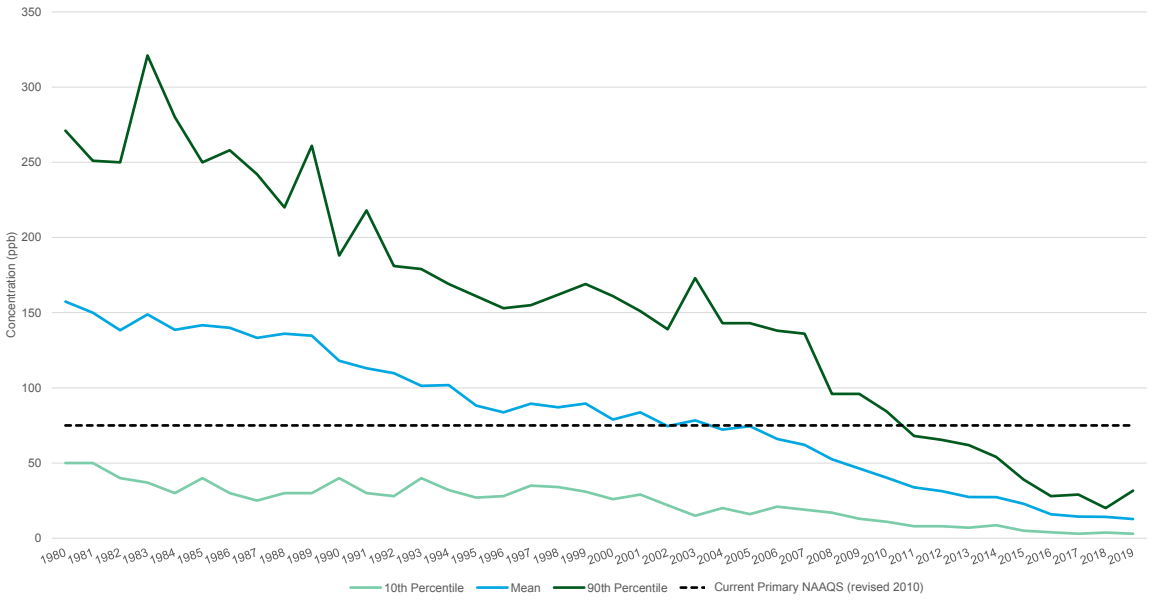


Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "National Annual Emissions Trend, Criteria pollutants National Tier 1 for 1970–2020").

Criteria Air Pollutant Trends | Sulfur Dioxide

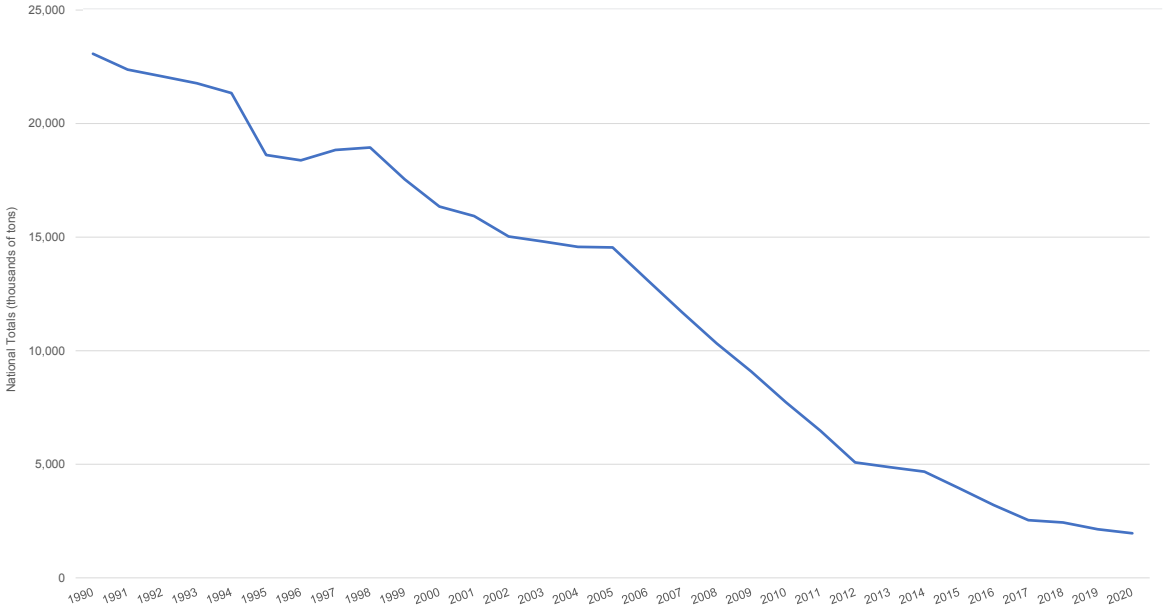
Sulfur Dioxide (SO_2) Air Quality, 1980–2019

(Annual 99th Percentile of Daily Max 1-Hour Average) National Trend based on 35 Sites



Source: U.S. EPA, **Sulfur Dioxide Trends.**

Sulfur Dioxide (SO_2) Emissions 1990–2020

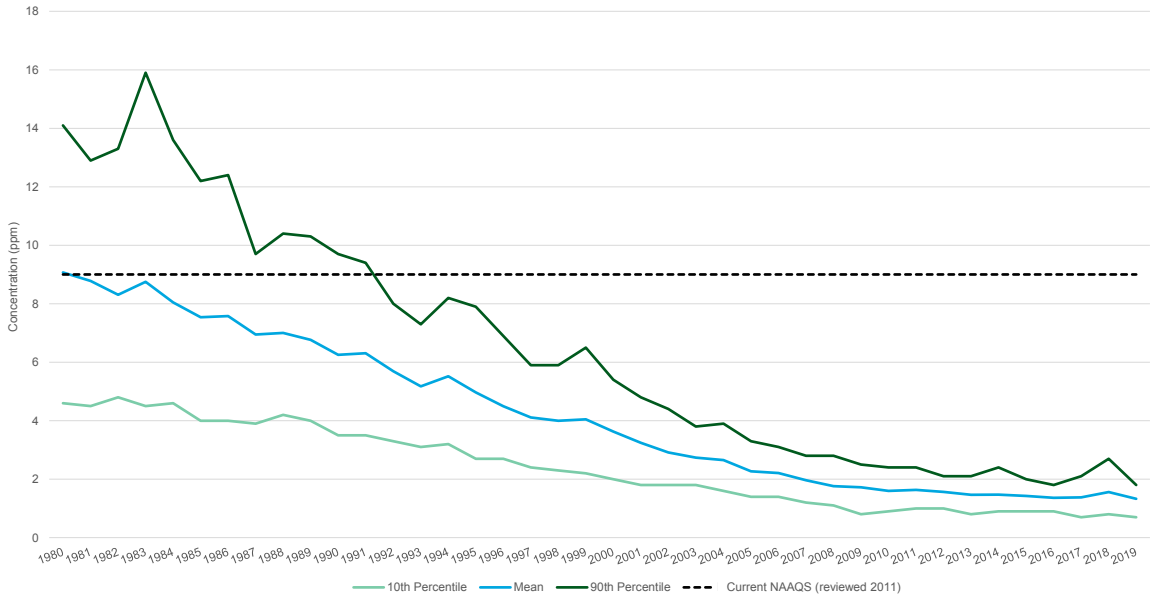


Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "National Annual Emissions Trend, Criteria pollutants National Tier 1 for 1970–2020").

Criteria Air Pollutant Trends | Carbon Monoxide

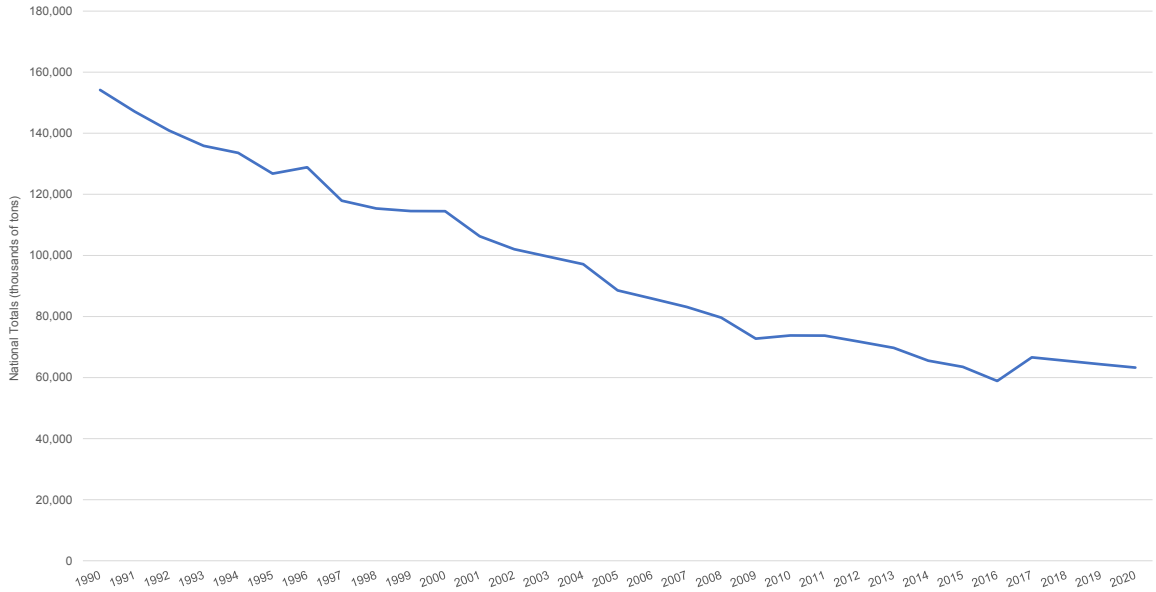
Carbon Monoxide (CO) Air Quality, 1980–2019

(Annual 2nd Maximum 8-hour Average) National Trend based on 41 Sites



Source: U.S. EPA, **Carbon Monoxide Trends.**

Carbon Monoxide (CO) Emissions 1990–2020

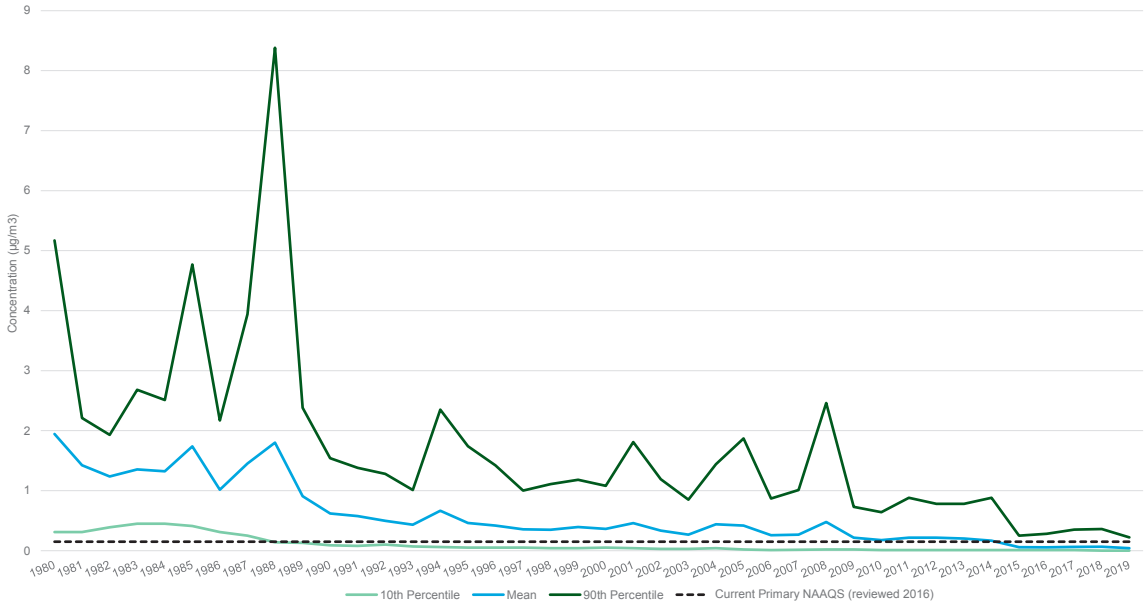


Source: U.S. EPA, **Air Pollutant Emissions Trends** (Data file: "National Annual Emissions Trend, Criteria pollutants National Tier 1 for 1970–2020").

Criteria Air Pollutant Trends | Lead

Lead Air Quality, 1980–2019

(Annual Maximum 3-Month Average) National Trend Based on 7 Sites



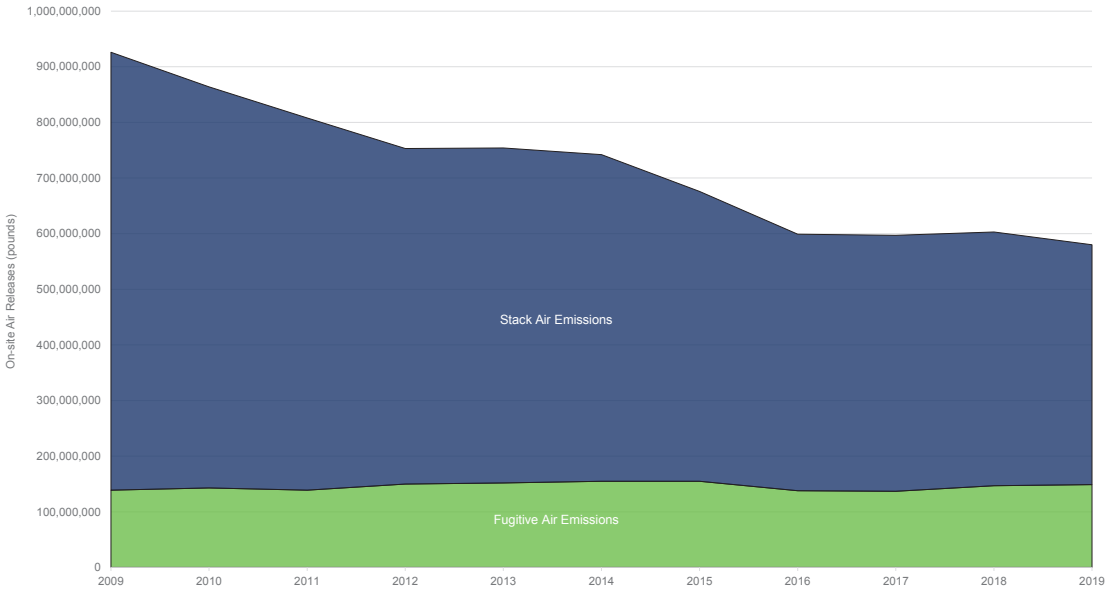
Source: U.S. EPA, **Lead Trends**.

Hazardous Air Pollutants

According to U.S. EPA's *2019 Toxic Release Inventory (TRI) National Analysis*, emissions of hazardous air pollutants, or air toxics, have trended downward over the past decade, including a 4 percent decline from 2018 to 2019. From 2009 to 2019, the Agency's analysis shows that reported toxic air releases have gone from 926 million pounds in 2009 to 580 million pounds in 2019, a 37 percent reduction.[5]

The TRI tracks by point source and fugitive air emissions,[6] which are reported by industry to EPA as required by the Emergency Planning and Community Right-to-Know Act (EPCRA). More than 21,000 facilities reported to the TRI in 2019.

National Toxic Air Releases, 2009–2019

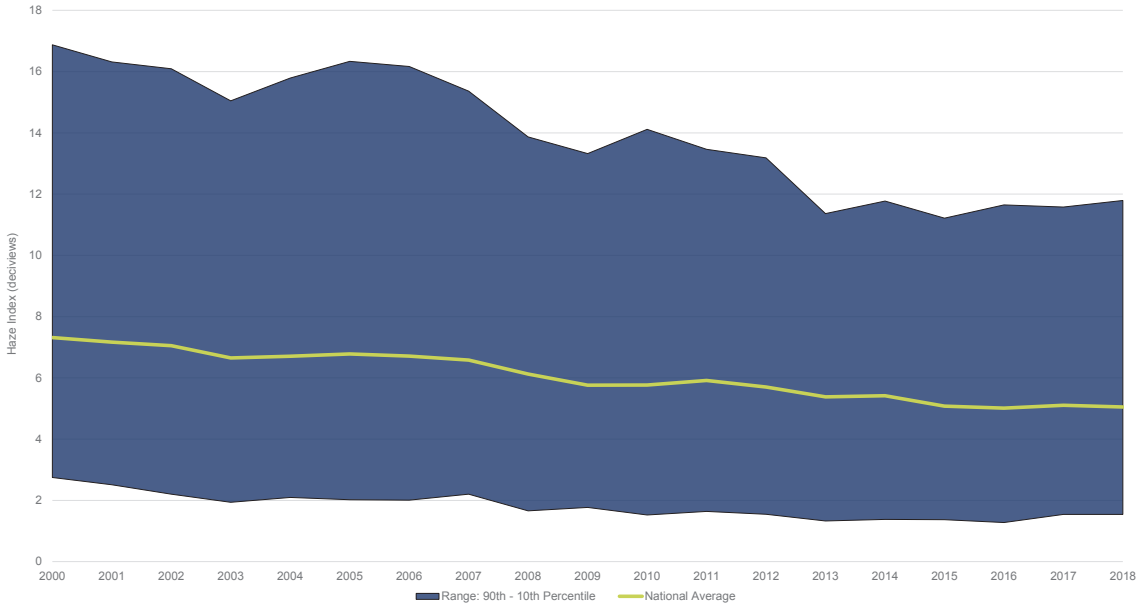


Source: U.S. EPA, ***2019 Toxic Release Inventory National Analysis***, January 2021.

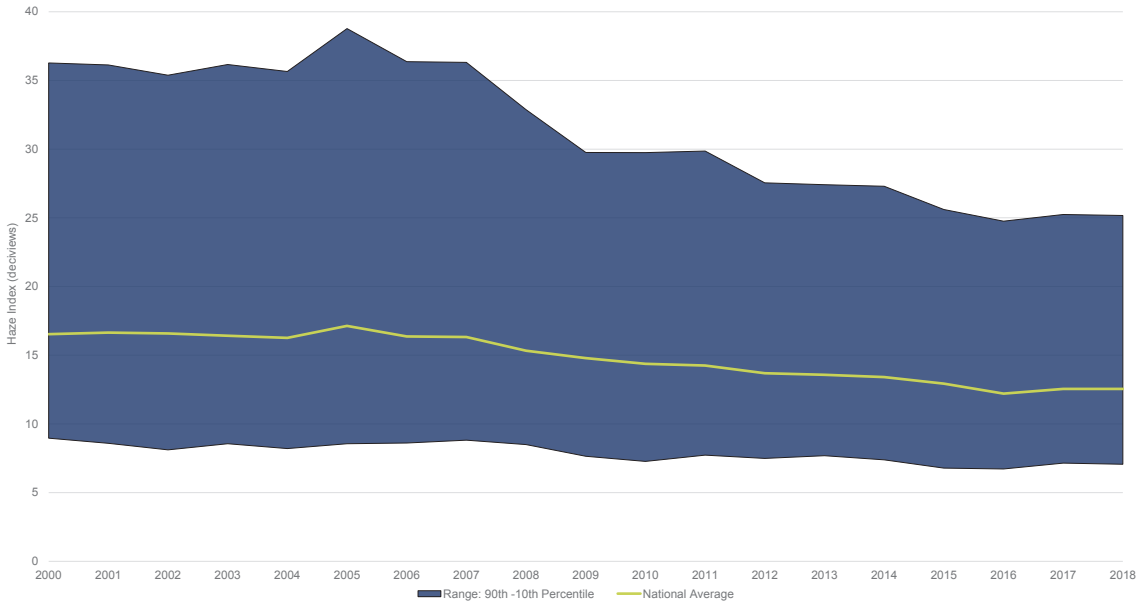
Visibility Improvements

Under the Regional Haze program, state and federal agencies monitor visibility in 156 national parks and wilderness areas, or Class I areas. U.S. EPA's 2020 air trends report provides visibility trends at Class I areas through 2018. Since 2000, visibility on the 20-percent-clearest days has improved by 31 percent, while there has been a 24 percent improvement in visibility during the 20-percent-most-impaired days.[7]

National Visibility Trends on Clearest Days, 2000–2018



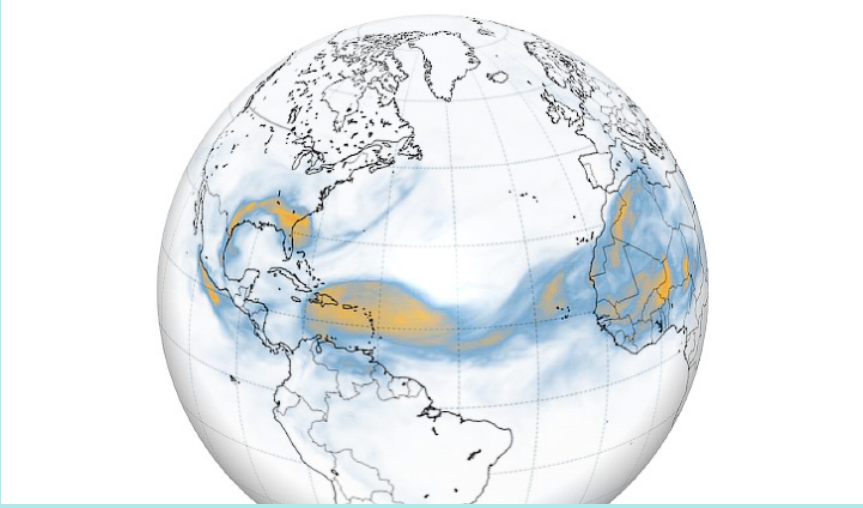
National Visibility Trends on Most Impaired Days, 2000–2018



Source: U.S. EPA, ***Our Nation's Air: EPA Celebrates 50 Years!***, June 2020 (Section: "**Visibility Improves in Scenic Areas**").

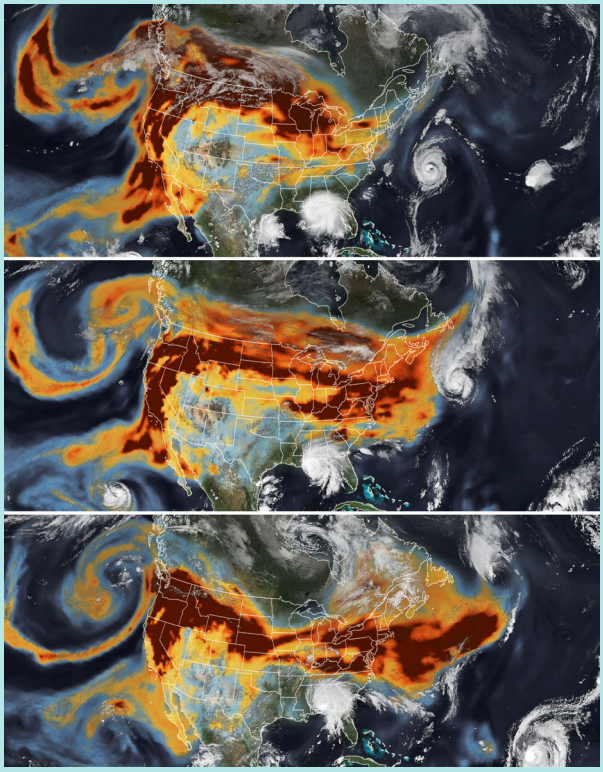
Exceptional Events in 2020: Wildfires, Hurricanes, and Saharan Dust

U.S. EPA defines "exceptional events" as "unusual or naturally occurring events that can affect air quality but are not reasonably controllable using techniques that tribal, state or local air agencies may implement in order to attain and maintain the [NAAQS]. Exceptional events may include wildfires, high wind dust events, prescribed fires, stratospheric ozone intrusions, and volcanic and seismic activities."



Source: NASA Earth Observatory, "**A Dust Plume to Remember**," June 27, 2020.

The National Aeronautics and Space Administration (NASA) Earth Observatory documented two of these-type events in 2020: Saharan dust moving across the Atlantic Ocean into the United States in June (pictured above); and, in September, large wildfires on the western coast that spread smoke to the East Coast (pictured below).

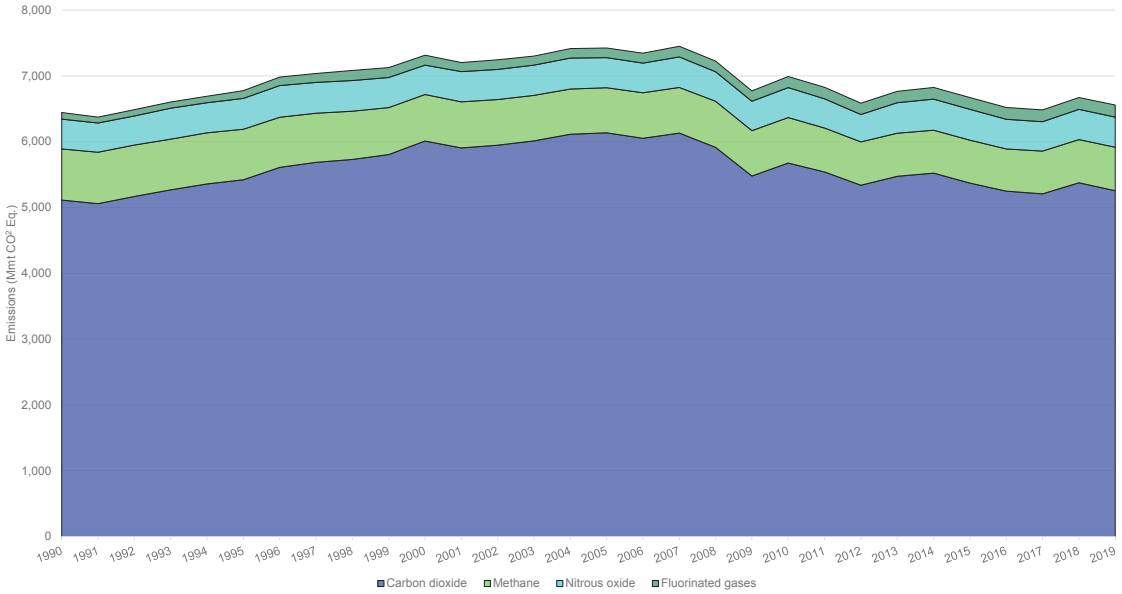


Source: NASA Earth Observatory, "**A Meeting of Smoke and Storms**," September 19, 2020.

Greenhouse Gas Trends

Released in April 2021, U.S. EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019* documents that greenhouse gas emissions in the United States totaled 6,558.3 million metric tons of carbon dioxide equivalents (mmt CO_2 eq.) in 2019, a 1.8 percent increase from 1990 levels. U.S. EPA's report on 2019 data also indicates that "Greenhouse gas emissions in 2019 (after accounting for sequestration from the land sector) were nearly 13 percent below 2005 levels."[8]

U.S. Greenhouse Gas Emissions by Gas 1990–2019

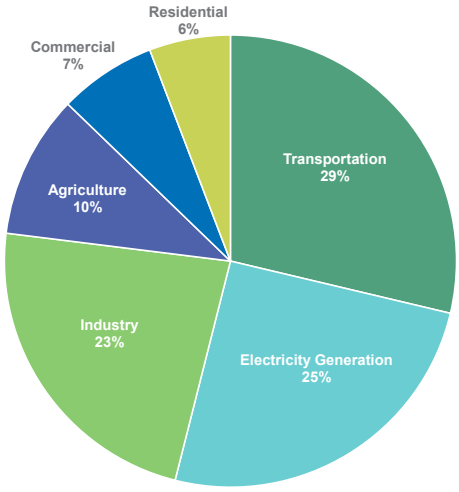


Source: U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019***, April 2021. Also see U.S. EPA's **Greenhouse Gas Inventory Data Explorer.**

U.S. Greenhouse Gas Emissions by Economic Sector, 2019

Greenhouse gas emissions in 2019 were from the following primary economic sectors:

- 29 percent from transportation, up 22.9 percent from 1990;
- 25 percent from electricity generation, down 12.1 percent from 1990;
- 23 percent from industry, a decrease of 8.3 percent since 1990;
- 10 percent from agriculture, an 11.5-percent increase since 1990;
- 7 percent from commercial, up 6.1 percent from 1990; and,
- 6 percent from residential, a 10.0 percent rise from 1990.

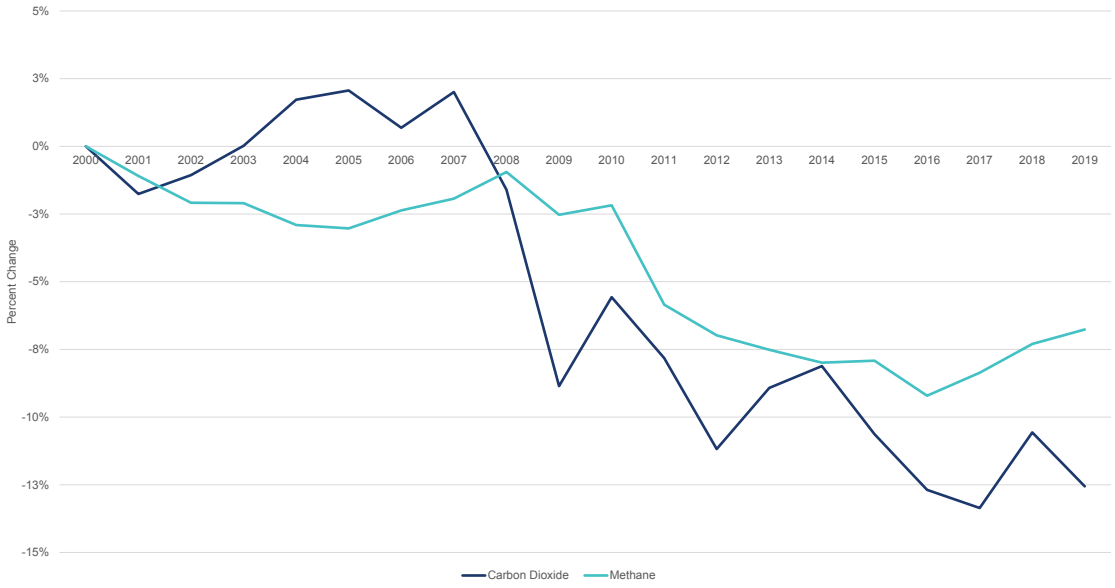


Source: U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019***, April 2021. Also see U.S. EPA's **Greenhouse Gas Inventory Data Explorer.**

Greenhouse Gas Trends

U.S. EPA's *Inventory* analysis also shows that, from 2000 to 2019, the United States has seen a 13 percent decline in the emissions of CO_2 (755 mmt CO_2 eq. reduction) and a 7 percent decline in the emissions of methane (48 mmt CO_2 eq. reduction). [9]

U.S. Emissions of Methane and CO_2 2000–2019

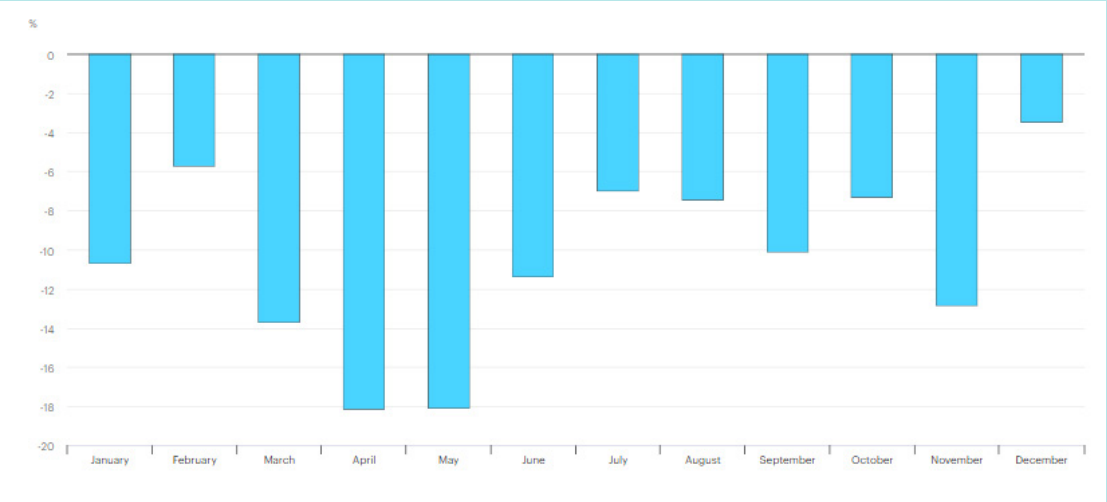


Source: U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019***, April 2021.

U.S. Carbon Dioxide Emissions in 2020

Monthly change in CO_2 emissions in the United States in 2020 relative to 2019

The IEA report, *Global Energy Review: CO_2 Emissions in 2020*, provides monthly changes in CO_2 emissions in 2020, reporting on U.S. CO_2 emissions that "the pandemic led overall annual CO_2 emissions to decline by more than 10%, or almost 500 Mt CO_2."

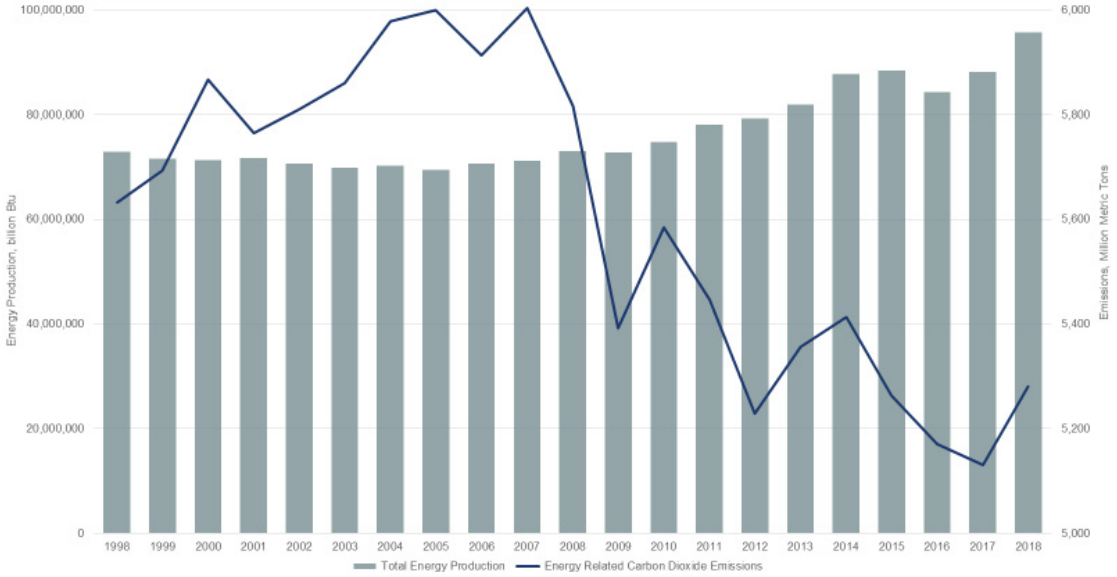


Source: IEA, ***Global Energy Review: CO_2 Emissions in 2020***, March 2, 2021.

Greenhouse Gas Trends | Energy-Related Carbon Dioxide Emissions

From 1998 through 2018, the United States reduced energy-related CO_2 emissions nearly 10 percent while experiencing a 34-percent increase in total energy production, according to recent data from the U.S. Energy Information Administration, or EIA.[10] U.S. energy-related CO_2 emissions went from 5,867 million metric tons in 1998 to 5,281 million metric tons in 2018 over the two-decade period.[11]

United States: Total Energy Production Compare to Energy-Related CO_2 Emissions 1998–2018



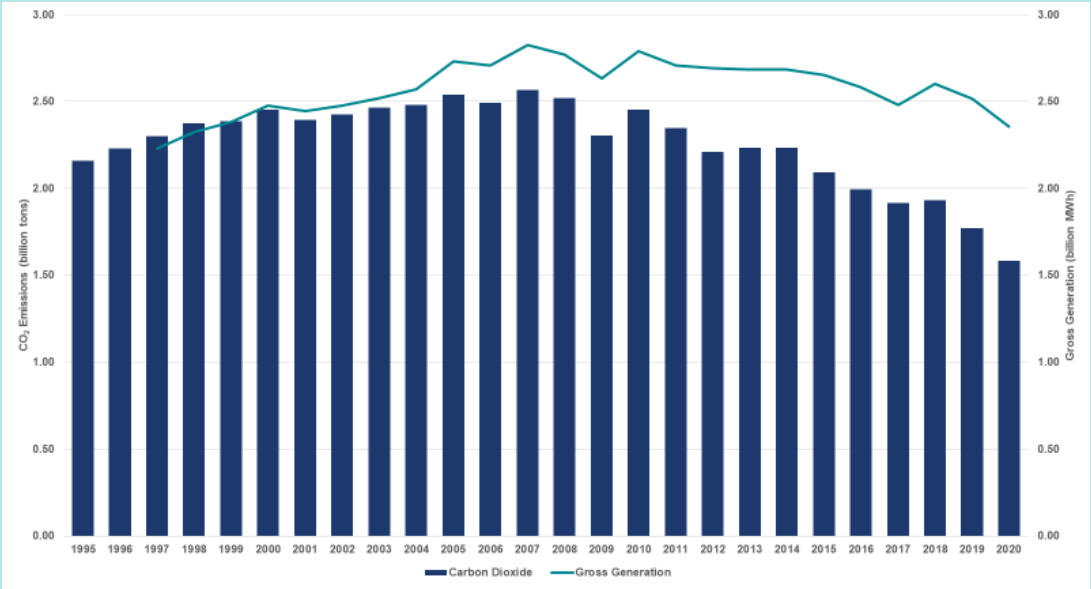
Sources: U.S. EIA, ***Annual Energy Outlook 2021***, February 3, 2021 (Section: "Emissions"); U.S. EIA, **State Energy Data System (SEDS): 1960–2017**.

Power Plant Emissions Trends

Annual CO_2 Emissions, 1995–2020

U.S. EPA's annual progress report on emissions from the power sector documents that CO_2 emissions from electricity generation declined more than 30 percent from 1997 to 2020, during which time gross generation grew nearly 6 percent.

Source: U.S. EPA, **Power Plant Emission Trends**, February 2021.



Section Notes | Air Quality Trends in the United States

[1] U.S. EPA, **Air Quality—National Summary: Air Quality Trends** (updated November 23, 2020).

[2] U.S. EPA, **Air Quality—National Summary: Emissions Trends** (updated November 23, 2020). Note: "EPA estimates nationwide emissions of ambient air pollutants and the pollutants they are formed from (their precursors). These estimates are based on actual monitored readings or engineering calculations of the amounts and types of pollutants emitted by vehicles, factories, and other sources. Emission estimates are based on many factors, including levels of industrial activity, technological developments, fuel consumption, vehicle miles traveled, and other activities that cause air pollution."

[3] U.S. EPA, **Air Quality—National Summary: Emissions Trends** (updated November 23, 2020)."

[4] U.S. EPA, **Air Pollutant Emissions Trends Data** (Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970–2019").

[5] U.S. EPA, ***2019 Toxic Release Inventory (TRI) National Analysis***, January 2021. Note: EPA tracks 187 hazardous air pollutants in the Toxic Release Inventory.

[6] **According to U.S. EPA**: "Fugitive air emissions are all releases to air that don't occur through a confined air stream, such as equipment leaks, releases from building ventilation systems and evaporative losses from surface impoundments and spills. Point source air emissions, also called stack emissions, are releases to air that occur through confined air streams, such as stacks, ducts or pipes."

[7] U.S. EPA, ***Our Nation's Air: EPA Celebrates 50 Years!***, June 2020 (Section: "Visibility Improves in Scenic Areas"). A full listing of Class I Areas under U.S. EPA's Regional Haze program can be found **here**.

[8] U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019***, April 2021. U.S. EPA's Inventory "provides a comprehensive accounting of total greenhouse gas emissions for all man-made sources in the United States."

[9] U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019***, April 2021.

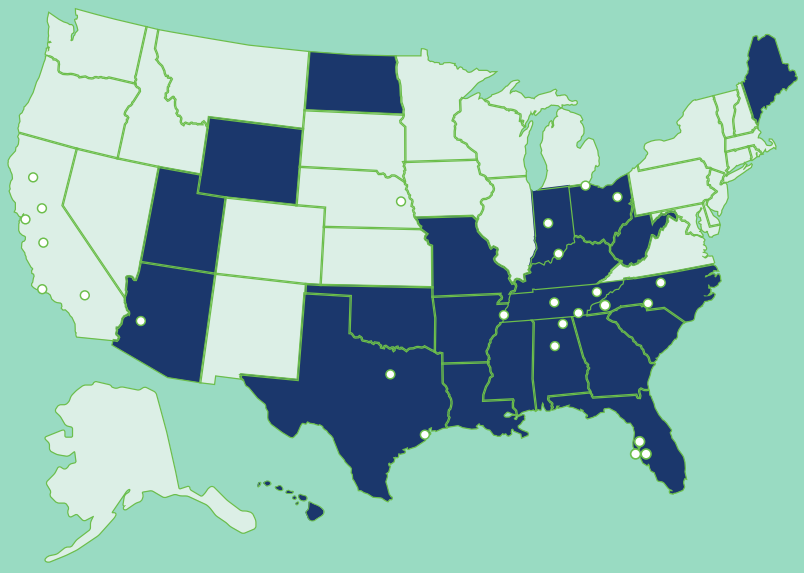
[10] U.S. EIA, **State Energy Data System (SEDS): 1960–2017**.

[11] U.S. Energy Information Administration, ***Annual Energy Outlook 2021***, February 3, 2021 (Section: "Emissions"). Includes the following sectors: transportation, industrial, electric power, residential, and commercial.

Other Air Quality Resources

AAPCA
THE ASSOCIATION OF AIR POLLUTION CONTROL AGENCIES

If you are interested in finding out more about air quality in your area, state and local air agencies are an outstanding resource. Below are links to AAPCA Member Agencies:



AAPCA STATE AGENCIES

- Alabama Department of Environmental Management
- Arizona Department of Environmental Quality
- Arkansas Department of Environmental Quality
- Florida Department of Environmental Protection
- Georgia Environmental Protection Division
- Hawaii Department of Health
- Indiana Department of Environmental Management
- Kentucky Department for Environmental Protection
- Louisiana Department of Environmental Quality
- Maine Department of Environmental Protection
- Mississippi Department of Environmental Quality
- Missouri Department of Natural Resources
- North Carolina Department of Environmental Quality
- North Dakota Department of Environmental Quality
- Ohio Environmental Protection Agency
- Oklahoma Department of Environmental Quality
- South Carolina Department of Health and Environmental Control
- Tennessee Department of Environment & Conservation
- Texas Commission on Environmental Quality
- Utah Department of Environmental Quality
- West Virginia Department of Environmental Protection
- Wyoming Department of Environmental Quality

AAPCA LOCAL AGENCIES

- Butte County Air Quality Management District (California)
- Canton City Health Department (Ohio)
- Chattanooga-Hamilton County Air Pollution Control Tennessee)
- El Dorado County Air Quality Management District (California)
- Forsyth County Office of Environmental Assistance and Protection (North Carolina)
- Fort Worth Environmental Management Department (Texas)
- Environmental Protection Commission of Hillsborough County (Florida)
- Galveston County Health District (Texas)
- Huntsville Division of Natural Resources and Environmental Management (Alabama)
- City of Indianapolis (Indiana)
- Jefferson County Department of Health (Alabama)
- Knox County Air Quality Management Division (Tennessee)
- Louisville Metro Air Pollution Control District (Kentucky)
- Manatee County Environmental Management Department (Florida)
- Maricopa Air Quality Department (Arizona)
- Mecklenburg County Air Quality (North Carolina)
- Mojave Desert Air Quality Management District (California)
- Nashville/Davidson Metro Public Health Department (Tennessee)
- Omaha Air Quality Control (Nebraska)
- Pinellas County Air Quality (Florida)
- San Joaquin Valley Air Pollution Control District (California)
- Shelby County Health Department (Tennessee)
- Toledo Division of Environmental Services (Ohio)
- Ventura County Air Pollution Control District (California)
- Western North Carolina Regional Air Quality Agency (North Carolina)
- Yolo-Solano Air Quality Management District (California)

ADDITIONAL AIR QUALITY RESOURCES

- U.S. EPA's Air Quality Trends website
- U.S. EPA's Nonattainment Areas for Criteria Pollutants (Green Book)
- U.S. EPA's Report on the Environment (ROE) website
- U.S. EPA's Air Quality Index (AQI)
- U.S. EPA Power Plant Emissions Trends
- Environmental Council of States' ECOS Results
- Western Regional Air Partnership's (WRAP) Regional Haze Storyboard