The Greatest Story Seldom Told

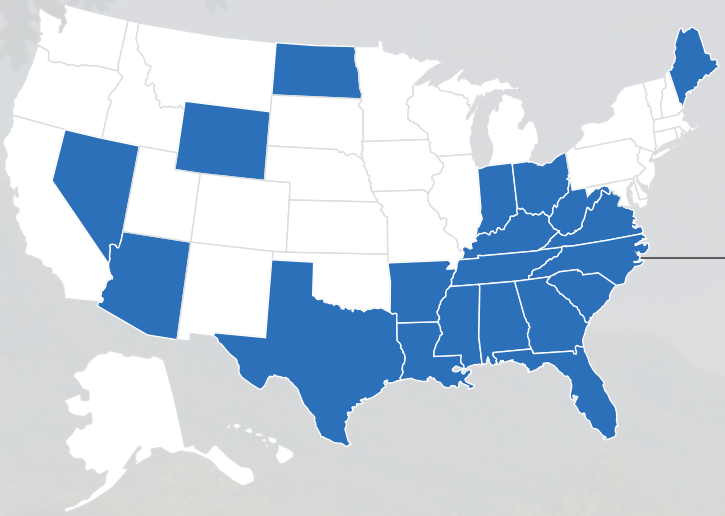
Profiles and Success Stories in Air Pollution Control

Association of Air Pollution Control Agencies

July 2018

The Association of Air Pollution Control Agencies (AAPCA) is a 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. AAPCA members work collaboratively on behalf of states and the communities they protect to act as a conduit for and provide feedback to federal regulators on air quality rules that have significant impacts across the entire nation. AAPCA represents more than 40 state and local air agencies, and senior officials from 20 state environmental agencies currently sit on the AAPCA Board of Directors. AAPCA is housed in Lexington, Kentucky as an affiliated association of The Council of State Governments (CSG). More information about AAPCA may be found by visiting **http://www.cleanairact.org.**

State Environmental Agencies Currently Represented on the AAPCA Board of Directors



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

Footprint of AAPCA State Members

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

- An estimated 143 million Americans, nearly 45 percent of the **total U.S. population**;
- An **average population growth** from 2000 – 2017 of approximately 22 percent, compared to national population growth of 15.7 percent;
- Nearly 40 percent of **U.S. Gross Domestic Product**;
- 45 percent of **U.S. Total Manufacturing Output** and over five million manufacturing jobs;
- 60 percent of **total energy production** in the United States, including:
  - 55 percent of **total net electricity generation**;
  - 77 percent of **coal production**;
  - 67 percent of **crude oil production**;
  - 56 percent of **natural gas production**;
  - 37 percent of **wind generation**; and,
  - 33 percent of **solar generation**;
- More than 60 percent of **U.S. operable petroleum refining capacity**;
- Nearly 50 percent of **Highway Vehicle-Miles Traveled**; and,
- Seven of the top ten states for number of establishments related to **automotive production**, and more than 45 percent of direct U.S. automotive manufacturing jobs.

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Foreword

Dear Readers,

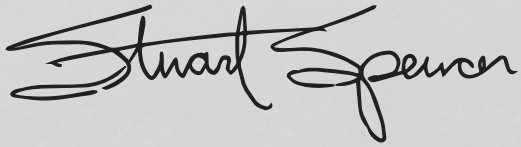
What greater natural resource do we have than our clean air? In the United States, we are blessed to enjoy landscapes replete with scenic vistas, sandy beaches, vast plains, grasslands, deserts, and majestic mountain ranges. Our experiences and the memories we make in those locations are made more enjoyable when we have clean air. We are also a nation built on a vibrant economy driven by technological innovation and determination, traits exemplified by the successes we've had in growing our job-creating industries. Importantly, we've achieved and sustained this economic growth while realizing air quality improvements throughout the country.

I'm honored to serve as current President for the Association of Air Pollution Control Agencies (AAPCA), and excited to present to you the 2018 edition of *The Greatest Story Seldom Told: Profiles and Success Stories in Air Pollution Control*, which details air quality trends in our member states' footprint and nationwide. AAPCA is a consensus-driven organization of 45 state and local air agencies focused on assisting members and their personnel with implementation of technical issues associated with the federal Clean Air Act. The AAPCA board of directors is made up of the Air Directors from our 20 geographically diverse Member States' environmental protection agencies. Despite the miles between state borders, we have common goals and missions. At the Arkansas Department of Environmental Quality, the Office of Air Quality strives to protect air quality to enhance the lives and health of all Arkansans and visitors to the State, while fostering responsible economic expansion opportunities. I know my fellow Air Directors strive for similar outcomes in each of their states.

AAPCA Member States lead the way in a number of air quality indicators. Perhaps most impressively, from 1990 to 2017, AACPA Member States realized a 56-percent reduction in the combined emissions of the six criteria air pollutants for which there are national ambient air quality standards. In this report, you will find additional information that demonstrates the leadership AAPCA Member States have taken in improving air quality over the last several decades. Examples of successes include:

- Ozone Precursor Emissions Trends: AAPCA Member States reduced emissions of nitrogen oxides (NO_x) from over 12.6 million tons in 1997 to less than 5.4 million tons in 2017 – nearly 60 percent. Over the same period, volatile organic compounds emissions in AAPCA Member States went down 14 percent, from over 9,000 tons to around 7,700 tons.
- Electricity Sector Emissions Reductions: From 1996 to 2015, sulfur dioxide emissions from the electricity sector in AAPCA Member States were reduced 84 percent, from 8,301,000 tons to 1,324,000 tons. Similarly, NO_x emissions from the electricity sector went from 3,983,000 tons in 1996 to 803,000 tons in 2015, a decrease of nearly 80 percent.
- Toxic Air Releases Trends: U.S. EPA's *2016 Toxic Release Inventory National Analysis* revealed a 58-percent reduction in reported toxic air releases nationally, with AAPCA Member States accounting for more than 551-million pounds of the 829-million-pound reduction that was documented, or more than 66 percent of the national total.

As Air Directors, we acknowledge our work is not over. AAPCA Member States continue to engage with the U.S. EPA and our stakeholders to realize the best outcomes for air quality. With each passing year, we will continue to highlight the results of our efforts. The story of our continued progress tells itself, and we are proud to share it with you.



Stuart Spencer
Associate Director, Arkansas Department of Environmental Quality
President, AAPCA

Introduction: Telling the Story of Air Quality in the United States

State and local air agencies, responsible for implementing regulations and standards under the federal Clean Air Act, have been at the forefront of the significant progress in air quality that has been achieved over the past several decades. This progress has been driven by complex planning and regulatory decisions that are made by agencies informed through direct connections with the communities they serve. Sensible, localized strategies that address air pollution and respond to unique social and economic factors are developed through agency leadership and active public participation.

This yearly report, first published by the Association of Air Pollution Control Agencies (AAPCA) in April 2017, highlights key air quality metrics and trends using publicly available data from the U.S. Environmental Protection Agency (EPA) and similar agencies. These trends range from concentrations of criteria air pollutants and visibility progress in national parks to permitting and compliance and enforcement statistics. Where applicable, this report also presents the trend lines of economic and social indicators that provide important context for air quality nationally – and which are often in sharp contrast to the trend lines of air pollutants.

Air Quality Progress: A Story Seldom Told

The **inaugural edition** of *The Greatest Story Seldom Told: Profiles and Success Stories in Air Pollution Control* categorized the story of air quality progress into three major sections. The first section detailed the critical areas where the 20 states who serve on the AAPCA Board of Directors have provided leadership; the second contextualized United States air quality success in terms of exceeding international progress; and, the final section catalogued a broad range of national air quality trends. In two parts, the 2018 version of The Greatest Story Seldom Told builds on the indicators and long-term trends that were presented last year.

This year's report first looks at the continued leadership of AAPCA Member States. The state members of AAPCA have substantially improved air quality in their jurisdictions, often outperforming national metrics, while experiencing above-average population and economic growth. AAPCA Member States are also significant contributors to several important economic sectors, including energy production and manufacturing.

The second part of this report catalogues a broad range of trends and metrics that characterize air quality nationally. Updated data and analyses continue to show positive momentum in reducing air pollution, including in the concentrations and emissions of criteria air pollutants, air releases of toxic chemicals, and greenhouse gases. As with AAPCA Member States, these national reductions trace very different trend lines from those reflecting sustained growth in U.S. Gross Domestic Product, population, and energy consumption.

Communicating Air Quality

Understanding the leadership position of state and local air agencies in prioritizing environmental concerns – and planning for solutions – underscores their unique position in communicating with the public about air quality. With expert personnel that can interpret up-to-date air quality data and have experience interfacing with the public, these agencies are able to provide accurate, responsive information to the communities they serve.

The 2018 edition of *The Greatest Story Seldom Told: Profiles and Success Stories in Air Pollution Control* highlights the remarkable progress that has been made in air quality and seeks to be a complement to agency work. With stable, adequate resources, state and local air agencies can continue to perform the vital role provided by the Clean Air Act's framework of cooperative federalism – and provide another chapter in the story of air pollution control.

Types of Air Quality Data and Metrics

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. The Clean Air Act directs the U.S. Environmental Protection Agency (EPA) to establish national ambient air quality standards (NAAQS) for air pollutants 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."[1] NAAQS have been set for six "criteria" pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), ground-level ozone (O_3), fine particulate matter ($PM_{2.5}$), lead (Pb), and nitrogen dioxide (NO_2).[2]

Section 109 of the Clean Air Act requires EPA to establish both primary and secondary NAAQS. Primary NAAQS are "standards the attainment and maintenance of which ... 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."[3] U.S. EPA and the Clean Air Scientific Advisory Committee review the adequacy of the NAAQS according to the statute. Individual NAAQS may have a different form (for example, annual fourth-highest daily maximum 8-hour concentration average over three years, for ozone), level (often measured in parts per billion or micrograms per cubic meter), and averaging time (from one hour up to one year).

Nationally, ambient air pollution data from thousands of monitors across the United States is collected by U.S. EPA, state, local, and tribal air pollution control agencies and provided to the Air Quality System. These data are used to "assess air quality, assist in Attainment/Non-Attainment designations, evaluate State Implementation Plans for Non-Attainment Areas, perform modeling for permit review analysis, and other air quality management functions. Air Quality System information is also used to prepare reports for Congress as mandated by the Clean Air Act."[4]

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 were used for this report when looking at criteria air pollutants include:

- For criteria air pollutant concentrations in ambient air, data are pulled from EPA's analysis of the Air Quality System that looks at long-term trends in air quality.[5]
- Data showing emissions trends of the criteria pollutants are pulled from U.S. EPA's Air Pollutant Emissions Trends Data,[6] which includes "all criteria pollutants National Tier 1" and 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] by State, Local, and Tribal air agencies for sources in their jurisdictions and supplemented by data developed by the US EPA."[7]
- Design values, which U.S. EPA defines 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."[8]

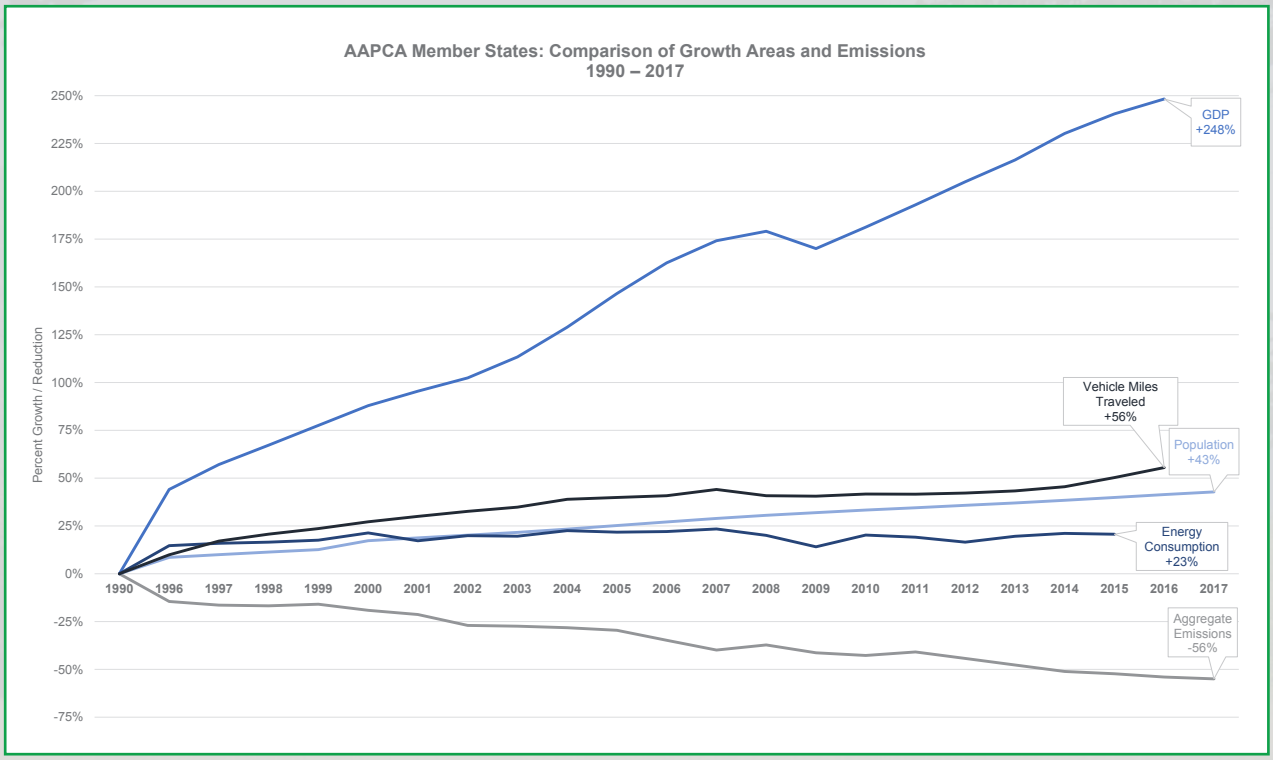
This report also includes data for hazardous air pollutants, visibility progress in national parks, wilderness areas and greenhouse gases. For hazardous air pollutants, the Toxic Release Inventory[9] provides a consistent trend over time that is shown here in conjunction with air toxics analysis from U.S. EPA's *2014 Report on the Environment*.[10] Greenhouse gas data is pulled primarily from U.S. EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks*[11] and the U.S. Energy Information Administration's (EIA) report *Energy-Related Carbon Dioxide Emissions at the State Level, 2000-2015*.[12]

[1] 42 U.S.C. §7409(b)(1)
[2] A chart of the primary and secondary NAAQS by pollutant can be found **here**.
[3] 42 U.S.C. §7409
[4] 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."
[5] Links to data summary files can be found **here**.
[6] Data can be found **here**. EPA notes: "The latest version of the 1970 – 2017 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."
[7] More information on the NEI can be found **here**. Version 2 released February 2018.
[8] U.S. EPA, **Air Quality Design Values**.
[9] U.S. EPA, ***2016 Toxic Release Inventory National Analysis***, April 2018.
[10] U.S. EPA, EPA's Report on the Environment (ROE). Last updated July 2017.
[11] U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016***, May 2018.
[12] U.S. EIA, ***Energy-Related Carbon Dioxide Emissions at the State Level, 2000-2015***, January 22, 2018.

AAPCA Member States: Growth Indicators and Emissions Reductions

From 1990 to 2017, AAPCA Member States oversaw a 56-percent reduction in the combined emissions of the six criteria air pollutants for which there are national ambient air quality standards (NAAQS).[1] Over the same period, AAPCA Member States as a whole experienced the following growth in economic and social indicators:

- Through 2016, a 248-percent increase in Gross Domestic Product (GDP), including accounting for nearly 40 percent of total U.S. GDP in 2017;[2]
- An approximately 56-percent increase in vehicle miles traveled through 2016;[3]
- A 43-percent increase in population,[4] representing an estimated 45 percent of the total U.S. population in 2017;[5] and,
- A 23-percent increase in energy consumption from 1990 to 2015, while producing 60 percent of total U.S. energy in 2015.[6]



Sources: U.S. Bureau of Economic Analysis, data available **here**; U.S. Office of Highway Policy Information, data available **here**; U.S. Census Bureau, data available **here**; U.S. EIA, **State Energy Data System (SEDS): 1960-2015**; U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "State Average Annual Emissions Trend."

> "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

Ozone

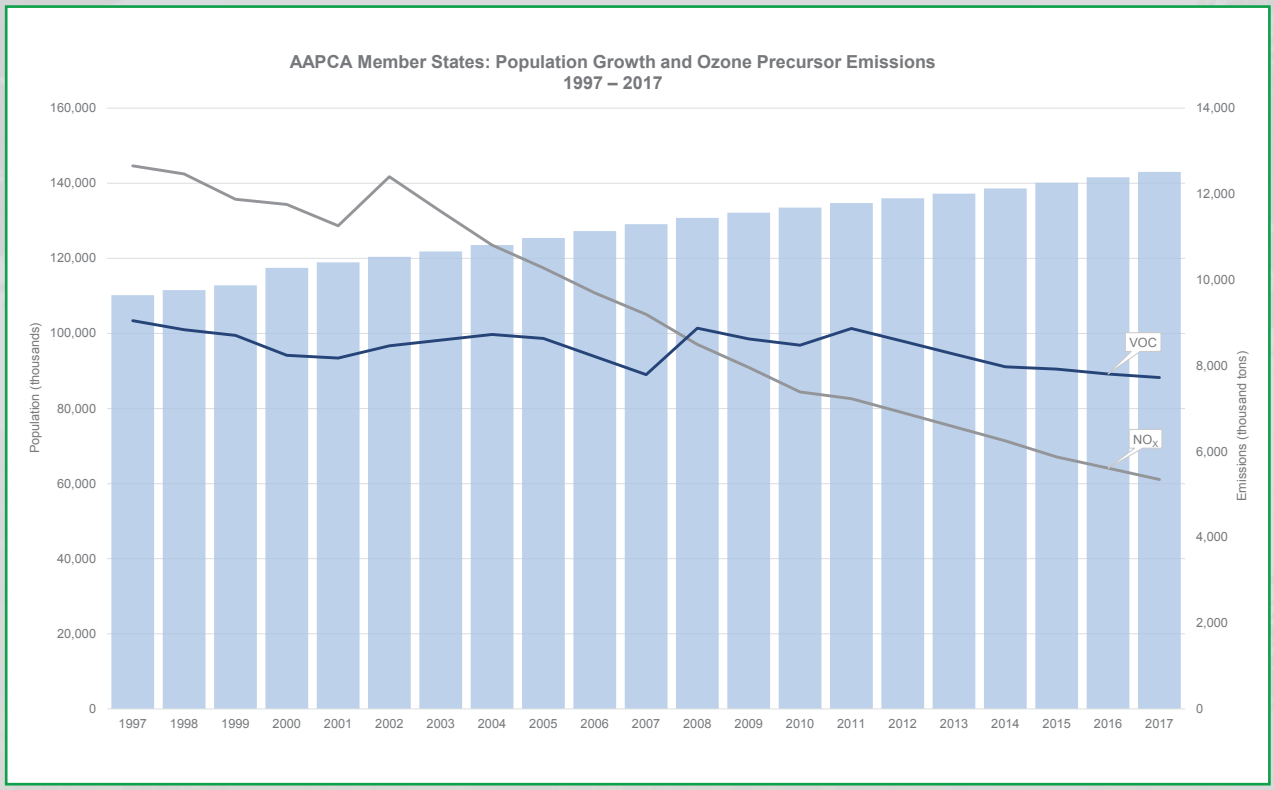
According to U.S. EPA's online *Green Book*, there were 46 areas in the United States designated nonattainment or maintenance[7] for the 2008 8-hour ozone national ambient air quality standard (NAAQS) of 0.075 parts per million (ppm).[8] Design values based on monitoring data from U.S. EPA's Air Quality System show that the 14 designated areas located within AAPCA Member States averaged a nearly 18-percent reduction in ambient concentrations of ozone from 2005 to 2016.[9] The table below shows percent reductions in design values for areas previously designated nonattainment in AAPCA Member States over this period.

Designated Area	Percent Change
Atlanta, GA	-21.05%
Baton Rouge, LA	-20.22%
Charlotte-Rock Hill, NC-SC	-24.73%
Chicago-Naperville, IL-IN-WI	-9.41%
Cincinnati, OH-KY-IN	-18.18%
Cleveland-Akron-Lorain, OH	-16.67%
Columbus, OH	-18.39%
Dallas-Fort Worth, TX	-15.79%
Houston-Galveston-Brazoria, TX	-17.71%
Knoxville, TN	-23.86%
Memphis, TN-MS-AR	-24.72%
Phoenix-Mesa, AZ	-7.23%
Upper Green River Basin Area, WY	-10.00%
Washington, DC-MD-VA	-20.88%

Source: U.S. EPA, **Air Quality Design Values**. Data file: "Ozone Design Values, 2016."

Ozone Precursor Emissions

Over the past two decades, the population in AAPCA Member States has grown nearly 30 percent, from 110,184,675 people in 1997 to 143,030,023 in 2017.[10] At the same time, emissions of nitrogen oxides (NO_X) and volatile organic compounds (VOC), precursors for ground-level ozone, decreased.[11] Emissions of NO_X fell nearly 60 percent, from over 12.6 million tons in 1997 to less than 5.4 million tons in 2017. Similarly, VOC emissions in AAPCA Member States went from over 9,000 tons to around 7,700 tons, a reduction of approximately 14 percent over the same period.[12]



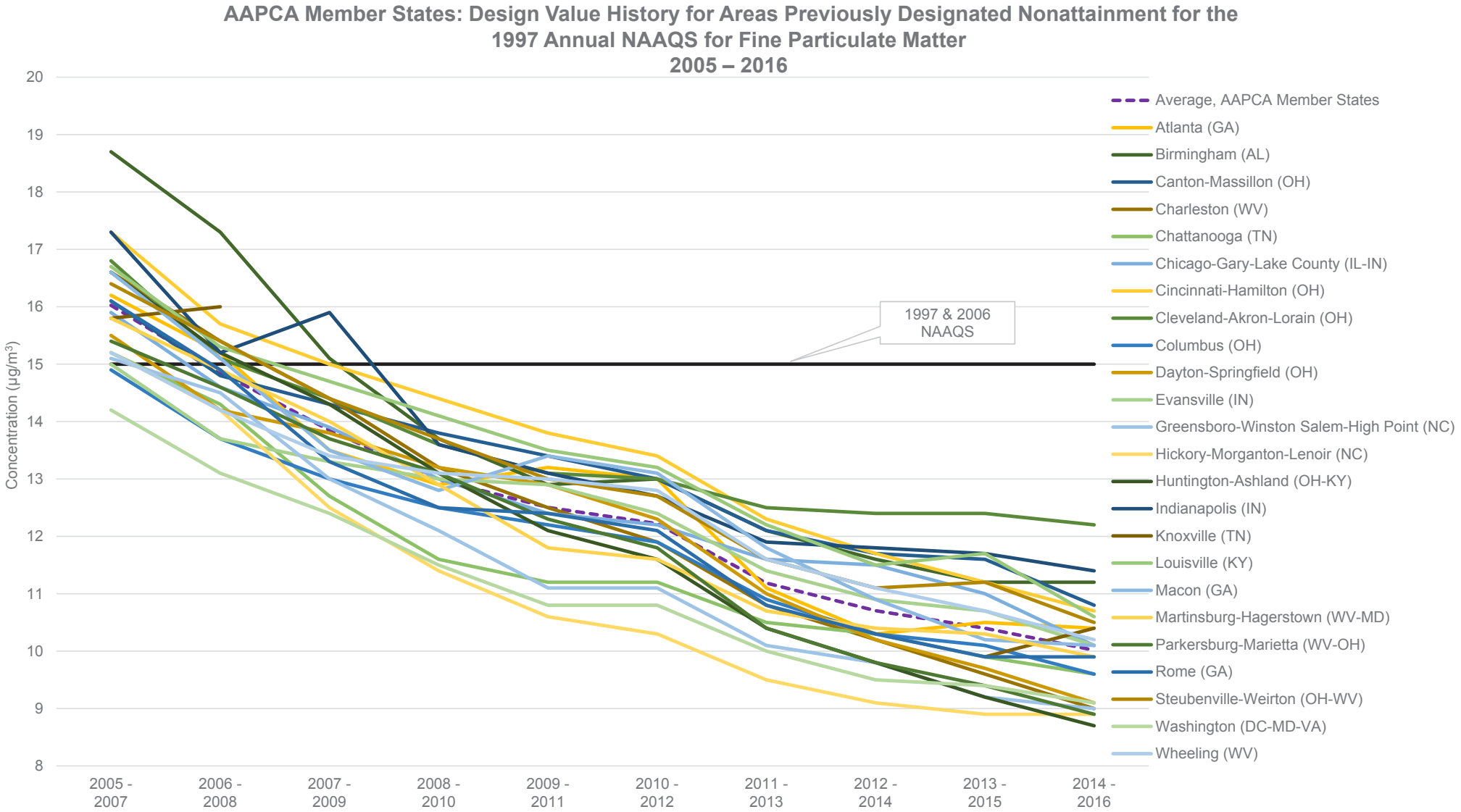
Sources: U.S. Census Bureau, data available **here**; U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "State Average Annual Emissions Trend."

Fine Particulate Matter

U.S. EPA's *Green Book* indicates that there were 39 locations in the United States designated non-attainment for the 1997 fine particulate matter ($PM_{2.5}$) NAAQS of 15 micrograms per cubic meter ($\mu g/m^3$), as measured by the three-year average annual mean concentration.[13] From 2005 to 2016, design values for the 24 designated areas in AAPCA Member States show an average 38-percent reduction in fine particulate matter concentrations.[14] The table below shows percent reductions in design values for areas previously designated nonattainment in AAPCA Member States over this period.

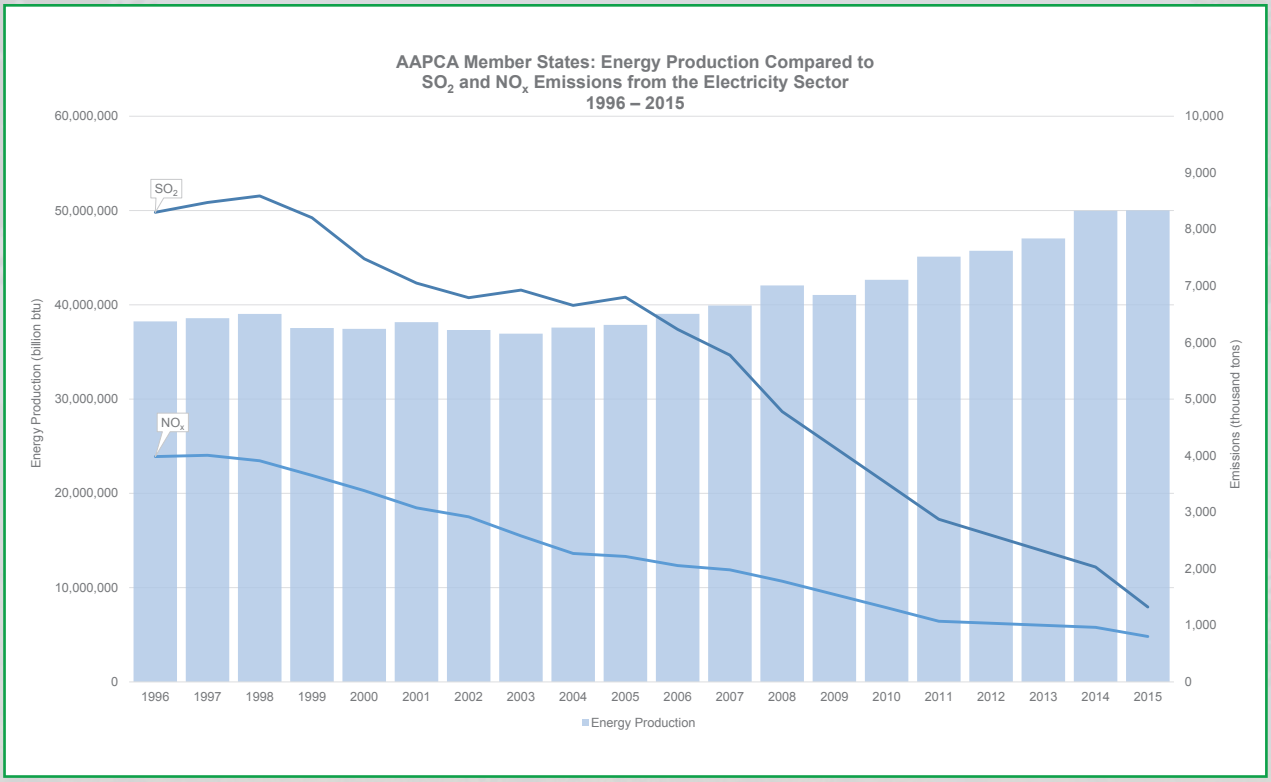
Designated Area	Percent Change
Atlanta, GA	-35.80%
Birmingham, AL	-40.11%
Canton-Massillon, OH	-32.92%
Charleston, WV	-45.78%
Chattanooga, AL-TN-GA	-36.84%
Chicago-Gary-Lake County, IL-IN	-36.48%
Cincinnati-Hamilton, OH-KY-IN	-38.15%
Cleveland-Akron-Lorain, OH	-27.38%
Columbus, OH	-35.57%
Dayton-Springfield, OH	-41.29%
Evansville, IN	-32.67%
Greensboro-Winston Salem-High Point, NC	-40.40%
Hickory-Morganton-Lenoir, NC	-41.45%
Huntington-Ashland, WV-KY-OH	-47.59%
Indianapolis, IN	-34.10%
Knoxville, TN	-34.18%
Louisville, KY-IN	-36.53%
Macon, GA	-39.16%
Martinsburg-Hagerstown, WV-MD	-37.34%
Parkersburg-Marietta, WV-OH	-42.21%
Rome, GA	-38.51%
Steubenville-Weirton, WV-IL	-35.98%
Washington, DC-MD-VA	-35.92%
Wheeling, WV-OH	-32.89%

Source: U.S. EPA, **Air Quality Design Values**. Data file: "$PM_{2.5}$ Design Values, 2016."


AAPCA Member States: Design Value History for Areas Previously Designated Nonattainment for the 1997 Annual NAAQS for Fine Particulate Matter 2005 – 2016
Concentration (µg/m³)
20
19
18
17
16
15
14
13
12
11
10
9
8
1997 & 2006 NAAQS
2005 - 2007
2006 - 2008
2007 - 2009
2008 - 2010
2009 - 2011
2010 - 2012
2011 - 2013
2012 - 2014
2013 - 2015
2014 - 2016
Average, AAPCA Member States
Atlanta (GA)
Birmingham (AL)
Canton-Massillon (OH)
Charleston (WV)
Chattanooga (TN)
Chicago-Gary-Lake County (IL-IN)
Cincinnati-Hamilton (OH)
Cleveland-Akron-Lorain (OH)
Columbus (OH)
Dayton-Springfield (OH)
Evansville (IN)
Greensboro-Winston Salem-High Point (NC)
Hickory-Morganton-Lenoir (NC)
Huntington-Ashland (OH-KY)
Indianapolis (IN)
Knoxville (TN)
Louisville (KY)
Macon (GA)
Martinsburg-Hagerstown (WV-MD)
Parkersburg-Marietta (WV-OH)
Rome (GA)
Steubenville-Weirton (OH-WV)
Washington (DC-MD-VA)
Wheeling (WV)

ELECTRICITY SECTOR EMISSIONS REDUCTIONS

Energy production in AAPCA Member States increased by more than 30 percent from 1996 to 2015,[15] while emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) were reduced significantly. SO_2 emissions from the electricity sector in AAPCA Member States decreased 84 percent, from 8,301,000 tons in 1996 to 1,324,000 tons in 2015, while NO_x emissions from the electricity sector went from 3,983,000 tons in 1996 to 803,000 tons in 2015, a reduction of nearly 80 percent.[16]



Sources: U.S. EIA, **State Energy Data System (SEDS): 1960-2015**; U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "State Average Annual Emissions Trend."

Cost of Energy

In 2016, the average retail price for electricity in AAPCA Member States was 9.21 cents per kilowatt-hour (cents/kWh), about 1.06 cents/kWh less than the national average of 10.27 cents/kWh – nearly 11 percent cheaper.

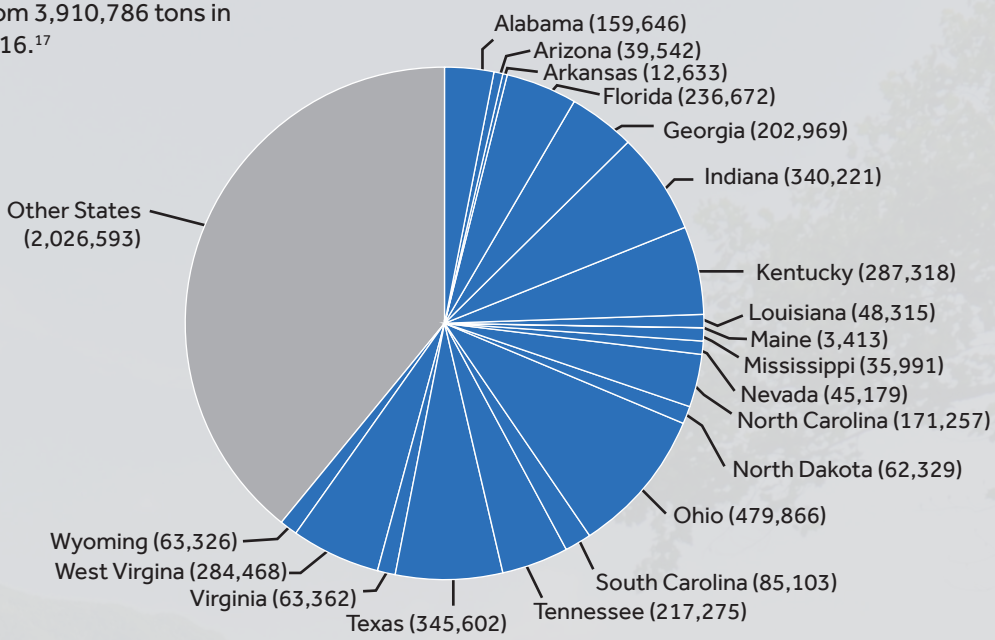
Source: U.S. EIA, "**State Electricity Profiles**," January 25, 2018.

Oxides of Nitrogen

Between 1990 and 2016 AAPCA Member States accounted for more than 61 percent of the NO_x emissions reductions in the electricity sector, lowering NO_x emissions from 3,910,786 tons in 1990 to 726,405 tons in 2016.[17]

AAPCA Member States: Share of NO_x Emissions Reductions in the Electricity Sector, 1990-2016
(tons of NO_x reduced)

Source: U.S. EPA, "**Annual NO_x Emissions from CSAPR and ARP Sources, 1990 – 2016**," May 2018.

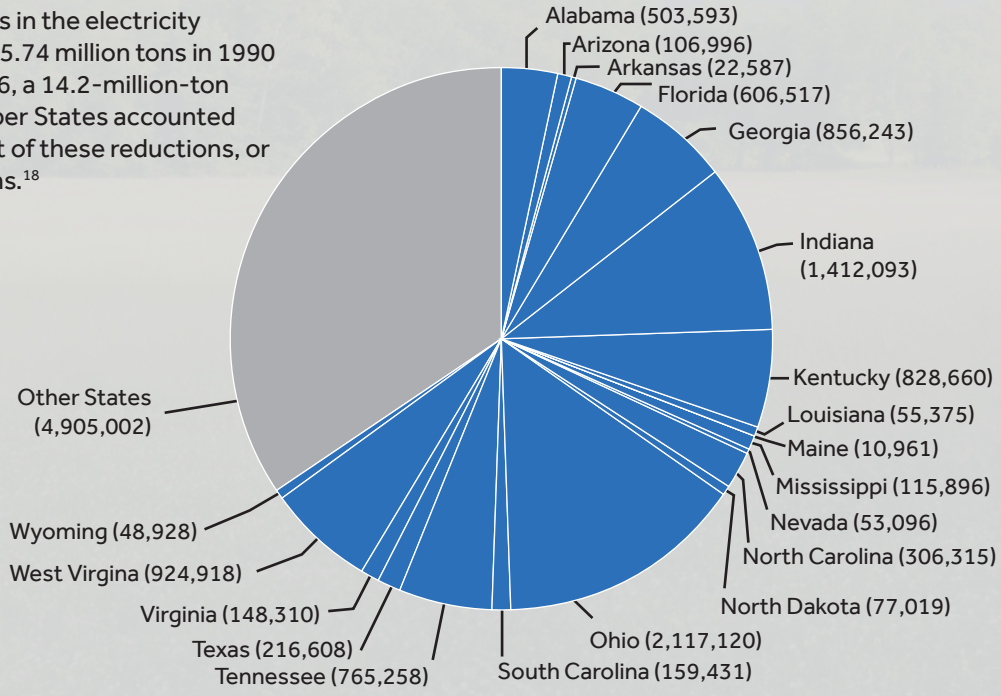


Sulfur Dioxide

Nationally, SO_2 emissions in the electricity sector decreased from 15.74 million tons in 1990 to 1.5 million tons in 2016, a 14.2-million-ton reduction. AAPCA Member States accounted for more than 65 percent of these reductions, or more than 9.3 million tons.[18]

AAPCA Member States: Share of SO_2 Emissions Reductions in the Electricity Sector, 1990-2016
(tons of SO_2 reduced)

Source: U.S. EPA, "**State-by-State SO_2 Emissions from CAIR and ARP Sources, 1990-2016**," May 2018.



Recent AAPCA Best Practice Winners

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 for the past three years:

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

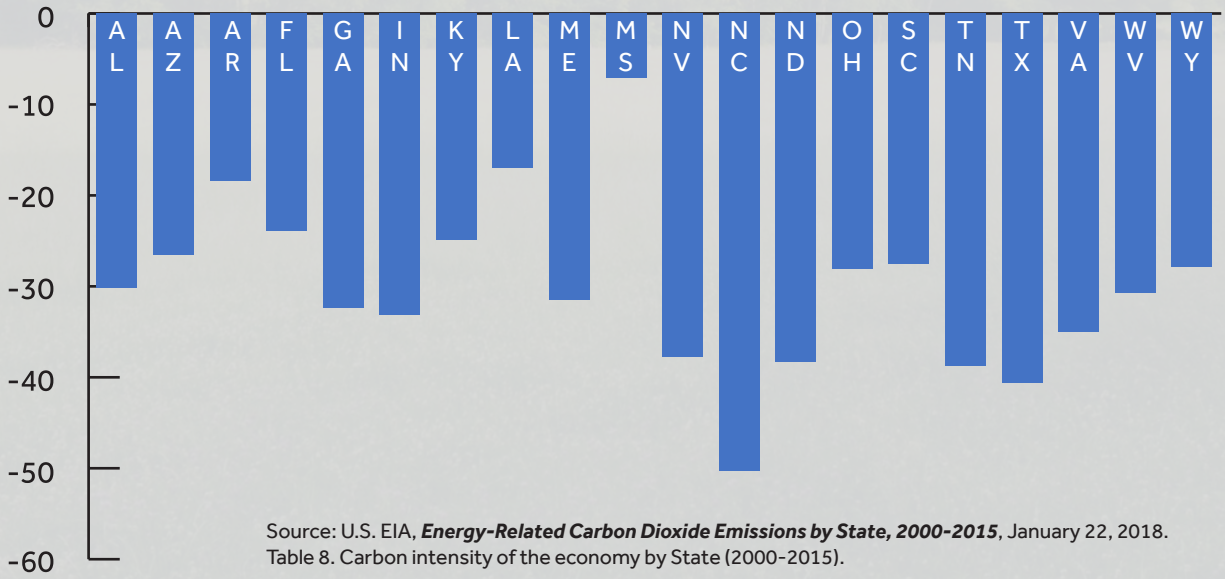
2015:
- **AirCom: Florida Division of Air Resource Management's New Compliance and Enforcement Database and Field Inspection Tool,** Florida Department of Environmental Protection
- **FAIR: Florida Air Inspector Reference**, Florida Department of Environmental Protection
- **Promoting Energy Efficiency at Commercial and Industrial Facilities in North Carolina**, North Carolina Division of Air Quality

GREENHOUSE GASES AND ENERGY

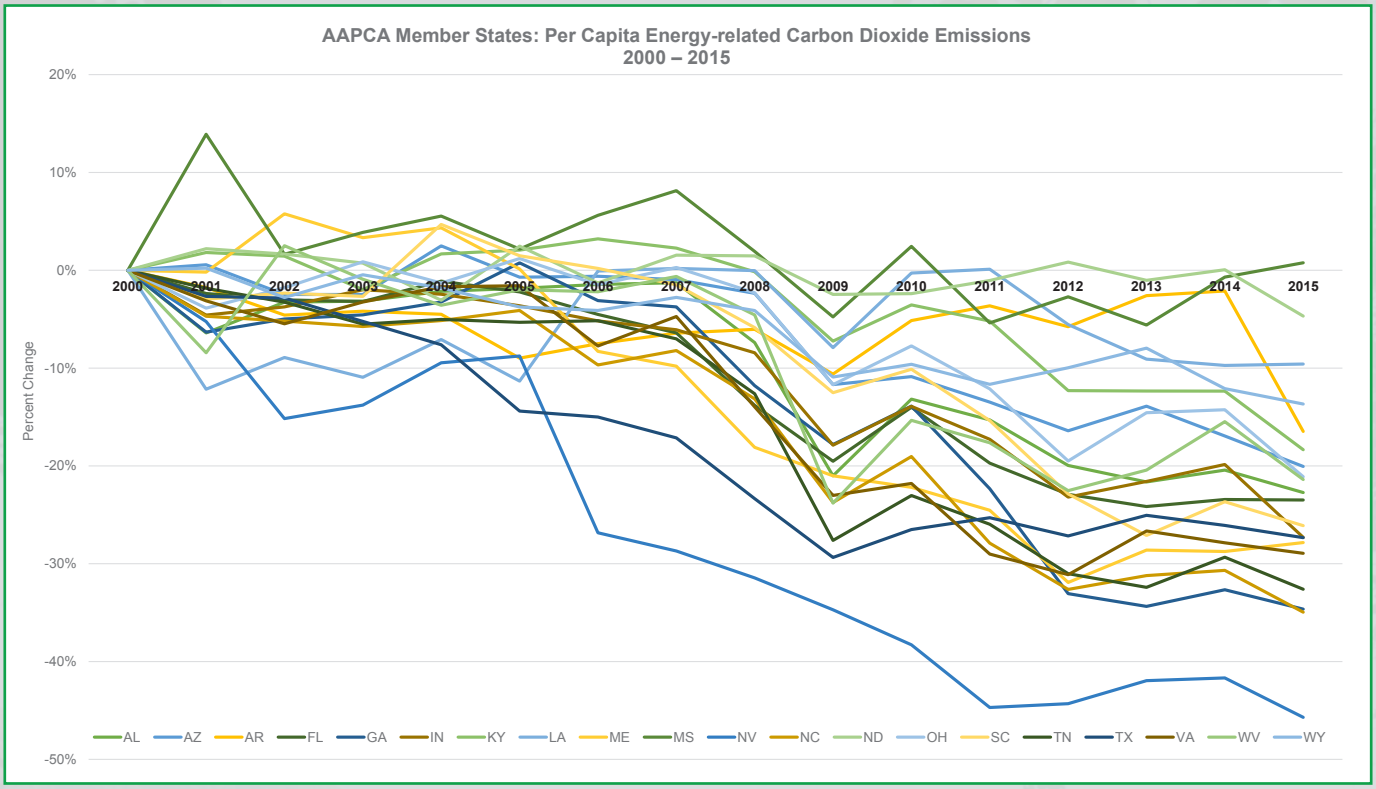
From 2000 to 2015, the 20 states that comprise the AAPCA Board of Directors reduced energy-related carbon dioxide emissions by 337.4 million metric tons, accounting for more than 56 percent of cumulative national reductions. AAPCA Member States also represented the following trends:[19]

- An average decrease in energy intensity of 19.2 percent, or 2.5 thousand British thermal units (Btu) per dollar of GDP, compared to the national average of 1.7 Btu per dollar of GDP;
- An average reduction in carbon intensity of the economy of 30 percent; and,
- On average, above a 19-percent reduction in per capita energy-related carbon dioxide emissions, or approximately 6.7 metric tons per person – 41 percent more than the national average of 4.4 metric tons per person.

AAPCA Member States: Carbon Intensity of the Economy
2000 - 2015



Source: U.S. EIA, ***Energy-Related Carbon Dioxide Emissions by State, 2000-2015***, January 22, 2018. Table 8. Carbon intensity of the economy by State (2000-2015).



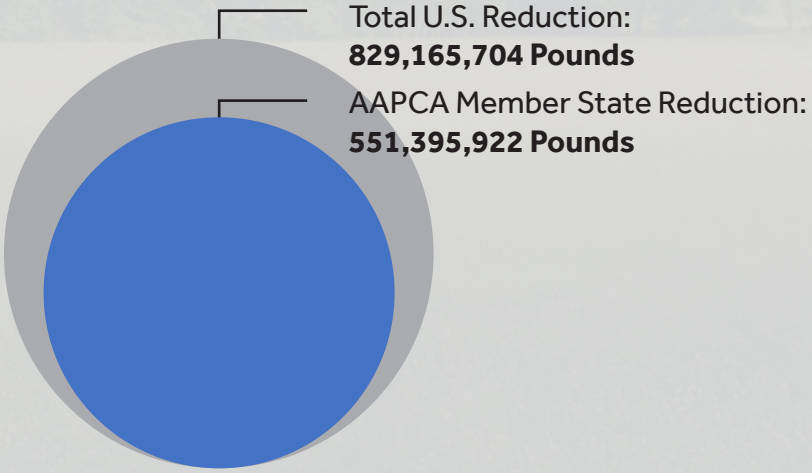
Source: U.S. EIA, ***Energy-Related Carbon Dioxide Emissions by State, 2000-2015***, January 22, 2018. Table 5. Per capita energy-related carbon dioxide emissions by State (2000 – 2015).

TOXIC AIR RELEASES

U.S. EPA's *2016 Toxic Release Inventory National Analysis* revealed a 58-percent decrease in reported toxic air releases compared to the 2006 level, from 1,418,995,095 pounds in 2006 to 589,829,391 pounds in 2016. Of the more than 829-million-pound reduction that was documented, AAPCA Member States accounted for more than 551-million pounds, or just over 66.5 percent of the national total.[20]

AAPCA Member States: Share of Total Reduction of Toxic Air Releases Reported to the Toxic Release Inventory 2006 — 2016

Source: U.S. EPA, "**Where You Live in the *2016 TRI National Analysis,***" February 2018.



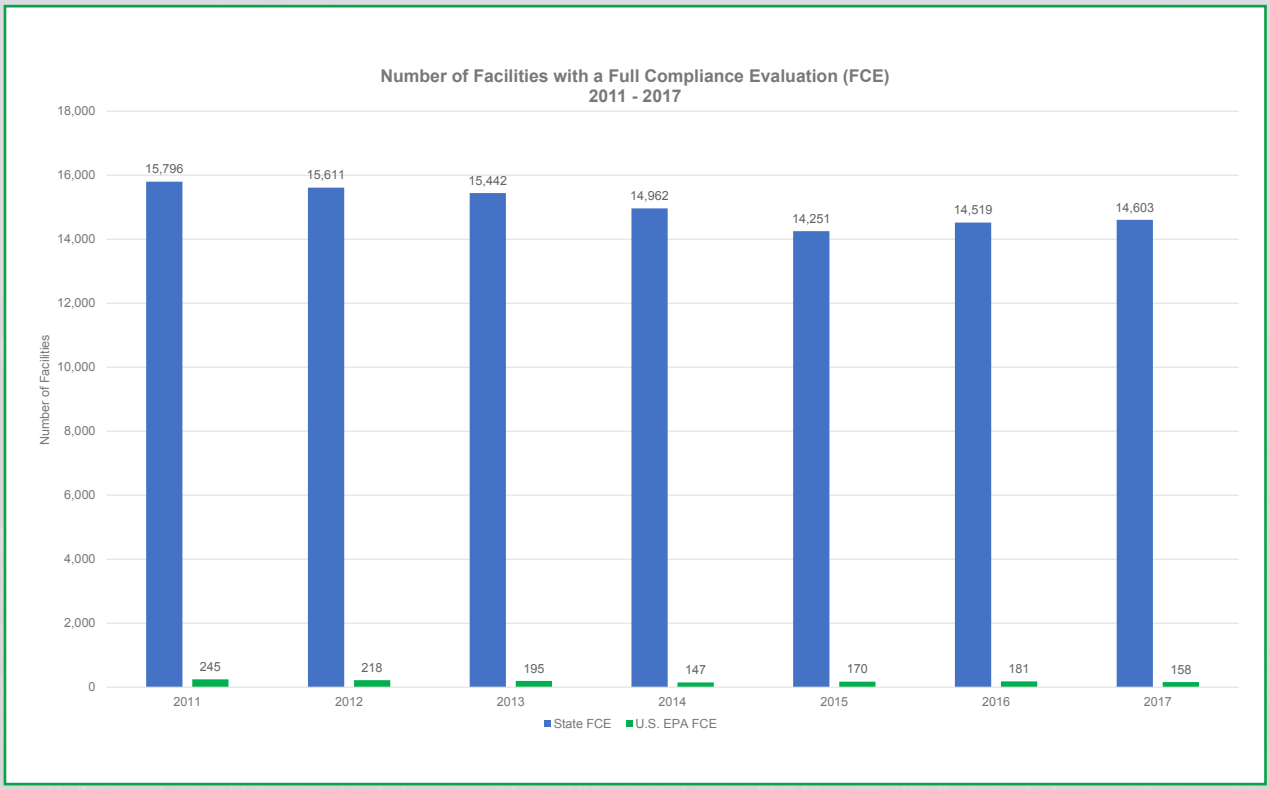
Visibility Progress: Then and Now in the Grand Canyon National Park

Through the U.S. EPA's Regional Haze Program, visibility is tracked in 156 national parks and wilderness areas. According to U.S. EPA's report *Protecting Our Nation's Treasured Vistas*, Grand Canyon National Park's "average visual range has improved from 110 miles in 2000 to 140 miles in 2015." The image shown on the left shows a visibility range of about 25 miles, while the image on the right shows a range of approximately 240 miles, according to a status report from U.S. EPA.

Source: U.S. EPA, ***Protecting Our Nation's Treasured Vistas***, 2015.

COMPLIANCE AND ENFORCEMENT ACTIVITY

According to U.S. EPA's Enforcement and Compliance History Online (ECHO), states were the leaders in full compliance evaluations related to the Clean Air Act, conducting full compliance evaluations for more than 14,000 facilities in 2017 — more than 80 times as many that were conducted by EPA.[21]

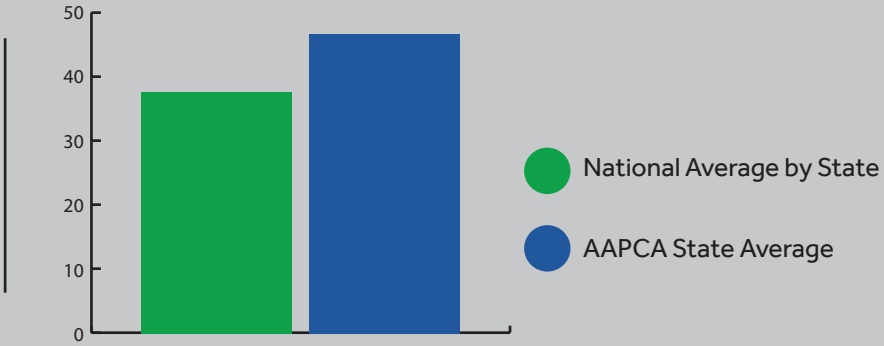


Source: U.S. EPA's **National Air Activity Dashboard.**

Full Compliance Evaluations by AAPCA Member States

AAPCA's 2017 edition of *The Greatest Story Seldom Told: Profiles and Success Stories in Air Pollution Control* detailed that AAPCA Member States performed full compliance evaluations at nearly 47 percent of facilities annually from 2010 to 2014, whereas the national average for states was approximately 37.5 percent of facilities.

Percentage of Facilities with a Full Compliance Evaluation (FCE), 2010 - 2014



Source: AAPCA, ***The Greatest Story Seldom Told: Profiles and Success Stories in Air Pollution Control***, April 2017. Data from U.S. EPA's **Analyze Trends: State Air Dashboard**, part of **ECHO**. EPA note: "Due to the transition between [Clean Air Act] national data management systems, the Performance View of the Air Dashboard has not been updated since January 31, 2015."

Section Notes

[1] U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "State Average Annual Emissions Trend."
[2] U.S. Bureau of Economic Analysis, data available **here**.
[3] U.S. Office of Highway Policy Information, data available **here**.
[4] U.S. Census Bureau, data available **here**.
[5] U.S. Census Bureau, data available **here**.
[6] U.S. EIA, **State Energy Data System (SEDS): 1960-2015**.
[7] Section 175A(a) of the Clean Air Act states that "redesignation of a nonattainment area for any air pollutant as an area which has attained the national primary ambient air quality standard for that air pollutant shall also submit a revision of the applicable State implementation plan to provide for the maintenance of the national primary ambient air quality standard for such air pollutant in the area concerned for at least 10 years after the redesignation. The plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance."
[8] U.S. EPA's ***Green Book*** contains a history of areas designated nonattainment or maintenance under the NAAQS. EPA's listing of areas designated nonattainment or maintenance for the 2008 ozone NAAQS can be found at: **https://www3.epa.gov/airquality/greenbook/hbtc.html**. In 2015, the NAAQS for ozone was **lowered** to 70 parts per billion (ppb). EPA measures ozone by calculating the three-year average of the annual 4th highest daily maximum 8-hour ozone concentration.
[9] **https://www.epa.gov/air-trends/air-quality-design-values#report**. Data file: "Ozone Design Values, 2016." Data for this chart is based on overlapping three-year averages beginning with 2005 – 2007 and ending with 2014 – 2016.
[10] U.S. Census Bureau, data available **here**.
[11] According to U.S. EPA: "Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight."
[12] U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "State Average Annual Emissions Trend."
[13] U.S. EPA's listing of areas designated nonattainment or maintenance for the 1997 annual $PM_{2.5}$ NAAQS can be found at: **https://www3.epa.gov/airquality/greenbook/qbtc.html**. In 2012, the NAAQS for $PM_{2.5}$ was lowered to 12 µg/m3, based on an annual arithmetic mean averaged over three years (the 2006 review maintained the 1997 standard).
[14] **https://www.epa.gov/air-trends/air-quality-design-values#report**. Data file: "$PM_{2.5}$ Design Values, 2015." Data for this chart is based on overlapping three-year averages beginning with 2005 – 2007 and ending with 2014 – 2016.
[15] U.S. EIA, **State Energy Data System (SEDS): 1960-2015**. Data file: "Production in physical units," 1960 – 2015.
[16] U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "State Average Annual Emissions Trend."
[17] U.S. EPA, "**Annual NO_x Emissions from CSAPR and ARP Sources, 1990 – 2016**," May 2018.
[18] U.S. EPA, "**State-by-State SO_2 Emissions from CAIR and ARP Sources, 1990-2016**," May 2018.
[19] U.S. EIA, ***Energy-Related Carbon Dioxide Emissions by State, 2000-2015***, January 22, 2018.
[20] U.S. EPA, ***Toxics Release Inventory 2016 National Analysis***, January 2018.
[21] Data from U.S. EPA's **National Air Activity Dashboard**, part of **ECHO**.

AIR QUALITY TRENDS

U.S. EPA's interactive 2017 air quality report, entitled *Our Nation's Air: Status and Trends Through 2016*, compares the national trend lines of several economic and social indicators to the trends of the six criteria air pollutants. Since 1970, US EPA's report highlights that U.S. Gross Domestic Product has increased by 253 percent, population has grown 58 percent, vehicle miles traveled are up 190 percent, and energy consumption has risen 44 percent. Conversely over that period, the U.S. experienced steep reductions in the emissions (73 percent combined) and ambient concentrations of criteria air pollutants.[1]

Concentrations of Criteria Pollutants

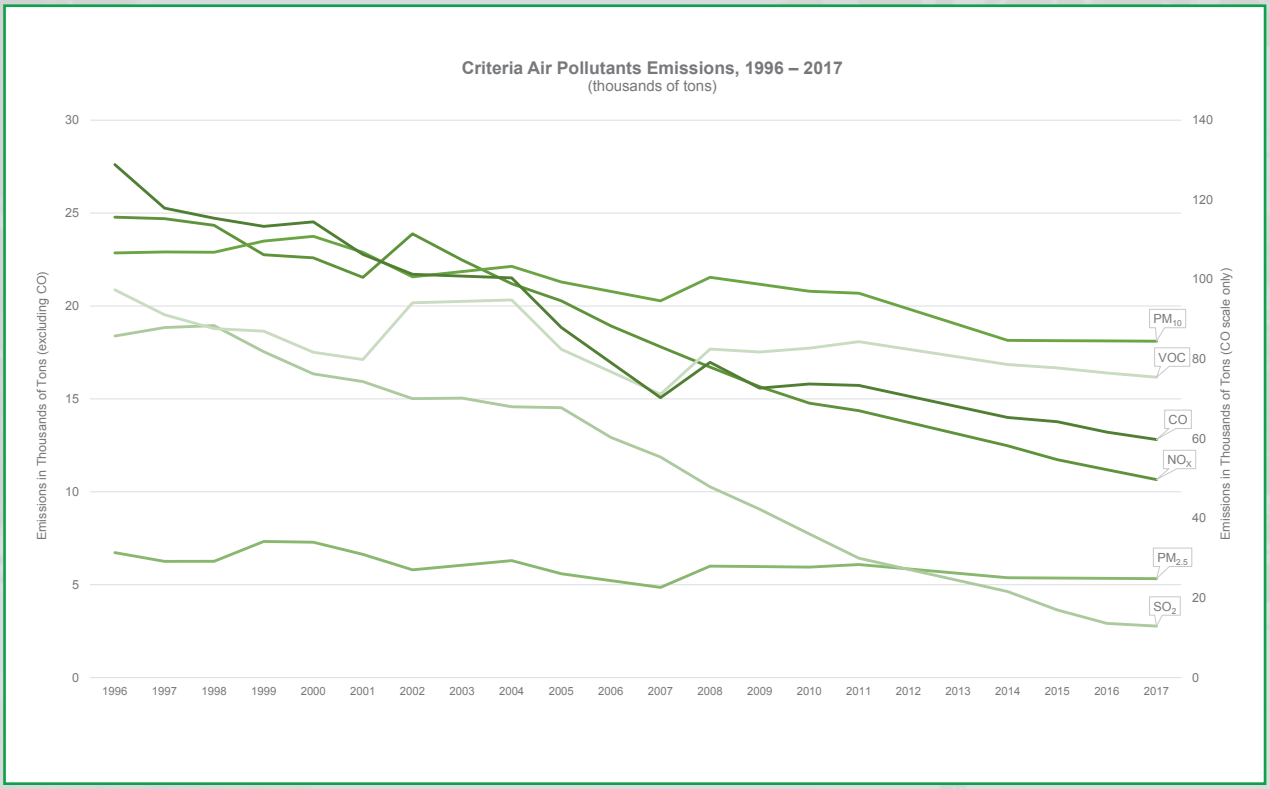
Nationally, concentrations for the six criteria air pollutants have plunged over the last several decades. U.S. EPA's website on air trends charts the changes in ambient air since 1980, 1990, and 2000.[2]

	1980 vs 2016	1990 vs 2016	2000 vs 2016
Carbon Monoxide	-85%	-77%	-61%
Lead	-99%	-99%	-93%
Nitrogen Dioxide (annual)	-62%	-56%	-47%
Nitrogen Dioxide (1-hour)	-61%	-50%	-33%
Ozone (8-hour)	-31%	-22%	-17%
PM_{10} (24-hour)	---	-39%	-40%
$PM_{2.5}$ (annual)	---	---	-42%
$PM_{2.5}$ (24-hour)	---	---	-44%
Sulfur Dioxide (1-hour)	-87%	-85%	-72%

Criteria Pollutant Emissions Trends

Utilizing the National Emissions Inventory (NEI), U.S. EPA publishes Air Pollutant Emissions Trends Data that provide annual estimates of criteria pollutant emissions and precursors, distinguished by major sources.[3] Nationally, criteria pollutant emissions and precursors have substantially decreased when comparing 1990 levels to 2017 levels, with emissions of all criteria pollutants or precursors down at least 29 percent since 1990.

	1990 Emissions (in thousands of tons)	2017 Emissions (in thousands of tons)	Percent Reduction
Carbon Monoxide	154,188	60,109	-61%
Oxides of Nitrogen	25,527	10,776	-58%
Fine Particulate Matter	7,560	5,345	-29%
Sulfur Dioxide	23,077	2,815	-88%
Volatile Organic Compounds	24,108	16,232	-33%



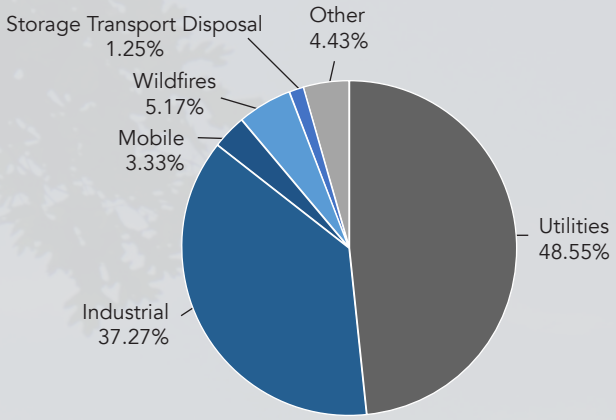
Source: U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970 - 2017."

Source: U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970 - 2017."

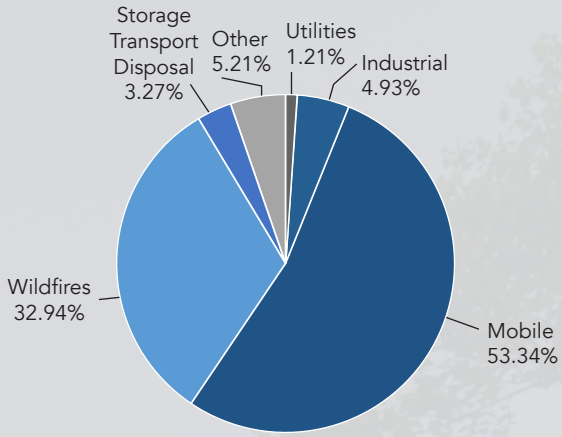
Sources of Criteria Pollutant Emissions

U.S. EPA tracks emissions from the following source categories: utilities; industrial; mobile; wildfires; storage, transport, and disposal; and other sources. Included below are the sources of criteria pollutant and precursor emissions for the year 2017.[4]

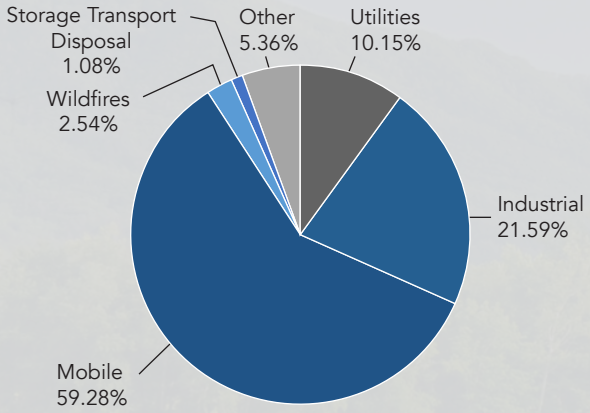
Sulfur Dioxide



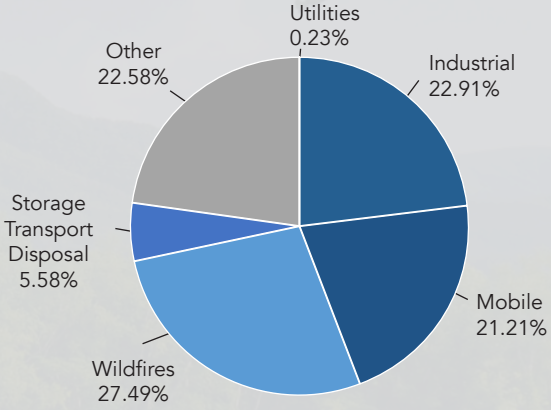
Carbon Monoxide



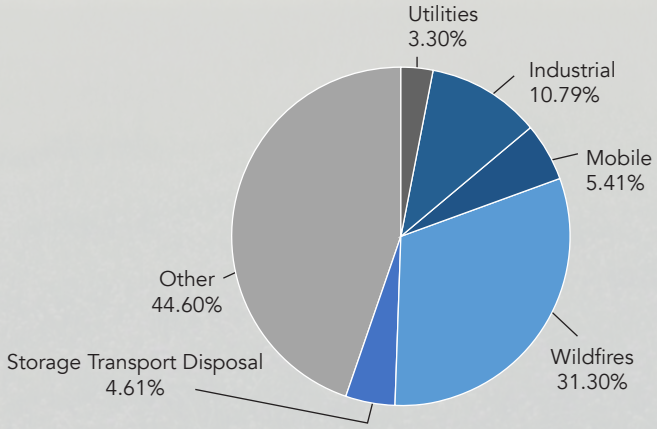
Nitrogen Oxide



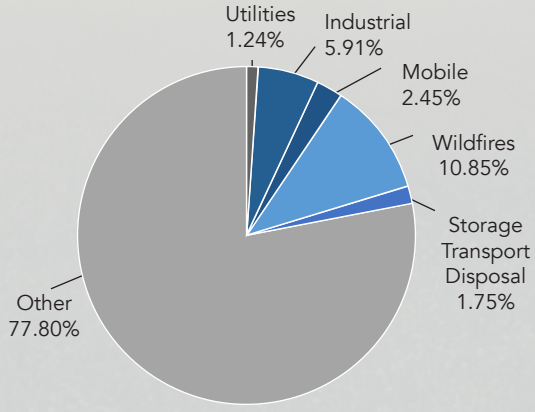
Volatile Organic Compounds



Fine Particulate Matter



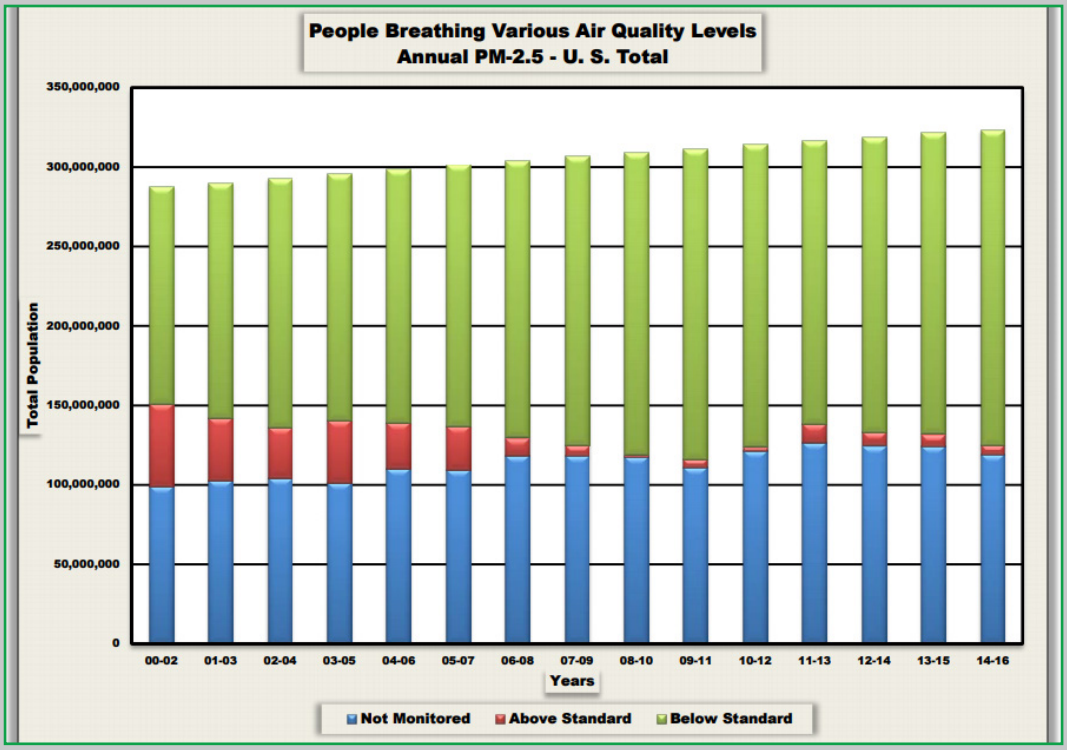
Coarse Particulate Matter



Source: U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970 - 2017."

The States' View of the Air

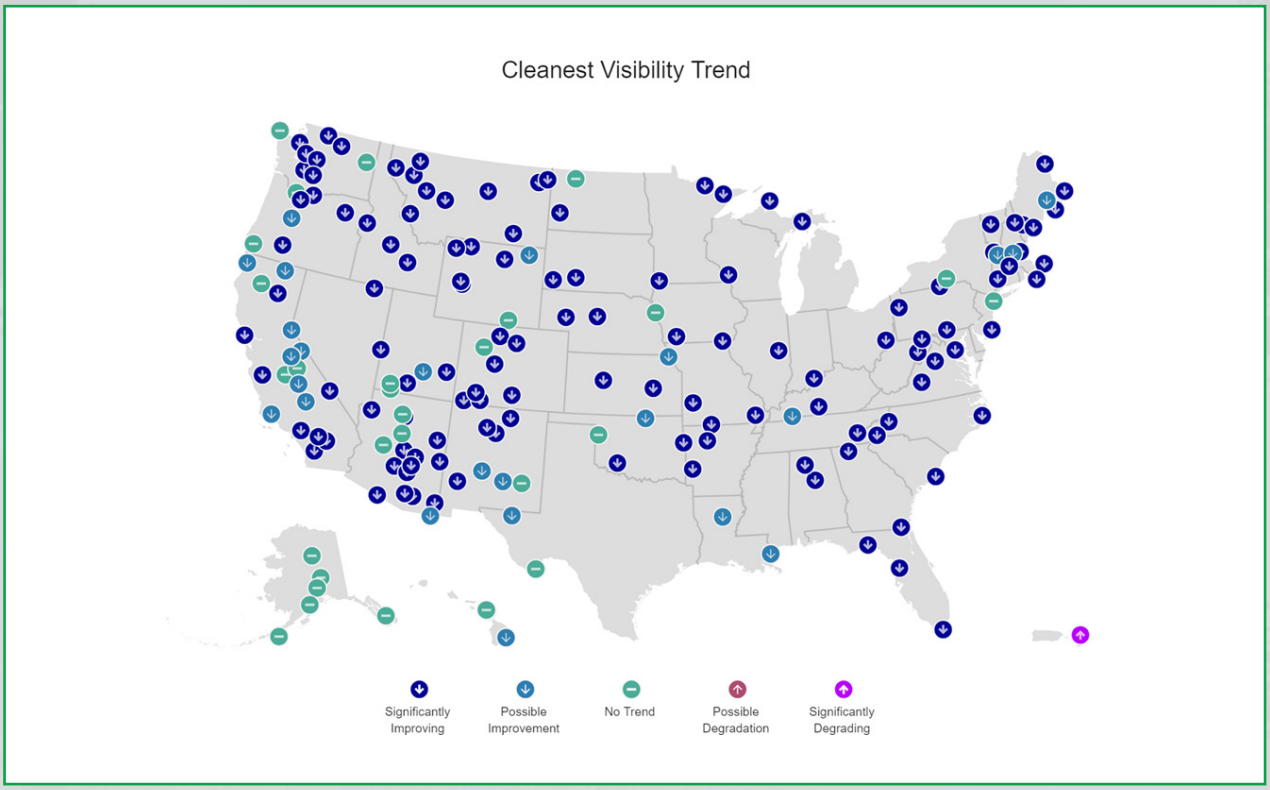
In April 2018, the Indiana Department of Environmental Management (IDEM) released the 2018 edition of *The States' View of the Air* report. The report highlights the air quality in counties and cities in the United States. Like a report card, IDEM has graded areas on the state of their air quality under the federal standards for ozone and fine particles. This report shows the percentage of the population breathing fine particulate matter and ozone at levels above or below the standard as well as areas that are not monitored.



Source: Assistant Commissioner Keith Baugues, IDEM, ***The States' View of the Air***, April 2018.

VISIBILITY PROGRESS

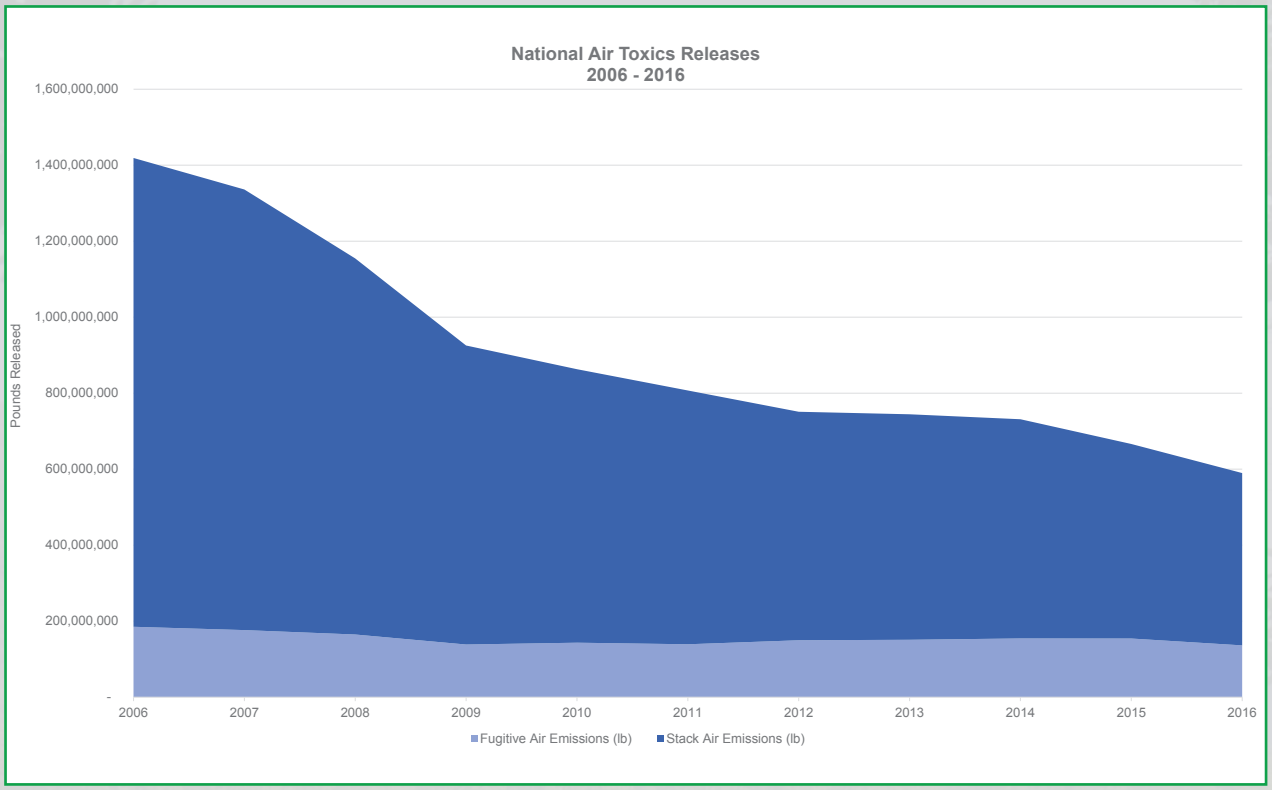
U.S. EPA's 2017 Air Trends Report also includes visibility trends in national parks and wilderness areas (Class I Areas) from 2000 to 2015.[5] Progress is evaluated based on the 20 percent clearest and 20 percent most impaired days. The map below displays visibility trends on the 20 percent cleanest days for several areas, with the majority of locations shown indicating a "Significantly Improving" trend.[6]



Source: U.S. EPA, ***Our Nation's Air: Status and Trends Through 2016***, November 2017. (Section: Visibility Improves in Scenic Areas).

HAZARDOUS AIR POLLUTANT TRENDS

U.S. EPA tracks 187 hazardous air pollutants, or air toxics. The *2016 Toxic Release Inventory National Analysis* documents a 58-percent reduction in air release over the past ten years, from 1,418,995,095 pounds in 2006 to 589,829,391 pounds in 2016.[7] The Toxic Release Inventory tracks by point source and fugitive air emissions,[8] which are reported by industry to EPA as required by the Emergency Planning and Community Right-to-Know Act (EPCRA). Over 18,000 facilities reported to the Toxic Release Inventory in 2016.[9]

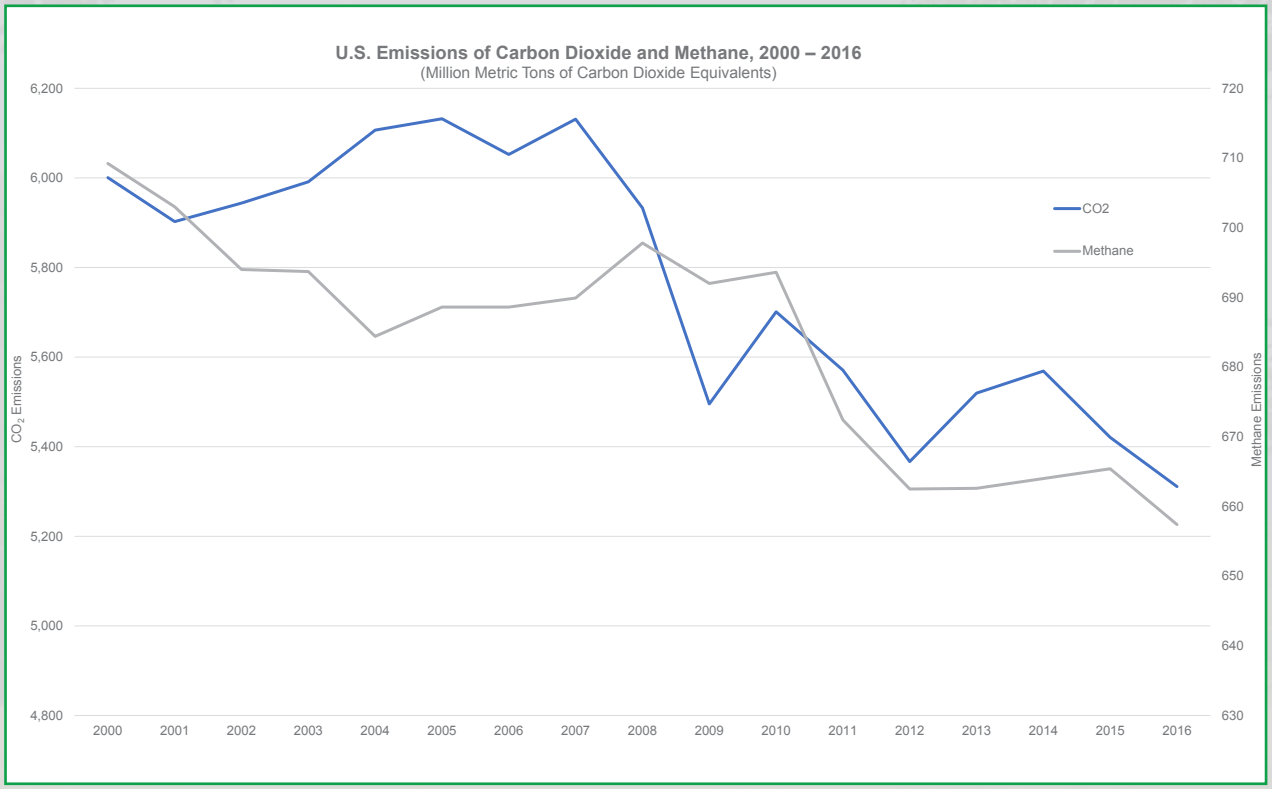


Source: U.S. EPA, ***2016 Toxic Release Inventory National Analysis***, January 2018.

GREENHOUSE GAS TRENDS
Carbon Dioxide and Methane

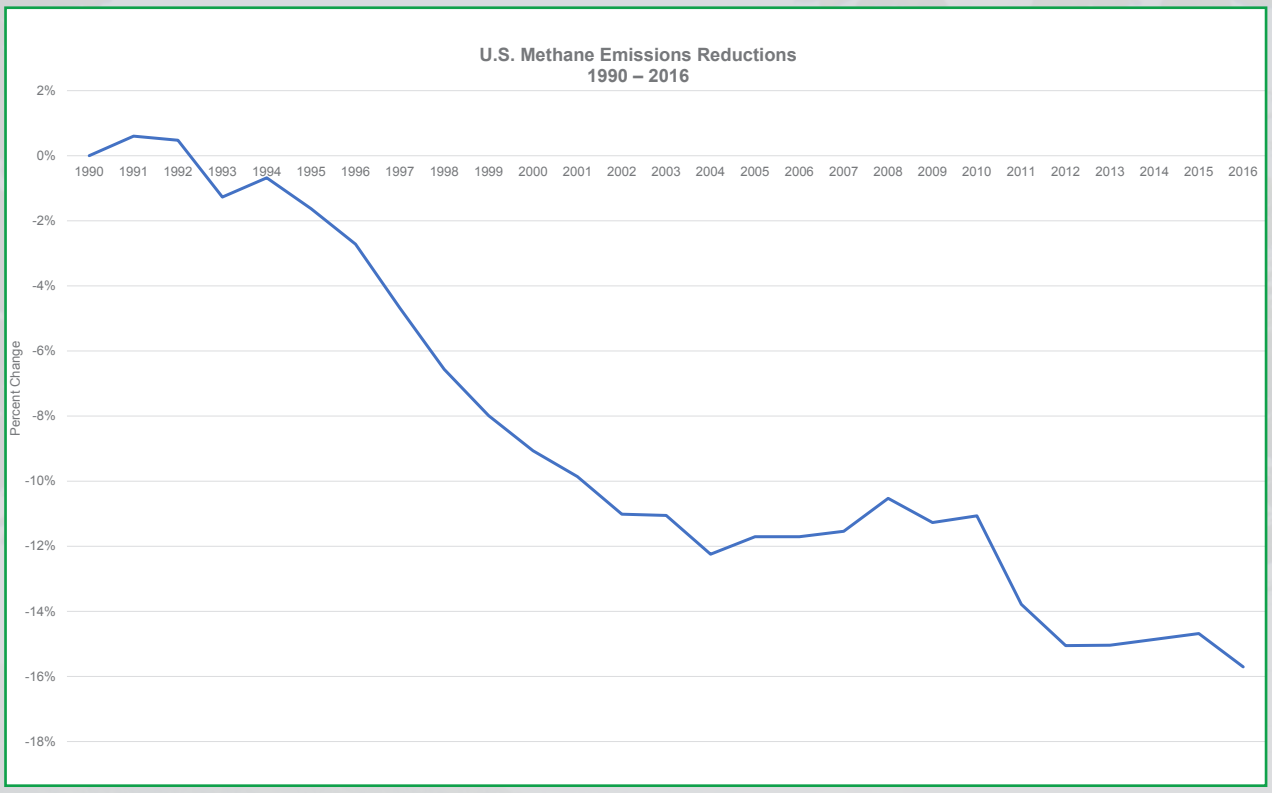
According to U.S. EPA's most recent *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, which is "an annual comprehensive accounting of total greenhouse gas emissions for all man-made sources in the United States,"[10] U.S. greenhouse gas emissions totaled 6,511 million metric tons of carbon dioxide equivalents (mmt CO_2 eq.) in 2016, down about 9.8 percent from 2000 levels.[11]

Emissions of carbon dioxide (CO_2) and methane have decreased since 2000. The graph below displays the trend lines for both CO_2 and methane, with the blue line plotting CO_2 emissions along the left axis and the gray line tracking methane emissions along the right axis. Comparing 2000 to 2016, CO_2 emission have been reduced by 689.7 mmt CO_2 eq. (11 percent) and methane emissions have fallen 51.8 mmt CO_2 eq. (7 percent).[12]



Source: U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks***, April 2018.

From 1990 to 2016 U.S. methane emissions fell a total of 15.7 percent, from 780 mmt CO_2 eq. to 657 mmt CO_2 eq.[13]



Source: U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks***, April 2018.

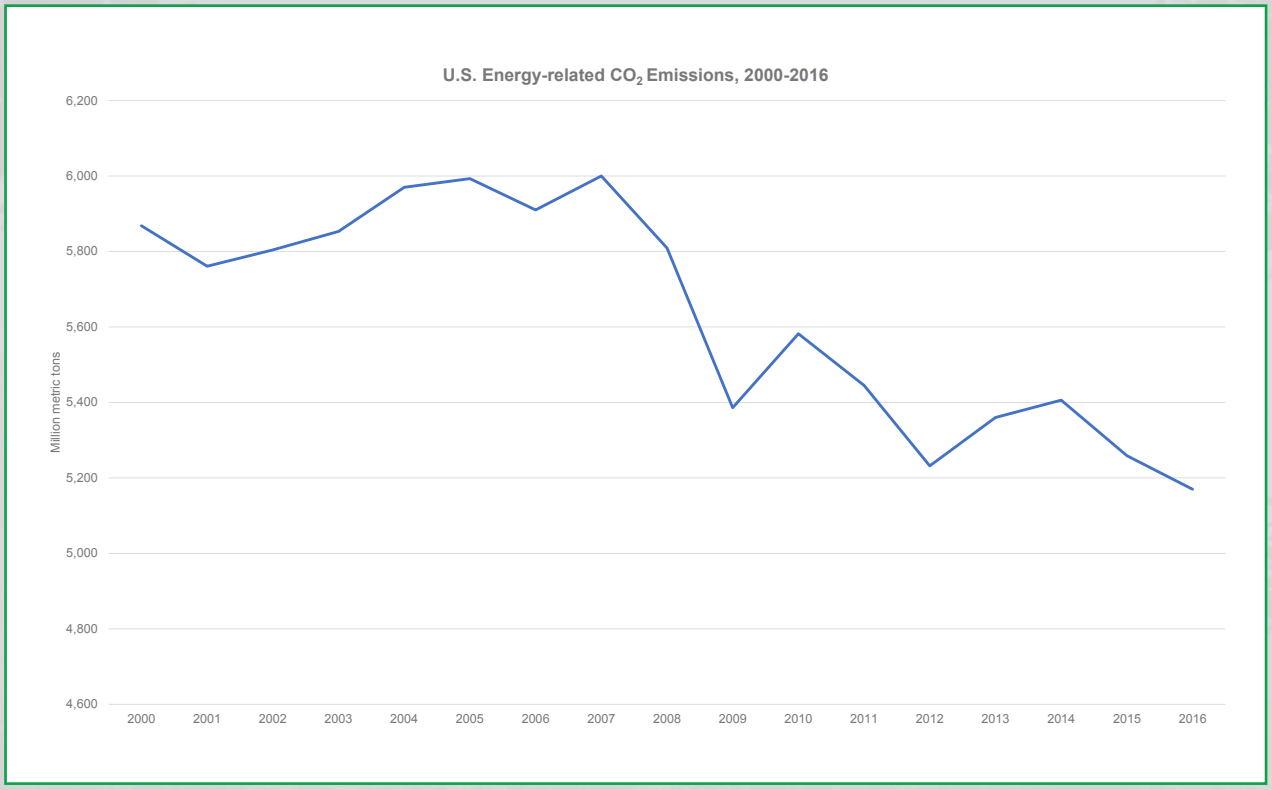
Headlines from the U.S. Energy Information Administration

- **Electric power sector consumption of fossil fuels at lowest level since 1994,** May 29, 2018
- **Electrified vehicles continue to see slow growth and less use than conventional vehicles,** May 22, 2018
- **United States remains the world's top producer of petroleum and natural gas hydrocarbons,** May 21, 2018
- **Changing energy efficiency and fuel economy standards affects energy consumption,** May 17, 2018
- **Solar surpasses biomass to become third-most prevalent renewable electricity source,** May 9, 2018
- **Natural gas and renewables make up most of 2018 electric capacity additions,** May 7, 2018
- **Electricity demand by U.S. manufacturing has declined in recent years,** March 23, 2018
- **Natural gas expected to remain most-consumed fuel in the U.S. industrial sector,** March 1, 2018
- **U.S. energy-related CO_2 emissions expected to rise slightly in 2018, remain flat in 2019,** February 8, 2018
- **Energy-related carbon dioxide emissions decreased in most states from 2005 to 2015,** December 11, 2017
- **Growth in global energy-related carbon dioxide emissions expected to slow,** November 16, 2017
- **CO_2 emissions from coal fell by record amount in 2015, led by Texas and Midwest,** November 13, 2017
- **Intensity of U.S. energy use in manufacturing decreases as output outpaces fuel use,** October 19, 2017

Energy Sector Emissions

According to the U.S. Energy Information Administration's (EIA) October 2017 report *U.S. Energy-Related Carbon Dioxide Emissions, 2016*, energy-related carbon dioxide emissions in 2016 were 12 percent lower than 2000 levels, falling from 5,868 million metric tons in 2000 to 5,170 million metric tons in 2016 – a reduction of 698 million metric tons.[14] Additionally, U.S. EIA's January 2018 analysis *Energy-Related Carbon Dioxide Emissions by State, 2000-2015* reports the following statistics:[15]

- An average state reduction of 21.1 percent in per capita energy-related carbon dioxide emissions;
- Energy intensity by state is down an average of 21.9 percent; and,
- On average, carbon intensity of the economy by state has been reduced by 31.3 percent.

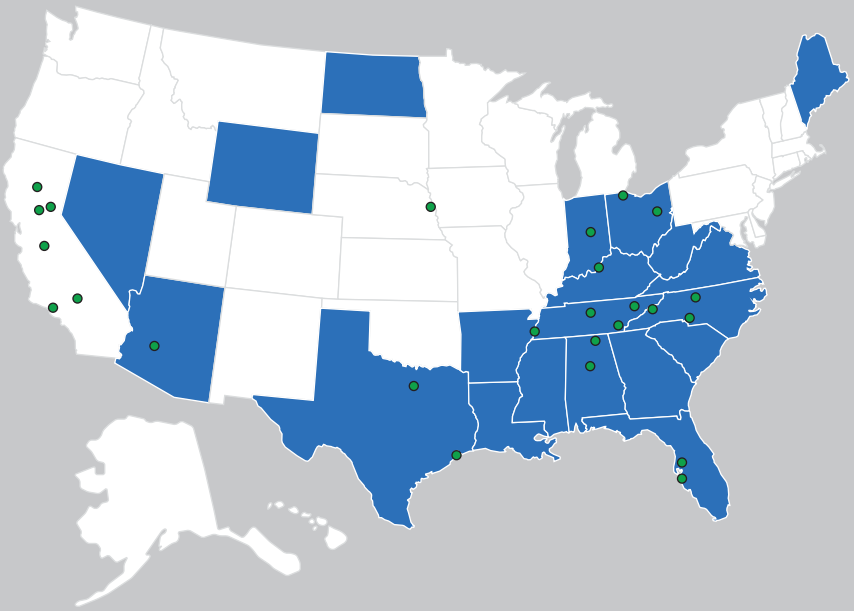


Source: U.S. EIA, ***Energy-Related Carbon Dioxide Emissions, 2016***, October 2017

Section Notes

[1] U.S. EPA, ***Our Nation's Air: Status and Trends Through 2016***, November 2017.
[2] U.S. EPA, **Air Quality - National Summary**. Last updated July 2017.
[3] U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970 - 2017."
[4] U.S. EPA, **Air Pollutant Emissions Trends**. Data file: "Average Annual Emissions, Criteria pollutants National Tier 1 for 1970 - 2017."
[5] A full list of Class I Areas, including the Federal Land Manager, can be found at **https://www.epa.gov/visibility/list-156-mandatoryclass-i-federal-areas**. In addition to EPA, other Federal agencies responsible for addressing visibility are the National Park Service, the U.S. Forest Service, and the U.S. Fish and Wildlife Service.
[6] U.S. EPA, ***Our Nation's Air: Status and Trends Through 2016***, November 2017. Section: "Visibility Improves in Scenic Areas."
[7] U.S. EPA, ***2016 Toxic Release Inventory National Analysis***, January 2018.
[8] "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." **https://goo.gl/W12ZYD**.
[9] More information about EPCRA can be found at: **https://www.epa.gov/epcra**. EPA also notes that the Pollution Prevention Act "requires facilities to submit information on pollution prevention and other waste management activities of Toxic Release Inventory chemicals."
[10] U.S. EPA, **Greenhouse Gas Emissions**. U.S. EPA also states that the Agency "also collects greenhouse gas emissions data from individual facilities and suppliers of certain fossil fuels and industrial gases through the Greenhouse Gas Reporting Program."
[11] U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks***, April 2018.
[12] U.S. EIA, ***Energy-Related Carbon Dioxide Emissions by State, 2000-2015***, January 22, 2018.
[13] U.S. EPA, ***Inventory of U.S. Greenhouse Gas Emissions and Sinks***, April 2018.
[14] U.S. EIA, ***U.S. Energy-Related Carbon Dioxide Emissions, 2016***, October 2017.
[15] U.S. EIA, ***Energy-Related Carbon Dioxide Emissions by State, 2000-2015***, January 2018

Other Air Quality Resources



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:

Alabama Department of Environmental Management
Arizona Department of Environmental Quality
Arkansas Department of Environmental Quality
Florida Department of Environmental Protection
Georgia Environmental Protection Division
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
Nevada Division of Environmental Protection
North Carolina Department of Environmental Quality
North Dakota Department of Health
Ohio Environmental Protection Agency
South Carolina Department of Health and Environmental Control
Tennessee Department of Environment & Conservation
Texas Commission on Environmental Quality
Virginia Department of Environmental Quality
West Virginia Department of Environmental Protection
Wyoming Department of Environmental Quality
Butte County Air Quality Management District (California)
Canton City Health Department (Ohio)
Chattanooga-Hamilton County Air Pollution Control Bureau (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 (Tennessee)
Louisville Metro Air Pollution Control District (Kentucky)
Manatee County Environmental Management Department (Florida)
Maricopa Air Quality Department (Arizona)
Mecklenburg County (North Carolina)
Mojave Desert Air Quality Management District (California)
Nashville/Davidson Metro Public Health Department (Tennessee)
Omaha Air Quality Control (Nebraska)
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
Indiana Department of Environmental Management's ***The States' View of the Air***
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)**