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 21 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](http://www.cleanairact.org).

State Environmental Agencies Currently Represented on the AAPCA Board of Directors

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

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, as reflected in the following statistics:

- An estimated [144.1 million](https://www.statista.com/topics/12562/usa-population/), Americans, about 43% of the nation's total population;
- From [2010 to 2021](https://www.census.gov/time-series/demo/popest/), a population growth of [10.5%](https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-population-change.html), compared to national population growth of [7.5%](https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-population-change.html) for the same time period;
- In 2019, [65%](https://www.eia.gov/dnav/pet/pet_pri_sum_cus_ns_hottpsa_ny.asp) of total energy production in the United States, as well as:
  - [76%](https://www.eia.gov/electricity/summaries/2021/index.html) of coal [production](https://www.eia.gov/electricity/summaries/2021/index.html) in 2020; and,
- [About 68%](https://www.eia.gov/dnav/pet/pet_pri_sum_cus_ns_hottpsa_ny.asp) of the nation's operable petroleum refining capacity in 2021; and,
Dear Readers,

The response to a health pandemic has afforded air quality planners with a unique opportunity to better understand the options available that are beyond the usual single occupant trip to an office by each employee in an organization. The work can be done with the aid of technology, the air emissions are lower through the reduction of trips, and the pocketbook is a little thicker due to fuel savings. The new workplace builds upon a long tradition of identifying and adopting technology and conservation to reduce air pollutant emissions while supporting a robust and growing economy. Regulation by state and local programs serve to analyze the cost and benefit of options to reduce emissions that allow the work or production to move forward while reducing the environmental impacts and significantly improving air quality.

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 21 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 144 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.

As the current president of the organization, I am pleased to present the Association’s 2022 edition of its annual publication, State Air Trends & Successes: The StATS Report. Highlights from this year’s report include:

- AAPCA Member States have affected a 52 percent reduction in the combined emissions of the six criteria air pollutants for which there are national ambient air quality standards (NAAQS) over the past two decades. The United States has reduced aggregate emissions of the six criteria air pollutants by 78 percent since 1970.
- Since 2000, AAPCA Member States were responsible for a 92 percent and 86 percent reduction of electricity-sector SO₂ and NOₓ emissions, respectively, and a 12 percent reduction in energy-related carbon dioxide (CO₂) emissions, all while energy production increased by 59 percent. Similarly, the United States reduced energy-related carbon dioxide (CO₂) emissions nearly 10 percent while experiencing a 42 percent increase in total energy production from 1999 to 2019.
- Of the more than 314-million-pound decrease in reported toxic air releases over the past decade, AAPCA Member States were responsible for 209 million pounds, roughly 66 percent.
- Since 2000, visibility in 156 national parks and wilderness areas across the U.S. has improved by 34 percent on the clearest days and by 24 percent on the most impaired days.

The AAPCA member agencies are dedicated to safeguarding and improving the nation’s air quality in order to protect health and safety and improve the natural environment for the enjoyment and quality of life that goes hand in hand with economic prosperity and protecting public health.

Thank you for reading.

BRYCE BIRD

Director, Division of Air Quality
Utah Department of Environmental Quality
President, AAPCA
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Introduction

Published annually since 2017, *State Air Trends & Successes: The STATS Report* spotlights state and local air agencies as fundamental to the significant improvement in air quality that has been achieved in the United States. Working as co-regulators with the U.S. Environmental Protection Agency (EPA) to implement and enforce the federal Clean Air Act, air agencies bring deep on-the-ground experience working directly with communities, necessary technical expertise, and a vast knowledge of resident social and environmental factors. State, local, and tribal governments, in this frontline role, are uniquely situated to bridge public information gaps and contribute to an informed approach to new and emerging environmental priorities.

In support of these agencies, *The STATS Report* by the Association of Air Pollution Control Agencies (AAPCA) catalogues key trends and metrics that are publicly available from federal, state, and local agencies (see page 6 of this report, “Types of Air Quality Data and Metrics”). This report includes data for criteria pollutant concentrations and emissions, hazardous air pollutants (or air toxics), greenhouse gases, and visibility in national parks. This report also details trends for economic and social indicators like Gross Domestic Product, energy production, and population to provide important context. While the United States has seen tremendous growth in the five decades since the federal Clean Air Act was passed, trends for air quality show consistent, sustained improvement, with drastic reductions in the emissions and ambient concentrations of pollutants.

As with previous editions, *State Air Trends & Successes: The STATS Report* is in three parts. The first section details trends for the 21 state members of AAPCA, which have shown leadership in their responsibility for protecting and improving the air quality for more than 144 million Americans, more than 43 percent of the U.S. population. The second section of this report attempts to place the United States’ substantial air quality progress in an international context, demonstrating the nation as a clear leader on the world stage. In the third and last section, *The STATS Report* covers an array of national trends, all of which show markedly improved air quality in the United States.

Data to Improve Public Perception

*The STATS Report* also seeks to help “bridge the gap” between the often-negative public perception about the quality of the environment and what the data show. In reporting on its annual poll on the environment in April 2022, Gallup found that “For the seventh straight year, U.S. public concern about the quality of the environment is near its two-decade high, with 44% of Americans worrying ‘a great deal’ about it.” *Data from the same poll* (conducted March 1–18, 2022) show that 43 percent of respondents rated the overall quality of the country’s environment as “Only fair” and 59 percent of respondents indicated that the quality of the environment is “Getting worse.” In fact, Gallup’s data since 2001 consistently shows more of the U.S. public (never less than 48 percent) thinks overall environmental quality is “Getting worse” versus “Getting better” (never above 42 percent).

While polls are not definitive of public perception, they can provide key insight that can assist governments in engaging citizens. In addition to the above polling data on the environment, 75 percent of respondents stated they worry about air pollution either a “Great deal” (45 percent) or a “Fair amount” (30 percent), as opposed to “Only a little” (17 percent) or “Not at all” (8 percent). Concerns about the environment and air pollution, as shown in this report, do not align with the metrics and national trends found in air monitoring data and analysis – and, in fact, seem to run counter to readily available information.

With views today often driven by national narratives, the gap in public perception and data on the environment suggest that state and local agencies, as technical, planning, and jurisdictional experts, can provide needed guidance and insight for communities. This suggestion is somewhat underscored by *Gallup polls* last undertaken in 2000 and 2005 that found respondents trust state environmental agencies a “Great deal” or “Moderate amount,” about as much as “Federal environmental agencies like the EPA.” With this public trust, state and local agencies are well-situated for engaging stakeholders and communities with an understanding of the potentially broad impacts of complex, federal policy.

Looking to State and Local Agencies

The U.S. EPA updated *strategic plan*, released in March 2022, asserts that “states and local governments serve as primary implementers of many of the nation’s environmental laws,” and are “critical to the development, implementation, and enforcement of the nation’s environmental programs.” As *The STATS Report* underscores, the Clean Air Act’s framework of cooperative federalism that centers state and local governments as co-regulators with U.S. EPA has resulted in cleaner, clearer, and healthier air. Often the first contact for citizens, air agencies are not only primary implementers of the Clean Air Act, but also serve as vital checkpoints for emerging issues. They are responsible for timely, informed, and reasoned responses that meet community and stakeholder expectations, and are transparent and understandable by the public.

The successes catalogued in AAPCA’s *State Air Trends & Successes: The STATS Report* result from cooperation between state, local, and tribal entities, U.S. EPA, and the regulated community. Working with these partners to meet new and evolving environmental priorities, state and local air agencies must perform detailed processes that include planning, modeling, monitoring, developing emissions inventories and rules, permitting, and inspections, among others. At the helm of these resource-intensive and complex activities, these agencies have been creative and developed best practices to meet – and exceed – their responsibilities under the Clean Air Act.

And, as this report demonstrates, placing state and local air agencies in a leadership position can help the nation continue to meet critical environmental and public health goals.
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.”

NAAQS have been set for six “criteria” pollutants: carbon monoxide (CO), sulfur dioxide (SO₂), ground-level ozone (O₃), fine particulate matter (PM₂·₅), lead (Pb), and nitrogen dioxide (NO₂). Individual NAAQS may differ in form (for example, annual fourth-highest daily maximum 8-hour concentration average over three years, for ozone), level² (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 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) from source reporting.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 SO₂, nitrogen oxides (NOₓ), and hazardous air pollutants, as well as carbon dioxide (CO₂).¹²

Additionally, greenhouse gas data are pulled primarily from U.S. EPA’s annual Inventory of U.S. Greenhouse Gas Emissions and Sinks¹³ and U.S. EIA reports, such as the Annual Energy Outlook, which includes CO₂ emissions data from energy sources.¹⁴

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 (µg/m³).”
3. A chart of the primary and secondary NAAQS by pollutant, which includes averaging time, level, and form, can be found here.
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 – 2021 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.”
10. U.S. EPA, Toxics Release Inventory (TRI) Program. Annual TRI National Analysis here. Note: 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.”
Economic Growth and Air Quality in AAPCA Member States

Over the past two decades, AAPCA Member States have overseen a 52 percent reduction in the combined emissions of the pollutants (or pollutant precursors) for which there are national ambient air quality standards, or NAAQS. These significant decreases have improved air quality while these states have experienced the following economic and social indicator growth:

- A 50 percent increase in Gross Domestic Product (GDP) from 2000 through 2021, including accounting for about 38 percent of total U.S. GDP in 2021;
- A 16 percent increase in vehicle miles traveled from 2000 to 2020; and,
- A population increase of 25 percent in the last 20 years, representing 43 percent of the total U.S. population in 2021.

From 2000 through 2019, states in AAPCA’s membership saw a 59 percent increase in energy production and produced nearly 65 percent of total U.S. energy in 2019. During the same period, AAPCA Member States were also responsible for a 12 percent reduction in energy-related carbon dioxide (CO₂) emissions.


"More than 50 years after the creation of EPA, states and local governments serve as primary implementers of many of the nation’s environmental laws. Due to these unique relationships, the early, meaningful, and substantial involvement of EPA’s co-regulator partners is critical to the development, implementation, and enforcement of the nation’s environmental programs."

U.S. EPA’s online Green Book “provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment status.”⁷ According to the online database, 47 areas in the United States were designated nonattainment or maintenance for the 2008 ozone national ambient air quality standard (NAAQS) of 0.075 parts per million (ppm), determined using the annual fourth-highest daily maximum 8-hour concentration, averaged over three years.⁸

U.S. EPA develops design values⁹ based on monitoring data from the Agency’s Air Quality System (AQS).¹⁰ Of the designated areas, 13 are located partially or fully in AAPCA Member States, with the chart below detailing the percent change in design values over two decades, a period in which AAPCA Member States averaged a 24 percent reduction in ambient concentrations of ozone.¹¹

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Atlanta, GA</td>
<td>-34.58%</td>
</tr>
<tr>
<td>Baton Rouge, LA</td>
<td>-24.18%</td>
</tr>
<tr>
<td>Charlotte-Rock Hill, NC-SC</td>
<td>-33.66%</td>
</tr>
<tr>
<td>Chicago-Naperville, IL-IN-WI</td>
<td>-18.95%</td>
</tr>
<tr>
<td>Cincinnati, OH-KY-IN</td>
<td>-22.11%</td>
</tr>
<tr>
<td>Cleveland-Akron-Lorain, OH</td>
<td>-20.43%</td>
</tr>
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<td>Columbus, OH</td>
<td>-26.37%</td>
</tr>
<tr>
<td>Dallas-Fort Worth, TX</td>
<td>-24.75%</td>
</tr>
<tr>
<td>Houston-Galveston-Brazoria, TX</td>
<td>-28.18%</td>
</tr>
<tr>
<td>Knoxville, TN</td>
<td>-35.71%</td>
</tr>
<tr>
<td>Memphis, TN-MS-AR</td>
<td>-27.96%</td>
</tr>
<tr>
<td>Phoenix-Mesa, AZ</td>
<td>-7.06%</td>
</tr>
<tr>
<td>Upper Green River Basin, WY*</td>
<td>-2.78%</td>
</tr>
</tbody>
</table>

*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.

AAPCA Member States: Percent Change in Design Value for Areas Previously Designated Nonattainment or Maintenance for the 2008 Ozone NAAQS (1999–2001 through 2018–2020 Design Values)

*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.

AAPCA Member States: Design Value History for Areas Previously Designated Nonattainment or Maintenance for the 2008 Ozone NAAQS (1999-2001 through 2018-2020 Design Values)

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<tbody>
<tr>
<td>Concentration (ppm)</td>
<td>Atlanta, GA</td>
<td>Baton Rouge, LA</td>
<td>Charlotte-Rock Hill, NC-SC</td>
<td>Chicago-Naperville, IL-IN-WI</td>
<td>Cincinnati, OH-KY-IN</td>
<td>Cleveland-Akron-Lorain, OH</td>
<td>Columbus, OH</td>
<td>Dallas-Fort Worth, TX</td>
<td>Houston-Galveston-Brazoria, TX</td>
<td>Knoxville, TN</td>
<td>Memphis, TN-MS-AR</td>
<td>Phoenix-Mesa, AZ</td>
<td>Upper Green River Basin, WY</td>
<td>AAPCA Member State Average</td>
<td></td>
<td></td>
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According to U.S. EPA’s Green Book, 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 (μg/m$^3$), measured by the three-year average annual mean concentration.$^{12}$

The table below lists the percent change in design values over the previous two decades for the 23 designated areas that are partially or completely within AAPCA Member States, which had an average reduction in PM$_{2.5}$ concentrations of above 50 percent.$^{13}$

<table>
<thead>
<tr>
<th>Designated Area</th>
<th>Percent Reduction in PM$_{2.5}$ Concentrations (1999-2001 through 2018-2000 Design Values)</th>
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<tbody>
<tr>
<td>Atlanta, GA</td>
<td>-55.19%</td>
</tr>
<tr>
<td>Birmingham, AL</td>
<td>-53.70%</td>
</tr>
<tr>
<td>Canton-Massillon, OH</td>
<td>-50.82%</td>
</tr>
<tr>
<td>Charleston, WV</td>
<td>-59.24%</td>
</tr>
<tr>
<td>Chattanooga, TN-GA-AL</td>
<td>-57.14%</td>
</tr>
<tr>
<td>Chicago-Gary-Lake County, IL-IN</td>
<td>-49.52%</td>
</tr>
<tr>
<td>Cincinnati-Hamilton, OH-KY-IN</td>
<td>-39.90%</td>
</tr>
<tr>
<td>Cleveland-Akron-Lorain, OH</td>
<td>-54.19%</td>
</tr>
<tr>
<td>Columbus, OH</td>
<td>-51.11%</td>
</tr>
<tr>
<td>Dayton-Springfield, OH</td>
<td>-42.77%</td>
</tr>
<tr>
<td>Evansville, IN</td>
<td>-46.75%</td>
</tr>
<tr>
<td>Greensboro-Winston Salem-High Point, NC</td>
<td>-48.84%</td>
</tr>
<tr>
<td>Hickory-Morganton-Lenoir, NC</td>
<td>-52.66%</td>
</tr>
<tr>
<td>Huntington-Ashland, WV-KY-OH</td>
<td>-65.91%</td>
</tr>
<tr>
<td>Indianapolis, IN</td>
<td>-37.50%</td>
</tr>
<tr>
<td>Knoxville, TN</td>
<td>-59.50%</td>
</tr>
<tr>
<td>Louisville, KY-IN</td>
<td>-41.62%</td>
</tr>
<tr>
<td>Macon, GA</td>
<td>-51.14%</td>
</tr>
<tr>
<td>Martinsburg-Hagerstown, WV-MD</td>
<td>-48.75%</td>
</tr>
<tr>
<td>Parkersburg-Marietta, WV-OH</td>
<td>-57.39%</td>
</tr>
<tr>
<td>Rome, GA*</td>
<td>-45.90%</td>
</tr>
<tr>
<td>Steubenville-Weirton, OH-WV</td>
<td>-52.20%</td>
</tr>
<tr>
<td>Wheeling, WV-OH</td>
<td>-47.88%</td>
</tr>
</tbody>
</table>

*Data ends in designation year 2014–2016

AAPCA Member States: Percent Change in Design Value for Areas Previously Designated Nonattainment or Maintenance for the 1997 PM$_{2.5}$ NAAQS (1999–2001 through 2018–2020 Design Values)

Source: U.S. EPA, Air Quality Design Values (Data file: “PM$_{2.5}$ Design Values, 2020”).
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 (1999–2001 through 2018–2020 Design Values)

Source: U.S. EPA, Air Quality Design Values (Data file: "PM$_{2.5}$ Design Values, 2020").
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 2016:

### 2021

**COVID-19 Air Quality Inspection/Compliance Determinations**  
Arizona Department of Environmental Quality

**Efficiencies in the Data Quality Review of Ambient Air Monitoring Data**  
Georgia Environmental Protection Division

**NESHAP 6H Reg Nav Tool**  
North Carolina Division of Environmental Assistance and Customer Service

**Shiny Dashboard for Remote Monitoring of Air Quality Data**  
Tennessee Department of Environment & Conservation

### 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

**Toxicity Factors Database**  
Texas Commission on Environmental Quality

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

### 2017

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

**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

### 2016

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

Presentations from past winners can be found on AAPCA’s website: [www.cleanairact.org](http://www.cleanairact.org)
Emissions Reductions in the Electricity Sector

In 2019, AAPCA Member States produced about 62,500,000 billion British thermal units (Btus) of energy, a 59 percent increase from 2000. Through 2021, AAPCA Member States oversaw significant reductions in the emissions of sulfur dioxide (SO₂) and oxides of nitrogen (NOₓ) from the electricity sector, specifically:

• SO₂ emissions decreased 92 percent, from 7,322,232 tons in 2000 to 556,097 tons in 2021; and,
• NOₓ emissions went from 3,405,187 tons in 2000 to 480,603 tons in 2021, a decline of 86 percent.

AAPCA Member States: Energy Production Compared to SO₂ and NOₓ Emissions from the Electricity Sector Since 2000


In February 2022, U.S. EPA released the 2021 annual emissions data for power plants, highlighting the following trends compared to 2020:

• A 20 percent increase in sulfur dioxide (SO₂) emissions, a 92 percent reduction from 1995 levels;
• A 6 percent increase in nitrogen oxides (NOₓ) emissions, down 87 percent from 1995 levels; and,
• A 7 percent increase in carbon dioxide (CO₂) emissions, 21 percent below 1995 levels.

AAPCA Member States: Share of SO₂ Emissions Reductions in the Electricity Sector, 1990–2020
(tons of SO₂ reduced)

Data from U.S. EPA’s Clean Air Markets Programs show that the United States reduced electricity sector sulfur dioxide (SO₂) emissions by 95 percent from 1990 to 2020, from 15.7 million tons to 788 thousand tons—a 14.9-million-ton decline.

AAPCA Member States accounted for nearly 65 percent of these SO₂ emissions reductions, lowering SO₂ emissions from 10.1 million tons in 1990 to 490 thousand tons in 2020.

AAPCA Member States: Percent Reduction in SO₂ Emissions from the Electricity Sector, 1990–2020

AAPCA Member States: Share of NO\textsubscript{x} Emissions Reductions in the Electricity Sector, 1990–2020 (tons of NO\textsubscript{x} reduced)

U.S. EPA’s Clean Air Markets Programs data also reveal a national reduction in nitrogen oxides (NO\textsubscript{x}) emissions from the electricity sector of 89 percent from 1990 to 2020, from 6.4 million tons to 737 thousand tons.

Of the 5.6-million-ton decrease in NO\textsubscript{x} emissions, AAPCA Member States accounted for 3.46 million tons (61 percent), from 3.94 million tons in 1990 to 480 thousand tons in 2020.\textsuperscript{18}

AAPCA Member States: Percent Reduction in NO\textsubscript{x} Emissions from the Electricity Sector, 1990–2000

Greenhouse Gases and Energy

From 2000 to 2019, energy-related carbon dioxide (CO₂) emissions in AAPCA Member States declined 12 percent, from 3,106 million metric tons in 2000 to 2,736 million metric tons in 2019, while energy production increased 59 percent.¹⁹

AAPCA Member States: Total Energy Production Compared to Energy-Related Carbon Dioxide Emissions, 2000–2019

Since 2000, states in AAPCA’s membership saw Gross Domestic Product (GDP) increase 50 percent while overseeing an average decline in carbon intensity of the economy of 33 percent.²⁰ By 2019, AAPCA Member States also reduced energy intensity by an average of 25 percent from 2000 levels.²¹

AAPCA Member States: Percent Reduction in Carbon Intensity of the Economy, 2000–2019


Shining Rock Wilderness Area, a part of Pisgah National Forest in the southwestern region of North Carolina, was one of the original Wild areas designated under the Wilderness Act of 1964. Shining Rock Wilderness Area currently includes 18,483 acres and is home to Cold Mountain, the tallest of three peaks exceeding 6,000 feet within the Wilderness boundaries. The 10-mile range known as Shining Rock Ledge, which includes the white quartz outcrop for which the Wilderness was named, offers stunning views of the area’s forested hills, grassy balds and valleys cut by numerous streams feeding the east and west forks of the Pigeon River.

Through the collaborative effort of state, local and federal stakeholders, visibility in the Shining Rock Wilderness Area has improved greatly over the last two decades due to significant reductions in sulfur dioxide (SO₂) and nitrogen oxides (NOₓ) emissions driven initially by the emissions caps required by the State’s Clean Smokestacks Act adopted in 2002 and subsequent controls on other stationary and mobile sources. Statewide, SO₂ and NOₓ emissions have decreased by 93 percent and 62 percent respectively from 2002 to 2017. Visibility on the 20 percent most impaired days at Shining Rock Wilderness Area has increased from 15 miles in 2002 to over 51 miles in 2018. On the clearest days, visibility is over 150 miles.

The goal of the U.S. EPA’s Regional Haze Rule is for each Class I area to achieve natural visibility conditions by the year 2064. Progress is measured by comparing the 5-year average haze index (dv) to the uniform rate of progress (URP) glide path at each Class I area. The monitoring data through 2018 indicates that the Shining Rock Wilderness Area is well below the 2018 URP glide slope target (Figure 2). In fact, the haze index at Shining Rock Wilderness Area is already within 0.5 dv of meeting the 2048 URP target—almost 30 years ahead of schedule!

More on the North Carolina Division of Air Quality can be found at https://deq.nc.gov/about/divisions/air-quality
Toxic Air Releases

**AAPCA Member States: Share of Total Reduction of Toxic Air Releases Reported to the Toxic Release Inventory, 2010–2020**

U.S. EPA’s 2020 Toxic Release Inventory (TRI) National Analysis revealed a 36 percent reduction in reported toxic air releases compared to 2010, from 863.8 million pounds in 2010 to 549.6 million pounds in 2020.22

Of the more than 314-million-pound decrease in reported releases over the past 10 years, AAPCA Member States were responsible for 209 million pounds, roughly 66 percent.23

**AAPCA Member States: Annual Share of National Reduction in Reported Toxic Air Releases, 2010–2020**

Use of Low-Cost NO$_2$ Sensors to understand ozone formation in Maricopa County, Arizona

The Maricopa County Air Quality Department partnered with Arizona State University (ASU) to use Clarity Node-S low-cost sensors (LCS) to better understand how nitrogen dioxide (NO$_2$) contributes to ozone formation in Maricopa County.

Prior to the start of ozone season, 12 LCS were collocated with a federal reference method (FRM) NO$_2$ monitor and a federal equivalent method (FEM) ozone monitor (Miech et al, 2021). During the ozone season, LCS were rotated so that each sensor was collocated with an FRM NO$_2$ monitor for two weeks and then deployed to a monitoring site without an FRM NO$_2$ monitor for six weeks. This allowed ASU to develop a period-specific custom calibration for each LCS based on day or night-time, FEM ozone measurements, temperature, and relative humidity. The application of the period-specific custom calibrations improved the correlation and reduced the error between the LCS and FRM NO$_2$ data sets.

Using the calibrated LCS data, ASU compared the ratio of NO$_2$ to ozone to better understand the impact of NO$_2$ on ozone formation. The results in the figure below show that based on the log NO$_2$/O$_3$ ratios:

- The three urban core sites (SP, WP, and CP) were NO$_2$ dominated.
- Peripheral monitoring sites outside the urban core (CC, D, M, PP, and SS) were ozone dominated.
- Upwind or more rural sites (BP, NP, WC, and B) tended to have equivalent ratios of NO$_2$ to ozone at night.

These results demonstrate that LCS can aid in better understanding the distribution in NO$_2$ concentrations. However, when a high degree of accuracy is required, the use of the LCS requires a significant amount of effort to continuously calibrate the LCS using FRM NO$_2$ and FEM ozone measurements.


More on the Maricopa County Air Quality Department can be found at www.maricopa.gov/AirQuality
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 2013. U.S. EPA’s ECHO Dashboard shows the following distribution of compliance monitoring activities related to the Clean Air Act by lead agency:

- In 2021, states were the lead agency on 81,790 activities, and averaged nearly 90,000 per year from 2013 through 2021;
- In 2021, local programs were the lead agency for 20,264 activities, with an average of more than 21,000 per year from 2013 through 2021; and,
- U.S. EPA was the lead agency for 1,468 activities, averaging just under 2,000 per year since 2013.

Additionally in 2021, AAPCA Member States were the lead agency for a total of 44,815 compliance monitoring activities, nearly 55 percent of the state lead agency total.

Compliance Monitoring Strategy Activities for Air by Lead Agency, 2013-2021

"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."


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 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. In October 2021, U.S. EPA announced the reconsideration of the 2020 decision to retain the 2015 ozone standards.

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.”


12. 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$^3$. In June 2021, U.S. EPA announced the reconsideration of the 2020 decision to retain the 2012 PM$_{2.5}$ standards.


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.


American Air Quality in an International Context
Air Quality and Growth Indicator Trends in the United States

According to U.S. EPA’s June 2021 report, *Our Nation’s Air: Trends Through 2020*, the United States has reduced aggregate emissions of the six criteria air pollutants by 78 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 272 percent, Vehicle Miles Traveled (VMT) increased 154 percent, population grew 61 percent, and energy consumption went up 37 percent.2

Internationally, the United States ranks:

- First in GDP, at $20.95 trillion in 2020, representing nearly a quarter of gross world product3 and nearly $6.23 trillion more than China, the country with the second-highest GDP in 2020.4
- Second in energy production, behind China, according to International Energy Agency (IEA) data.5 From 1960 to 2019, the United States increased energy production by approximately 138 percent,6 and, in 2020, was 106 percent energy self-sufficient.7
- Third in total population, behind China and India,8 with a 61 percent increase in population from 1970 to 2021, from 203 million people to 332 million.9

"Internationally, EPA is seen as the gold standard for environmental protection, based on our commitment to science, setting of strong standards and introducing new and innovative approaches to the most persistent and difficult environmental concerns."

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.$^{10}$

**Average Annual Population-Weighted PM$_{2.5}$ Concentrations in 2019**

![Map of PM$_{2.5}$ concentrations worldwide](image)


**NASA Satellite Data | Annual-Average NO$_2$ for 2005 and 2018 Over the Globe**

Through the Ozone Monitoring Instrument aboard the Aura satellite, the National Aeronautics and Space Administration (NASA) has monitored trends for nitrogen dioxide (NO$_2$) across the globe. Satellite images from 2005 (left) and 2018 (right) show the significant progress the United States has made in NO$_2$ levels compared to the rest of the world.

![Satellite images of NO$_2$ concentrations](image)

Source: NASA Observations from Space, "NO$_2$: An Indicator of Pollution Sources and Trends," Last updated January 6, 2022. More information on the Aura satellite can be found [here](link).
International Trends | Greenhouse Gas Emissions

The International Energy Agency’s (IEA) database, Greenhouse Gas Emissions from Energy, was expanded in 2021 to include estimates of total greenhouse gas (GHG) emissions from energy and related indicators, including carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emissions from fuel combustion as well as fugitive emissions. The database estimates that “energy accounts for around three-quarters of total greenhouse gas (GHG) emissions globally.”

Of the five highest emitting nations, the United States is the only one to reduce greenhouse gas emissions from energy by more than 10 percent in the past two decades. From 2000 to 2020, provisional data from the International Energy Agency shows that the United States reduced GHG emissions from energy by 1.3 billion metric tons of carbon dioxide equivalent (CO₂e), a 22 percent decrease. From 2000 to 2019, China and India, the two highest emitting nations, saw an increase in GHG emissions from energy by 7.2 billion metric tons of CO₂e (210 percent) and 1.5 billion metric tons of CO₂e (152 percent), respectively.

Annual Percent Change of GHG Emissions from Energy by Country, 2000–2019


Global Energy and Industry CO₂ Emissions, 2021 (million tonnes CO₂)

In March 2022, IEA released the report, Global Energy Review: CO₂ Emissions in 2021, highlighting the following global CO₂ emissions trends compared to 2020:

- Global CO₂ emissions from energy combustion and industrial processes reached 36.3 gigatonnes (Gt) in 2021, a 6 percent increase from 2020;
- Coal accounted for over 40 percent of the overall growth in global CO₂ emissions in 2021, reaching a record high of 15.3 Gt; and,
- The 6 percent increase in CO₂ emissions in 2021 was coupled with a jump in global economic output of 5.1 percent.

Section Notes | American Air Quality in an International Context


8 U.S. Census Bureau, *Current Population*.

9 U.S. Census Bureau, *Population and Housing Estimates*.


Air Quality Trends in the United States
Criteria Air Pollutants | Concentration Trends

U.S. EPA’s national-level analysis of 2020 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 33 percent decline in the ambient levels of carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), and sulfur dioxide (SO₂) since 1980. Available data show that fine and coarse particulate matter (PM_{2.5} and PM_{10}) levels have declined nearly 30 percent since 2000. And more recent data point to a sustained trend of meaningful improvements, with monitored concentrations of all gaseous criteria pollutants down at least 10 percent over the past decade. U.S. EPA’s report, *Our Nation’s Air: Trends Through 2020*, states “Despite increases in air concentrations of pollutants associated with fires, carbon monoxide and particle pollution, national average air quality concentrations remain below the current, national standards.”

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<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>-81%</td>
<td>-73%</td>
<td>-57%</td>
<td>-12%</td>
</tr>
<tr>
<td>Lead</td>
<td>-98%</td>
<td>-98%</td>
<td>-93%</td>
<td>-86%</td>
</tr>
<tr>
<td>Nitrogen Dioxide (annual)</td>
<td>-67%</td>
<td>-61%</td>
<td>-53%</td>
<td>-29%</td>
</tr>
<tr>
<td>Nitrogen Dioxide (1-hour)</td>
<td>-64%</td>
<td>-54%</td>
<td>-39%</td>
<td>-21%</td>
</tr>
<tr>
<td>Ozone (8-hour)</td>
<td>-33%</td>
<td>-25%</td>
<td>-20%</td>
<td>-10%</td>
</tr>
<tr>
<td>PM_{10} (24-hour)</td>
<td>---</td>
<td>-26%</td>
<td>-27%</td>
<td>+9%</td>
</tr>
<tr>
<td>PM_{2.5} (annual)</td>
<td>---</td>
<td>---</td>
<td>-41%</td>
<td>-18%</td>
</tr>
<tr>
<td>PM_{10} (24-hour)</td>
<td>---</td>
<td>---</td>
<td>-30%</td>
<td>+3%</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>-94%</td>
<td>-91%</td>
<td>-85%</td>
<td>-74%</td>
</tr>
</tbody>
</table>


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.” U.S. EPA’s most recently published estimates, show that the emissions of all criteria pollutants and precursors declined at least 31 percent from 1990 through 2020, and at least 19 percent since 2010.

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<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>-75%</td>
<td>-70%</td>
<td>-57%</td>
<td>-29%</td>
</tr>
<tr>
<td>Lead</td>
<td>-99%</td>
<td>-87%</td>
<td>-76%</td>
<td>-30%</td>
</tr>
<tr>
<td>Nitrogen Oxides (NOₓ)</td>
<td>-70%</td>
<td>-68%</td>
<td>-64%</td>
<td>-46%</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOC)</td>
<td>-60%</td>
<td>-48%</td>
<td>-29%</td>
<td>-20%</td>
</tr>
<tr>
<td>Direct PM_{10}</td>
<td>-64%</td>
<td>-31%</td>
<td>-28%</td>
<td>-19%</td>
</tr>
<tr>
<td>Direct PM_{2.5}</td>
<td>---</td>
<td>-38%</td>
<td>-44%</td>
<td>-22%</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>-93%</td>
<td>-92%</td>
<td>-89%</td>
<td>-76%</td>
</tr>
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</table>

Criteria Air Pollutants | Emissions Trends

Percent Change in Criteria Air Pollutant Emissions Since 1990

Criteria Air Pollutant Emissions Since 1990

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 2021.¹

### Criteria Air Pollutant Sources, 2021

#### Fine Particulate Matter (PM$_{2.5}$)
- Stationary fuel combustion: 13.04%
- Industrial: 12.38%
- Wildfires: 4.18%
- Miscellaneous: 13.69%
- Transportation: 56.71%

#### Coarse Particulate Matter (PM$_{10}$)
- Stationary fuel combustion: 2.14%
- Industrial: 4.37%
- Wildfires: 4.66%
- Miscellaneous: 7.51%
- Transportation: 81.32%

#### Oxides of Nitrogen (NO$_x$)
- Stationary fuel combustion: 13.52%
- Industrial: 30.05%
- Wildfires: 2.53%
- Miscellaneous: .84%
- Transportation: 53.05%

#### Volatile Organic Compounds (VOCs)
- Stationary fuel combustion: 19.32%
- Industrial: 15.26%
- Wildfires: 11.70%
- Miscellaneous: 3.80%
- Transportation: 49.92%

#### Sulfur Dioxide (SO$_2$)
- Stationary fuel combustion: 4.95%
- Industrial: 22.13%
- Wildfires: 2.17%
- Miscellaneous: 2.25%
- Transportation: 68.50%

#### Carbon Monoxide (CO)
- Stationary fuel combustion: 7.87%
- Industrial: 52.65%
- Wildfires: 5.97%
- Miscellaneous: 13.31%
- Transportation: 20.20%

Monitoring Criteria Pollutants by Satellite | Nitrogen Dioxide

Using the Aura Ozone Monitoring Instrument, the Health and Air Quality Applied Science Team (HAQAST) at the National Aeronautics and Space Administration (NASA) mapped the annual mean observations for tropospheric NO₂ since 2005. By 2019, “the large decreases (20–50%) are associated with the implementation of state and federal regulations to reduce NOₓ emissions from power plants and cars.”

The NASA HAQAST also mapped the annual mean observations for tropospheric sulfur dioxide (SO₂) using the Aura Ozone Monitoring Instrument, most recently showing decreases from 2005 to 2017. Satellite data show that "SO₄ levels have also decreased dramatically near coal-burning power plants" in the eastern United States.

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 2021 air trends report provides visibility trends at Class I areas through 2019. Since 2000, visibility on the 20 percent clearest days has improved by 34 percent, while there has been a 24 percent improvement in visibility during the 20 percent most impaired days. 


**National Visibility Trends on Clearest Days, 2000–2019**

**National Visibility Trends on Most Impaired Days, 2000–2019**

Hazardous Air Pollutants

According to U.S. EPA’s 2020 Toxic Release Inventory National Analysis, emissions of hazardous air pollutants, or air toxics, have trended downward over the past decade, including a 9 percent decline from 2019 to 2020. From 2010 to 2020, the Agency’s analysis shows that reported on-site toxic air releases have gone from 864 million pounds in 2010 to 532 million pounds in 2020, a 38 percent reduction.\(^8\)

National Toxic Air Releases, 2010–2020


National Toxic Air Releases by Industry Sector, 2020

The Toxic Release Inventory (TRI) tracks by point source and fugitive air emissions,\(^9\) which are reported by industry to EPA as required by the Emergency Planning and Community Right-to-Know Act (EPCRA). About 21,000 facilities reported to the Toxic Release Inventory in 2020.

Facilities in the chemical manufacturing, paper manufacturing, and electric utility sectors accounted for the largest on-site air releases of TRI chemicals during 2020.

Greenhouse Gas Trends

Released in April 2022, U.S. EPA’s *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2020* documents that gross greenhouse gas emissions in the United States totaled 5,981.4 million metric tons of carbon dioxide equivalents (mmt CO₂ eq.) in 2020, a 7.3 percent decrease from 1990 levels. U.S. EPA’s report also indicates that “In 2020, U.S. greenhouse gas emissions totaled 5,222 million metric tons of carbon dioxide equivalents after accounting for sequestration from the land sector. Emissions decreased from 2019 to 2020 by 11 percent... [and] were 21 percent below 2005 levels.”

Greenhouse gas (GHG) emissions in 2020 were from the following primary economic sectors:

- 27 percent from transportation, up 6.6 percent from 1990;
- 25 percent from electricity generation, down 21.2 percent from 1990;
- 24 percent from industry, a decrease of 13.7 percent since 1990;
- 11 percent from agriculture, a 6.4 percent increase since 1990;
- 7 percent from commercial, down 0.4 percent from 1990; and,
- 6 percent from residential, a 4.9 percent rise from 1990.

U.S. EPA’s Inventory analysis also shows that, from 2000 to 2020, the United States saw a 20 percent decline in carbon dioxide emissions (1,300.7 mmt CO₂ eq. reduction) and a 9 percent decline in methane emissions (67.7 mmt CO₂ eq. reduction). The Inventory found: “Emissions decreased from 2019 to 2020 by 11 percent (after accounting for sequestration from the land sector). The primary driver for the decrease was an 11 percent decrease in CO₂ emissions from fossil fuel combustion. The decrease was primarily due to a 13 percent decrease in transportation emissions driven by decreased demand due to the ongoing COVID-19 pandemic. Electric power sector emissions also decreased 10 percent, reflecting both a slight decrease in demand from the COVID-19 pandemic and a continued shift from coal to less carbon intensive natural gas and renewables.”

Emissions decreased from 2019 to 2020 by 11 percent (after accounting for sequestration from the land sector). The primary driver for the decrease was an 11 percent decrease in CO₂ emissions from fossil fuel combustion. The decrease was primarily due to a 13 percent decrease in transportation emissions driven by decreased demand due to the ongoing COVID-19 pandemic. Electric power sector emissions also decreased 10 percent, reflecting both a slight decrease in demand from the COVID-19 pandemic and a continued shift from coal to less carbon intensive natural gas and renewables.

Recent Headlines from the U.S. Energy Information Administration (EIA)

- EIA projects U.S. energy-related CO₂ emissions to fall in the near term, then rise | March 21, 2022
- EIA projects U.S. energy consumption will grow through 2050, driven by economic growth | March 3, 2022
- U.S. marketed natural gas production forecast to rise in 2022 and 2023 | February 17, 2022
- U.S. crude oil production forecast to rise in 2022 and 2023 to record-high levels | February 16, 2022
- Electric vehicles and hybrids surpass 10% of U.S. light-duty vehicle sales | February 9, 2022
- EIA expects U.S. fossil fuel production to reach new highs in 2023 | January 21, 2022
- EIA expects U.S. energy-related carbon dioxide emissions to increase in 2022 and 2023 | January 20, 2022
- EIA projects that energy-related carbon dioxide emissions will rise over the next 30 years | October 21, 2021
- Annual U.S. coal-fired electricity generation will increase for the first time since 2014 | October 18, 2021
- In 2020, the United States produced the least CO₂ emissions from energy in nearly 40 years | July 26, 2021
Greenhouse Gas Trends | Energy-Related Carbon Dioxide Emissions

From 1999 through 2019, the United States reduced energy-related carbon dioxide (CO₂) emissions nearly 10 percent while experiencing a 42 percent increase in total energy production, according to recent data from the U.S. Energy Information Administration, or EIA.¹³ U.S. energy-related CO₂ emissions went from 5,700 million metric tons in 1999 to 5,144 million metric tons in 2019 over the two-decade period.¹⁴


![Energy Production and CO₂ Emissions Chart]


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**Power Plant Emissions Trends | Annual CO₂ Emissions, 1995-2021**

U.S. EPA’s annual progress report on emissions from the power sector documents that CO₂ emissions from electricity generation declined by 21 percent from 1995 to 2021, during which time gross generation grew nearly 7 percent.

![Power Plant Emissions Chart]

Section Notes | Air Quality Trends in the United States


2. U.S. EPA, *Air Quality—National Summary: Emissions Trends* (updated May 26, 2021). 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.”


5. NASA HAQAST, “NO₂: An Indicator of Pollution Sources and Trends,” 2019. NO₂ data are from the Ozone Monitoring Instrument (OMI) on the NASA Aura satellite, and more information on NASA’s HAQAST can be found at: [www.haqast.org](http://www.haqast.org).

6. NASA HAQAST, “Particulate Matter & Precursors,” 2018. SO₂ data courtesy of Chris McLinden, Environment Canada (Animation: NASA), and more information on NASA’s HAQAST can be found at [www.haqast.org](http://www.haqast.org).


9. 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.”


Air Quality Resources

AAPCA STATE AGENCIES

• Alabama Department of Environmental Management
• Arizona Department of Environmental Quality
• Arkansas Division of Environmental Quality
• Florida Department of Environmental Protection
• Georgia Environmental Protection Division
• Hawaii Department of Health
• Indiana Department of Environmental Management
• Kentucky Division for Air Quality
• Louisiana Department of Environmental Quality
• Maine Department of Environmental Protection
• Mississippi Department of Environmental Quality
• 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 & 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

• Asheville-Buncombe Air Quality Agency (NC)
• Butte County Air Quality Management District (CA)
• Canton City Health Department Air Pollution Control Division (OH)
• Chattanooga-Hamilton County Air Pollution Control Bureau (TN)
• City of Fort Worth Environmental Quality Division (TX)
• City of Huntsville Natural Resources Office (AL)
• City of Indianapolis (IN)
• El Dorado County Air Pollution Control District (CA)
• Environmental Protection Commission of Hillsborough County (FL)
• Forsyth County Office of Environmental Assistance & Protection (NC)
• Galveston County Health District, Air & Water Pollution Services (TX)
• Jefferson County Department of Health, Air & Radiation Protection Division (AL)
• Knox County Air Quality Management (TN)
• Louisville Metro Air Pollution Control District (KY)
• Manatee County Environmental Protection Division (FL)
• Maricopa County Air Quality Department (AZ)
• Mecklenburg County Air Quality (NC)
• Mojave Desert Air Quality Management District (CA)
• Nashville-Davidson Metro Public Health Department (TN)
• Omaha Air Quality Control Division (NE)
• Orange County Air Quality Management (FL)
• Pinellas County Air Quality Monitoring Program (FL)
• San Joaquin Valley Air Pollution Control District (CA)
• Shelby County Health Department (TN)
• Toledo Division of Environmental Services (OH)
• Ventura County Air Pollution Control District (CA)
• Yolo-Solano Air Quality Management District (CA)

ADDITIONAL AIR QUALITY RESOURCES

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

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