SIX PRINCIPAL POLLUTANTS

To protect public health and the environment, EPA has established, and regularly reviews, national ambient air quality standards (NAAQS) for six principal air pollutants: ground-level ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and lead (Pb). Some of these pollutants (CO, SO_2, and lead) are emitted directly from a variety of sources. Ozone is not directly emitted, but is formed when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight. NO_2 is formed in the air through the oxidation of nitric oxide (NO). PM, also known as particle pollution, can be directly emitted or formed when gaseous emissions react in the atmosphere. Particle pollution is regulated as $PM_{2.5}$, or "fine particles" with diameters less than or equal to 2.5 micrometers (μm), and PM_{10}, which includes all particles with diameters less than or equal to 10 μm.

This section discusses the six principal pollutants and shows how air quality and emissions have changed over time. Summary information across all six pollutants is presented for the time period 1980 to 2006. Several approaches are used here to look at the pollutants over time, including changes in (1) national air quality concentrations, (2) Air Quality Index "unhealthy" days, (3) air quality in nonattainment areas, and (4) national emissions.

NATIONAL AIR QUALITY CONCENTRATIONS

Figure 1 shows national trends in the principal pollutants relative to their air quality standards, as measured by monitors located across the country. Most pollutants show a steady decline throughout the time period with a couple of exceptions. For example, lead declined in the 1980s and remained low for the remainder of the time period. Ozone declined in the 1980s, leveled off in the 1990s, and showed a notable decline after 2002. Most of the pollutants show a smooth, gradual trend from year to year, while ozone and $PM_{2.5}$ trends are not smooth and show year-to-year influences of weather conditions which contribute to their formation in the air.

All of the six principal pollutants show improvement over the 27-year period. While progress has been made nationally, there are still areas that have local air quality problems caused by one or more pollutants. Ozone and fine particle pollution continue to present air quality concerns throughout much of the U.S., with many monitors measuring concentrations above, or close to, national air quality standards.

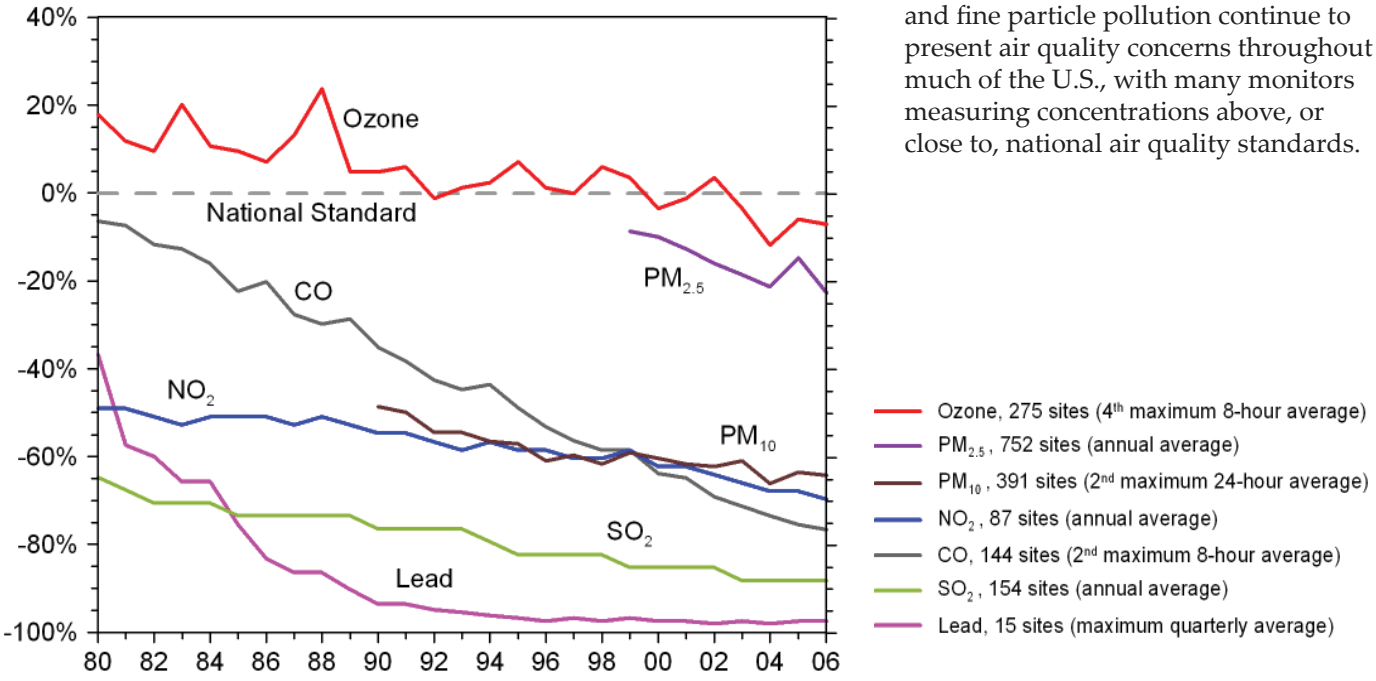


Figure 1. Comparison of national levels of the six principal pollutants to national ambient air quality standards, 1980-2006. National levels are averages across all sites with complete data for the time period.

Note: Air quality data for PM_{10} and $PM_{2.5}$ start in 1990 and 1999, respectively.

AIR QUALITY INDEX "UNHEALTHY" DAYS

The Air Quality Index (AQI) relates daily air pollution concentrations for ozone, $PM_{2.5}$, NO_2, CO, and SO_2 to health concerns for the general public. Daily forecasts allow people to take steps to protect their health when air pollution reaches levels that are unhealthy for them. Figure 2 shows how selected metropolitan areas fared in 2006 relative to previous years. Most areas had fewer unhealthy days in 2006 compared with the previous five years. Notable exceptions were Atlanta and Kansas City, with six more unhealthy days each in 2006 than the average of the previous five years. Most of the unhealthy days are due to ozone and/or particle pollution. Later in this report, the number of unhealthy days for ozone and particle pollution are shown separately.

EPA's Air Quality Index (AQI)

EPA provides an AQI based on five of the six principal pollutants: ozone, $PM_{2.5}$, NO_2, CO, and SO_2. The AQI indicates a level of health concern. A value of 100 generally corresponds to the national air quality standard for each pollutant. Values below 100 are generally thought of as satisfactory. Values above 100 are considered to be unhealthy—at first for certain sensitive groups of people, then for everyone as the AQI values increase. For more information about the AQI, visit http://www.airnow.gov.

AQI AIR QUALITY INDEX

Air Quality Index (AQI) Values	Levels of Health Concern
0 to 50	Good
51-100	Moderate
101-150	Unhealthy for Sensitive Groups
151-200	Unhealthy
201-300	Very Unhealthy
301 to 500	Hazardous

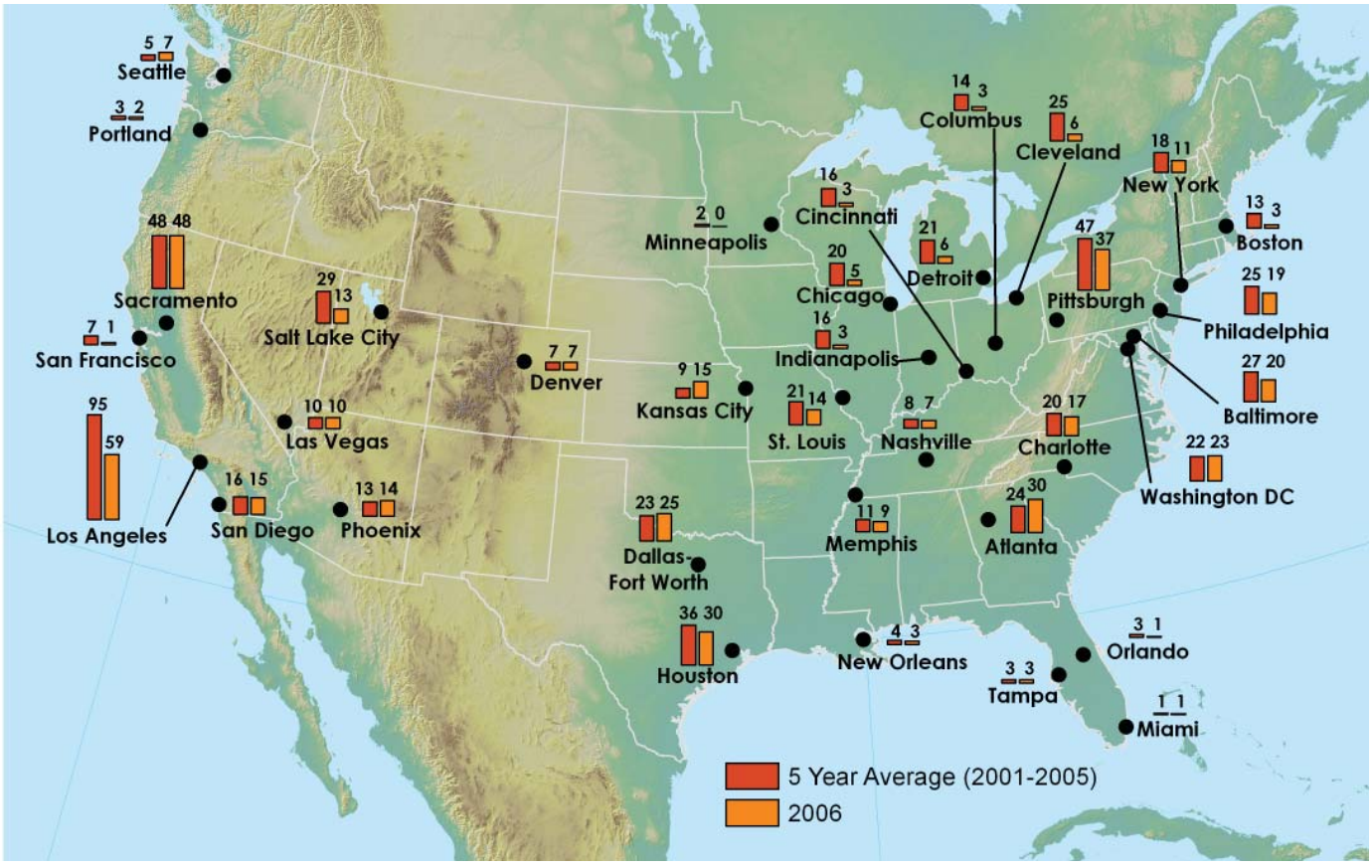


Figure 2. Number of days reaching Unhealthy for Sensitive Groups on the Air Quality Index for five of the six principal pollutants for 2001-2005 (average) vs. 2006.

AIR QUALITY IN NONATTAINMENT AREAS

Many areas of the country where air pollution levels exceeded the NAAQS have been designated "nonattainment." Under the Clean Air Act, EPA and state, tribal, and local air quality planning agencies work together to develop air quality management plans to address the air pollution in these areas. Each year, EPA tracks air quality progress in areas identified as nonattainment by reviewing changes in measured concentrations with respect to the standards. Figure 3 shows which of these areas are above or below one or more of the standards as of 2006, using the most recent year(s) of data.

Air quality has improved in the areas that were originally designated nonattainment across all six principal pollutants. All of the original areas designated as nonattainment for NO_2, CO, and SO_2 had air quality levels below their respective standards as of December 2006. Only one area was above the standard for lead, Herculaneum, Mo. For ozone, annual $PM_{2.5}$, and PM_{10}, a number of areas were above the standards: 35, 32, and 41 areas, respectively. Even though many areas were above the standard, there have been improvements in the concentration levels in the nonattainment areas. For example, the ozone areas showed an 11 percent improvement, and the annual $PM_{2.5}$ areas showed a 6 percent improvement between the time of designation and 2006.

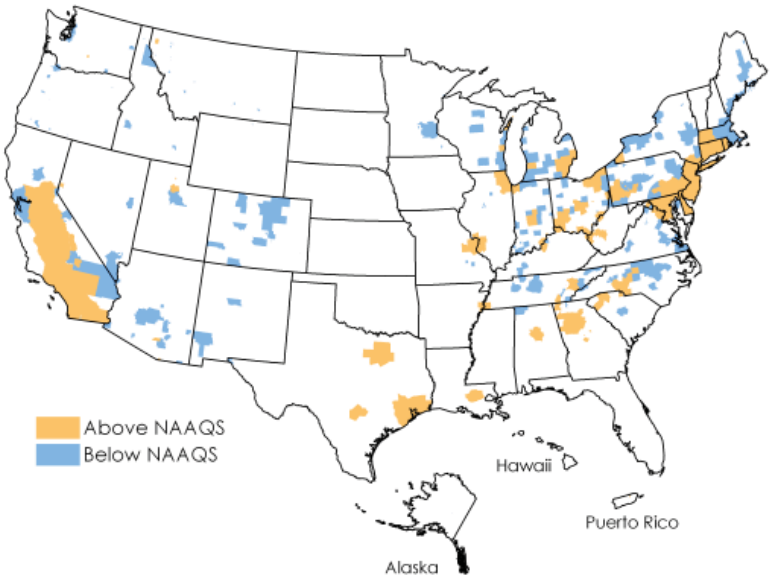


Figure 3. Status of original nonattainment areas for one or more standards (i.e., ozone, annual $PM_{2.5}$, PM_{10}, NO_2, CO, SO_2, and lead) as of 2006.

Notes: To determine NAAQS attainment, typically an average of multiple years of data is required for comparison with the standard. For information about Air Trends Design Values, visit http://www.epa.gov/air/airtrends/values.html.

Review of the National Ambient Air Quality Standards

The Clean Air Act requires EPA to set two types of NAAQS for the principal air pollutants:

- ***primary standards*** to protect public health with an adequate margin of safety, including the health of sensitive populations such as asthmatics, children, and the elderly; and
- ***secondary standards*** to protect public welfare from adverse effects, including visibility impairment and effects on the environment (e.g., vegetation, soils, water, and wildlife).

The Clean Air Act requires periodic review of the science upon which the standards are based and the standards themselves. The current standards and the status of each review are shown below.

Pollutant	Primary Standard(s)	Secondary Standard(s)	Status of Review
$PM_{2.5}$	15 µg/m³ (annual) 35 µg/m³ (daily)	Same as Primary	Review completed 2006 (daily $PM_{2.5}$ standard strengthened and annual PM_{10} standard revoked)
PM_{10}	150 µg/m³ (daily)	Same as Primary	Next review initiated 2007
O_3	0.08 ppm (8-hour)	Same as Primary	Proposed tightening primary and secondary standards July 2007; final decision March 2008
Pb	1.5 µg/m³	Same as Primary	To be completed September 2008
NO_2	0.053 ppm (annual)	Same as Primary	To be completed 2010
SO_2	0.03 ppm (annual) 0.14 ppm (daily)	0.5 ppm (3-hour)	To be completed 2010
CO	9 ppm (8-hour) 35 ppm (1-hour)	None	Schedule under development

Units of measure are parts per million (ppm) or micrograms per cubic meter of air (µg/m³). For more information about the standards, visit http://www.epa.gov/ttn/naaqs/.

NATIONAL EMISSIONS

EPA tracks direct emissions of air pollutants and emissions that contribute to air pollution formation. Emissions data are compiled from many different sources, including industry and state, tribal, and local agencies. Some emissions data are based on actual measurements, while others are estimates.

Since 1980, emissions of the six principal pollutants have declined significantly, with the greatest drop in lead, as shown in Figure 4. The removal of lead from gasoline is primarily responsible for the 97 percent decrease in lead emissions.

During that same time period, NO_x emissions have dropped by one third, and VOC, SO_2, and CO emissions have been cut by roughly one half. Combined, the emissions of the six principal pollutants dropped 49 percent since 1980, as shown in Figure 5.

All of this progress has occurred while the U.S. economy continued to grow, Americans drove more miles, and population and energy use increased. These emission reductions resulted from a variety of control programs, from regulations at the federal, state, local, and regional level to voluntary partnerships between federal, state, local, and tribal governments, academia, industrial groups, and environmental organizations.

The following sections provide more information on each pollutant, including where the pollutant comes from, its health and environmental effects, and more detailed trends in air quality and emissions between 1990 and 2006. The ozone and $PM_{2.5}$ sections also show how these two pollutants are affected by weather and the extent to which they contribute to the number of unhealthy days in selected cities. In addition, the $PM_{2.5}$ section includes regional trends for the different components of $PM_{2.5}$.

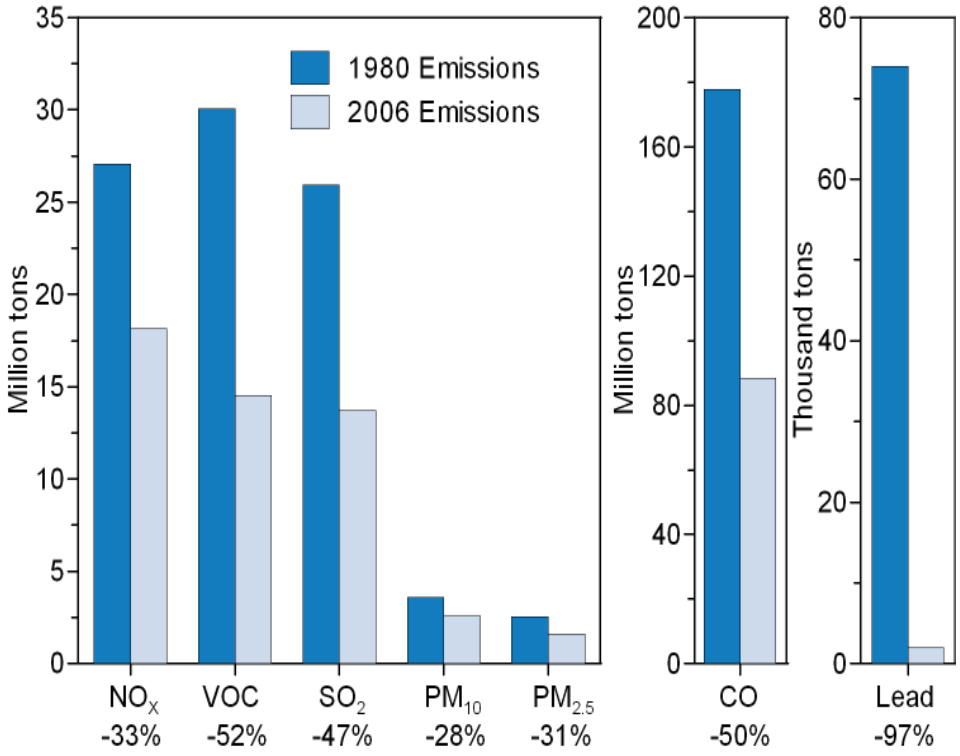


Figure 4. Comparison of national annual emissions, 1980 vs. 2006.

Notes:
$PM_{2.5}$ estimates are for 1990 vs. 2006.
PM_{10} estimates are for 1985 vs. 2006.

Emissions Used in this Report

- PM emissions are direct emissions only.
- PM emissions do not include condensibles, fires, or dust sources.
- VOC and NO_x emissions are from anthropogenic (human activity) sources only.
- In most cases, emission trends for major sources are shown.
- Emissions were derived from 1996, 1999, and 2002 inventories, except for NO_x and SO_2 emissions from electric generating units, which come from measured data.
- Emissions inventories are compiled using the best methods and measurements available at the time.

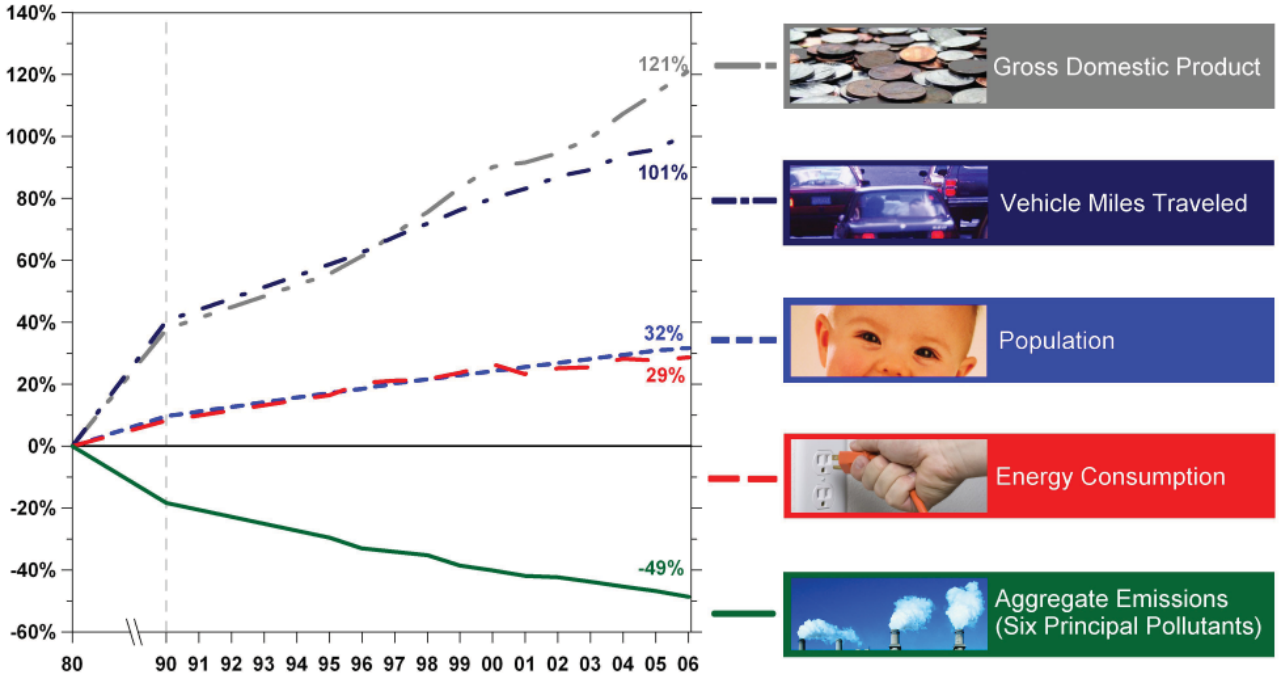
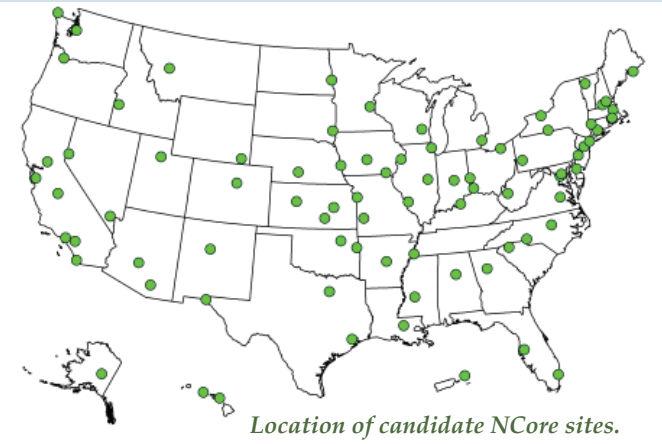


Figure 5. Comparison of growth measures and emissions, 1980-2006.

New National Monitoring Network



Location of candidate NCore sites.

The National Core Monitoring Network (NCore) will provide a network of monitoring sites (owned and operated by cities and states) that measure the principal pollutants (ozone, particles, NO_2, CO, SO_2, and lead), related gases (like VOCs and NO_x), and basic meteorology. NCore is primarily designed to measure very low-level concentrations to support air quality analyses and health effects studies. Sites will be placed in urban (about 55 sites) and rural (about 20 sites) locations throughout the country to help characterize regional and urban air pollution. Information provided by this network will improve our understanding of the relationships among air quality pollutants and meteorology. For information about the NCore network, visit http://www.epa.gov/ttn/amtic/files/ambient/monitorstrat/naamstrat2005.pdf.