Thirty Years of Clean Air Progress

Jeffrey R. Holmstead

AP/WWP Photo by Eric Risberg
San Franciscans enjoy clear skies over their California city in April 2005.

The United States made the connection between polluted air and public health decades ago and has worked steadily to reduce harmful emissions, down fully half in 30 years. As science has revealed more about the risks of various pollutants, efforts to monitor, control, and even eliminate these substances have grown ever more ambitious.

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By virtually any measure, the air we breathe in the United States is cleaner today than at any time since we started monitoring air quality back in 1970. This success is all the more remarkable because there was relatively little public interest in air pollution until the 1960s. In fact, it was not until the Clean Air Act of 1963 that the United States began to focus its attention on the link between air pollution and public health. Since then, we have seen the Clean Air Act strengthened and improved—most notably with amendments in 1970, 1977, and 1990.

Where We Are Today

Under the Clean Air Act, the Environmental Protection Agency (EPA) has focused on six key air pollutants that have a significant impact on public health and the environment: ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. Since President Nixon signed the 1970 Clean Air Act, emissions of these pollutants have been cut by more than half—from 273 million metric tons of annual emissions to 133 million metric tons. The reductions for individual pollutants are just as impressive. Over the same period, emissions of lead decreased 98 percent, volatile organic compounds (contributors to ground level smog) 54 percent, carbon monoxide (CO) 52 percent, sulfur dioxide (SO_2) 49 percent, and nitrogen oxides (NOx) 24 percent.

Perhaps most impressive, these reductions in air pollution came during a period of robust economic growth. Between 1970 and today, the U.S. economy grew by more than 187 percent, the number of vehicle miles traveled in the United States increased by 171 percent, and U.S. energy consumption grew by 47 percent.

Particle Pollution—Major Health Threat

Over the past decade, we have learned that particulate pollution, and especially fine particulate matter such as dust and soot (generally referred to as PM fine or PM2.5 which is particulate matter that is 2.5 micrometers in size) is the most serious environmental threat to public health in the United States. Researchers in government and academia estimate that elevated concentrations of fine particles are responsible for tens of thousands of the nation's premature deaths every year.

National Air Pollutant Emissions Estimates (fires and dust excluded) For Major Pollutants

Millions of Tons Per Year

	1970	1975	1980	1985[1]	1990	1995	2000[1]	2004[2]
Carbon Monoxide (CO)	197.3	184.0	177.8	169.6	143.6	120.0	102.4	87.2
Nitrogen Oxides (NOx)[3]	26.9	26.4	27.1	25.8	25.2	24.7	22.3	18.8
Particulate Matter (PM)[4] PM10	12.2[1]	7.0	6.2	3.6	3.2	3.1	2.3	2.5
PM2.5[5]	NA	NA	NA	NA	2.3	2.2	1.8	1.9
Sulfur Dioxide (SO_2)	31.2	28.0	25.9	23.3	23.1	18.6	16.3	15.2
Volatile Organic Compounds (VOC)	33.7	30.2	30.1	26.9	23.1	21.6	16.9	15.0
Lead[6]	0.221	0.16	0.074	0.022	0.005	0.004	0.003	0.003
Totals[7]	301.5	275.8	267.2	249.2	218.2	188.0	160.2	138.7

Notes:

1. In 1985 and 1996 EPA refined its methods for estimating emissions. Between 1970 and 1975, EPA revised its methods for estimating particulate matter emissions.
2. The estimates for 2004 are preliminary.
3. NOx estimates prior to 1990 include emissions from fires. Fires would represent a small percentage of the NOx emissions.
4. PM estimates do not include condensable PM, or the majority of PM2.5 that is formed in the atmosphere from 'precursor' gases such as SO_2 and NOx.
5. EPA has not estimated PM2.5 emissions prior to 1990.
6. The 1999 estimate for lead is used to represent 2000 and 2004 because lead estimates do not exist for these years.
7. PM2.5 emissions are not added when calculating the total because they are included in the PM10 estimate.

Source: U.S. Environmental Protection Agency

The good news is that we have already made significant progress in reducing particle pollution. Since setting a new national standard for fine particles in 1997, EPA has worked with state and local governments on the monumental task of monitoring fine particle concentrations throughout the country. Our most recent Particle Pollution Report shows that:

- In 2003, PM2.5 concentrations were the lowest they have been since nationwide monitoring began in 1999.
- In 2003, concentrations of a related pollutant known as PM10 (10 micrometers) were the second lowest since nationwide monitoring began in 1988.
- Significantly, we have seen the biggest improvements in regions with the worst air quality problems. Between 1999 and 2003, PM2.5 levels dropped 20 percent in the Southeast, 16 percent in southern California, and 9 percent in the industrial Midwest.

Our progress toward clean air is often measured by reductions in individual air pollutants. It is also important to look beyond these environmental improvements and understand what they mean for our health and well being. Such progress means that we are living healthier, longer lives. In fact, EPA's air programs prevent tens of thousands of deaths and hundreds of thousands of illnesses every year, including cancer and long-term damage to the immune, neurological, reproductive, and respiratory systems.

Although EPA is proud of this success, we recognize that there is still more to do. Poor air quality continues to threaten people's health in many urban areas, and emissions often reduce visibility in many parts of the country, including national parks.

Programs That Work

Over the past few years, EPA has worked with government and outside experts to develop methodologies for quantifying the public health benefits of reducing air pollution. These methods, which have been reviewed by the National Academy of Sciences and are now widely accepted, allow us to focus our attention on programs that provide the greatest value to society. They also make it possible to compare the benefits of the many air pollution control programs that have been adopted over time. The top five programs, measured in terms of public health benefits, are:

- The removal of lead from gasoline (adopted by EPA in the late 1970s).
- The acid rain program (enacted by Congress in 1990 to

reduce SO_2 from power plants).

- The Clean Air Interstate Rule (adopted by EPA in 2005 to further reduce SO_2, as well as NOx, from power plants).
- The nonroad diesel rule (adopted by EPA in 2004 to reduce particulate matter and NOx from construction, farming, and other nonroad equipment).
- The heavy-duty highway vehicle and diesel sulfur rule (adopted by EPA in 2000 to reduce particulate matter and NOx diesel trucks, buses, and other on-road vehicles).

One striking thing about this list is that, even after more than 30 years of air pollution regulation, three of the top five programs in EPA history have been adopted in just the past five years—and two in the last year alone. Two developments have made this progress possible: a better understanding by government and industry of the need to address fine particle pollution (including SO_2 and NOx, which contribute to the formation of fine particulate matter), and advances in technology, especially for diesel engines and power plants.

The most recent of these rules is the Clean Air Interstate Rule (CAIR), which will dramatically reduce pollution in the eastern United States by cutting power plant emissions of SO_2 by more than 70 percent and NOx by more than 60 percent. It will also place permanent caps on emissions that lead to smog and soot. When fully implemented, CAIR will provide nearly $2 billion in visibility benefits, significantly reducing haze in eastern national parks.

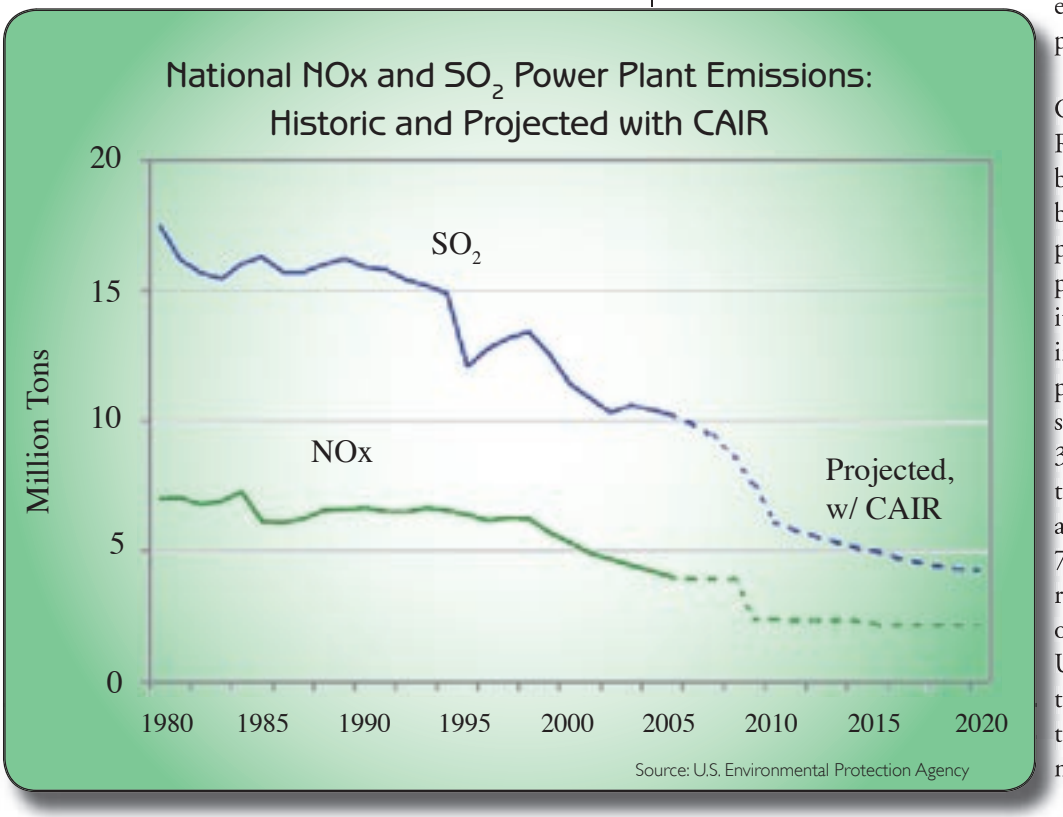
AP/WWP Photo by Dario Lopez-Mills

The World Summit for Sustainable Development meets in Johannesburg, South Africa, in August 2002.

Most importantly, CAIR will result in the greatest health benefits of any rule initiated by EPA since the late 1970s—almost $100 billion per year by 2015. By 2015, CAIR will annually prevent approximately 17,000 premature deaths; 1.7 million lost workdays; 500,000 lost school days; 22,000 nonfatal heart attacks; and 12,300 hospital admissions.

Days after CAIR was signed, EPA released a related rule designed to reduce mercury emissions from power plants. This rule, known as the Clean Air Mercury Rule, is designed to work with CAIR and provide a flexible multipollutant approach to reducing SO_2, NOx, and mercury emissions from power plants.

Like CAIR, the Clean Air Mercury Rule limits emissions by using a market-based, cap-and-trade program that will permanently cap utility mercury emissions in two phases. The first phase will reduce emissions from 48 tons to 31 tons by 2010, and the second phase will achieve a reduction of 70 percent from current levels. As a result of this action, the United States is now the only country in the world to regulate mercury emissions



Real Air in Real Time

AP/WWP Photo by Matt York

National Park Service Web cam allows views of air quality at Arizona's Grand Canyon.

The EPA has been working to reduce air pollution for more than 30 years, but the Internet has taken that pursuit to an entirely new level. Web cams allow anybody to go just about anywhere in the country to check out air quality for the day. The EPA maintains a portal for these sites at http://www.epa.gov/airnow/webcam.html

The National Park Service maintains a similar portal, providing views of the air quality over some of the most breathtaking landscapes in the nation at http://www2.nature.nps.gov/air/webcams/

The U.S. Forest Service keeps a Web cam trained on the Mt. Saint Helens volcano in the state of Washington at http://www.fs.fed.us/gpnf/volcanocams/msh/

The National Oceanic and Atmospheric Administration provides a variety of views from different points surrounding the Great Lakes in the Midwest at http://www.glerl.noaa.gov/webcams/

from coal-burning power plants.

The success of EPA's air programs is not limited to legislation and regulation. Much of our progress can be attributed to voluntary programs developed in concert with states, industry, and environmental organizations. An example of this is Energy Star, a government-backed program helping businesses and individuals protect the environment through superior energy efficiency.

Through partnerships with hundreds of organizations, Energy Star has eliminated millions of tons of greenhouse gas emissions and saved consumers money at the same time. In 2004, EPA's voluntary programs reduced greenhouse gas emissions in an amount equivalent to the greenhouse gas reductions that would be achieved by eliminating 32 million cars.

EPA's International Efforts

Because air pollution does not respect geographic boundaries, the United States has been engaged internationally to translate its domestic successes into solutions around the world. For example, less than half of the mercury deposited in the environment in the United States is from sources located in this country.

Airborne mercury is a global problem, requiring global solutions. Moreover, even if we could completely eliminate mercury deposition in the United States (from U.S. and foreign sources), many Americans would still be exposed to elevated mercury levels. Virtually all mercury exposure in the United States comes from eating mercury-contaminated fish—more than 80 percent of which comes from other parts of the world.

EPA estimates that coal combustion, chloralkali (a chlorine-containing chemical used in chemical processing, plastics, environmental services, and metal cleaning) production, mercury use in products, and mercury use in small-scale gold mining are together responsible for about 80 percent of global anthropogenic (human-generated) air emissions of mercury. It should be noted, however, that almost two-thirds of annual global mercury emissions are from natural sources such as volcanic activity and from the "re-emission" of mercury that has already been deposited in the environment.

At the February 2005 United Nations Environment Programme (UNEP) Governing Council meeting in Nairobi, the United States put forth an initiative to develop multistakeholder partnerships to improve global understanding of mercury transport and to reduce mercury releases in these key sectors. The UNEP Governing Council recognized partnerships as an important way for the world community to move forward in reducing mercury use and emissions. The United States plans to launch partnerships in these five areas over the next few months.

EPA has pursued similar partnership initiatives to address other air pollutants. Because transportation sources are the largest contributor to air pollution in urban areas

of the developing world, one of EPA's key priorities is the Partnership for Clean Fuels and Vehicles (www.unep.org/PCFV), launched at the World Summit on Sustainable Development in South Africa in August 2002. The partnership, which boasts 75 international partners from government, industry, and the nongovernmental sector, is seeking to eliminate leaded gasoline worldwide and simultaneously reduce sulfur in fuels while introducing cleaner vehicle technologies.

Eliminating leaded gasoline in Africa is a focus of the partnership and for EPA. Since 2002, the countries of sub-Saharan Africa have made huge strides in phasing out leaded gasoline. Currently, more than 50 percent of the gasoline in sub-Saharan Africa is lead-free and many more countries have set a date for complete lead phase-out. U.S. funding has supported technical expertise, stakeholder workshops, public outreach, training of gas station attendants, and blood-lead-level studies in Ghana, Kenya, Nigeria, and South Africa.

Under the umbrella of the partnership, EPA also initiated the Mexico City Diesel Retrofit Project in June 2004 in cooperation with the World Resources Institute and the U.S. Agency for International Development. The project is designed to demonstrate how the combined use of low-sulfur fuels and diesel retrofit technologies can improve air quality and reduce effects on human health. It has already shown that newer public buses retrofitted and running on ultra-low sulfur fuel can reduce up to 90 percent of particulate emissions. The Mexico City project is serving as a model for EPA projects in other areas of the world, including Beijing, China; Pune, India; Santiago, Chile; and Bangkok, Thailand.

The Future

Although challenges remain, we have made a great deal of progress in our effort to improve air quality throughout the United States. Because of actions taken over the past five years, we know that this progress will continue far into the future. We look forward to continuing our efforts in the United States and to sharing the lessons we have learned with our partners worldwide. Because pollution can be transported around the globe, these international efforts will-help improve air quality in the United States and the health and well being of people around the world. ■