

The Clean Air Act at 35



PREVENTING DEATH AND DISEASE
FROM PARTICULATE POLLUTION

EXECUTIVE SUMMARY

e

ENVIRONMENTAL DEFENSE

finding the ways that work

The Clean Air Act at 35

PREVENTING DEATH AND DISEASE
FROM PARTICULATE POLLUTION

EXECUTIVE SUMMARY

AUTHORS

Janea Scott

John Balbus

Jana Milford

Vickie Patton

Nancy Spencer

Rachel Zwillinger

e

ENVIRONMENTAL DEFENSE

finding the ways that work

Acknowledgments

We deeply appreciate the contributions and insight provided by Sandra Goodman, Mark MacLeod, and Megan Williams. We are grateful for the input and guidance provided by the health experts at the American Lung Association including Paul Billings, Blake Early, Janice Nolen and Deborah Shprentz. We thank Leon Billings for providing inestimable insight and perspective on the adoption of the 1970 Clean Air Act, the historic policy changes it forged, and the development of our nation's clean air laws over the past 35 years. We also appreciate the many experts who lent their knowledge, experience and wisdom in reviewing drafts of this report.

Cover image: Corbis.

Our mission

Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

©2005 Environmental Defense

The complete report is available online at www.environmentaldefense.org.

Executive summary

Thirty-five years ago, in December 1970, the modern Clean Air Act became law. A triumph of bipartisanship, the statute has delivered cleaner, healthier air to millions of Americans. The U.S. Environmental Protection Agency (EPA) estimated that by 1990, after 20 years of reducing air pollution, the Clean Air Act prevented the following annual human health impacts: 206,000 premature deaths, 674,000 cases of chronic bronchitis, 209,000 hospital admissions, 227 million respiratory ailments, and over 22 million lost work days. EPA valued the total monetized health benefits achieved through 1990 at \$22.2 trillion and the total compliance costs over the same years at \$0.5 trillion. The resulting net monetary benefits of \$21.7 trillion make the Clean Air Act one of the most cost-effective regulatory programs in American history. The Clean Air Act continues to deliver these benefits today, supplemented by the considerable health and environmental gains from the Clean Air Act Amendments of 1990.

The tremendous health benefits achieved from 1970 to 1990 were due almost exclusively to programs designed to meet the health-based national ambient air quality standards. These standards are the benchmark for determining

“We worked together. We disagreed. We worried about many provisions of the bill. At last, however, we joined unanimously in recommending and sponsoring this bill, believing that our approach was one that could make progress toward solution of the problem of air pollution.”

Statement of U.S. Senator John Sherman Cooper (Republican-Kentucky), 1970

whether millions of Americans breathe healthy air. The success of the Clean Air Act springs from its bedrock mandate to base these national standards exclusively on human health considerations and from an unwavering commitment to health standards for all Americans. Its success is also rooted in American ingenuity: Americans have continuously worked to forge innovative solutions that meet the vital challenge of restoring healthy air. These are the great legacies of the Clean Air Act.

Preventing death and disease from particulate pollution

This month, more than a generation after the passage of the modern Clean Air Act, EPA Administrator Stephen Johnson has the opportunity to uphold its core principles when he proposes revisions to the national ambient air quality standards for particulate pollution. The Administrator’s decision will determine whether millions of Americans are protected from harmful particulate pollution.

More than 2000 peer-reviewed scientific studies examining the effects of particulate pollution have been published since EPA last updated the particulate health standards over eight years ago. These studies are overwhelming in showing that particulate pollution imposes a heavy burden on human health. The major health effects of breathing particulate pollution include reduced lung function, coughing, wheezing, missed school days due to respiratory symptoms, increased use of asthma medications, cardiac arrhythmias, strokes, emergency room visits, hospital admissions, lung cancer, and premature death. The science also shows that these adverse effects occur at pollution levels

far below the existing national health standards for particulate pollution.

EPA acts this month against the backdrop of the rich history of the Clean Air Act and the vital health protection it has delivered through the national ambient air quality standards program. Over the last 35 years, EPA has repeatedly strengthened public health standards for air pollutants. In carrying out this responsibility, the statute mandates that the EPA Administrator set standards “requisite to protect the public health” “allowing an adequate margin of safety.”

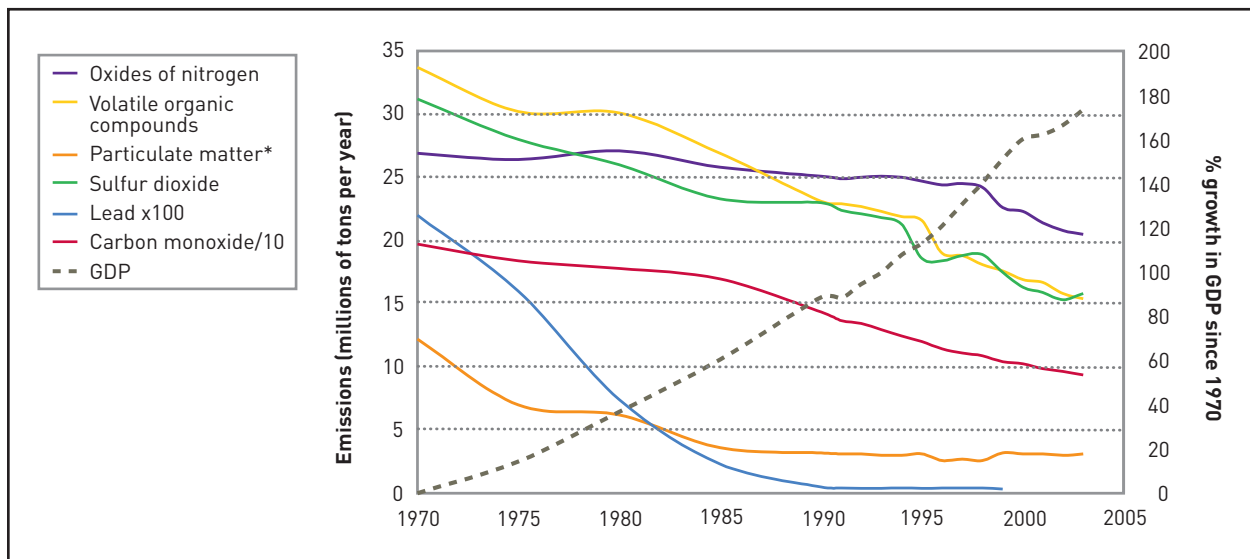
This report examines the national ambient air quality standards program. It provides an overview of the signal public health achievements the program has delivered over the last 35 years. It also calls for EPA Administrator Stephen Johnson to heed the compelling body of scientific research on particulate pollution health effects, to carry forward the legacy entrusted to him under the Clean Air Act to protect human health

with an adequate margin of safety, and to address today’s urgent national challenge: preventing death and disease from particulate pollution.

1970–2005: Cleaner air, American ingenuity and a growing economy

Today, our air is dramatically cleaner than it was in 1970, and our economy has prospered as air quality has improved. No program better illustrates the strengths of the Clean Air Act than the national ambient air quality standards. For five of the six pollutants for which EPA has established national air quality standards—carbon monoxide (CO), lead, particulate pollution, sulfur dioxide (SO₂) and ozone (volatile organic compounds and oxides of nitrogen form ozone)—pollution levels have fallen over the 35 years since the original Clean Air Act was passed. And after years of holding steady, oxides of nitrogen (NO_x) emissions have recently begun to fall. Figure 1 and

FIGURE 1
Reduction in pollution and growth in gross domestic product since the 1970 Clean Air Act



Note: Lead and carbon monoxide emissions have been scaled for graphical representation with the other pollutants. The rate of change in emissions levels is unaffected. Condensable PM is defined as material that is a gas at the smoke stack temperature at the sampling location but which condenses to a liquid or solid within a few seconds after leaving the stack. Trends data incorporating condensable emissions are available only since 1998.

*PM₁₀ with condensables from 1998–2003

Sources: EPA (2004), Department of Commerce (2005)

TABLE 1
Summary of pollution levels and economic growth since 1970 Clean Air Act

Indicator	Pollution cuts since 1970	Percent change
Oxides of nitrogen (NO _x)	6.4 million tons annually	23.8% decrease
Volatile organic compounds (VOC)	18.3 million tons annually	54.3% decrease
Particulate matter (PM)	9.1 million tons annually	74.6% decrease
Sulfur dioxide (SO ₂)	15.4 million tons annually	49.4% decrease
Lead	0.22 million tons annually	98.5% decrease
Carbon monoxide (CO)	104 million tons annually	52.5% decrease
Gross Domestic Product		174% increase

Table 1 document that during the same period when emissions have fallen, the gross domestic product has steadily risen, showing that there is no contradiction between lowering airborne contaminants and a strong, growing economy.

The results depicted above are impressive, especially considering that in 1970, no one knew *how* the new national air quality standards would be met. Yet Congress recognized that the standards *must* be met in order to protect Americans' health and their

environment. Lawmakers knew that the growth in harmful air pollution needed to be reversed, not just slowed down. So they wrote into the law a mandate to establish fixed national standards limiting air pollution concentrations to protect human health and strict deadlines by which the standards had to be achieved.

2005: A stronger particulate pollution standard will save lives and prevent disease

Though pollution levels have fallen dramatically since 1970, people are still dying and suffering disease from particulate pollution in America today. More than 160 million Americans live in areas that fail to meet at least one of the national ambient air quality standards, and numerous more suffer death and disease from particulate pollution at concentrations that meet the existing health standards.

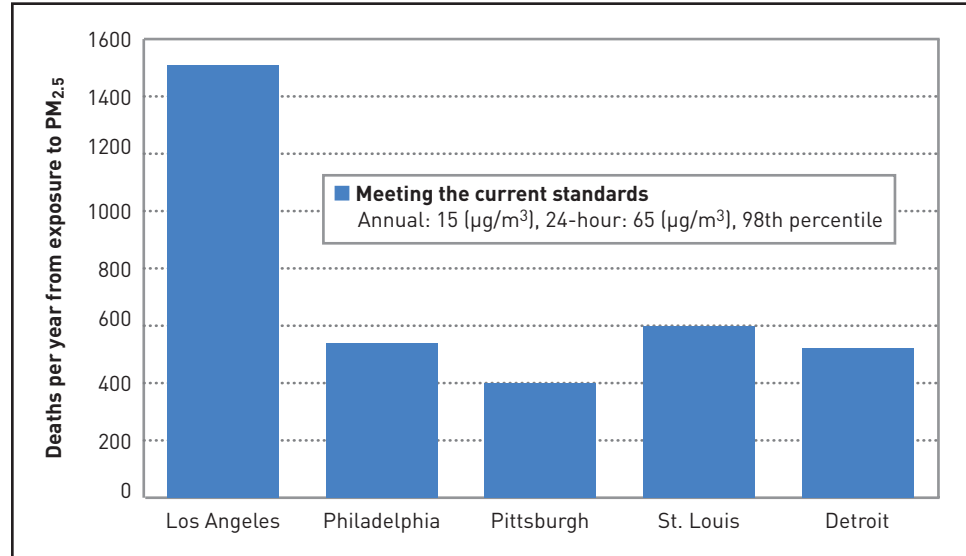
PROTECTING HUMAN HEALTH FROM FINE PARTICULATE POLLUTION

EPA staff recently estimated that in just the following five cities—Los Angeles, Philadelphia, Pittsburgh, St. Louis, and Detroit—3570 people would die prematurely each year due to fine particulate pollution, even if the air in those cities met the current public health standards.

What is particulate pollution?

Particulate pollution is a mixture of chemicals found in solid or liquid particles that are suspended in the atmosphere. Because they can penetrate deep into the lungs and damage health, EPA is now focusing on two size classes—particles less than 2.5 microns across (“PM_{2.5}” or fine particles), and particles between 2.5 and 10 microns across (“PM_{10-2.5}” or coarse particles). A micron, which is one millionth of a meter, is about one hundred times smaller than the diameter of a human hair. Particulate pollution includes a wide variety of chemical compounds from many sources, including pure carbon (“soot”) and organic carbon from burning fossil fuels in diesel engines and other combustion sources. Particulate pollution also contains significant quantities of ammonium sulfate and ammonium nitrate, which form in the atmosphere from chemical reactions of sulfur dioxide, nitrogen oxides and ammonia. In turn, sulfur dioxide (SO₂) and nitrogen oxides (NO_x) come primarily from burning fossil fuels in sources like power plants, industrial boilers and motor vehicles. Ammonia is from livestock and fertilizers.

FIGURE 2
Projected deaths at existing fine particulate health standards



Current annual standard is 15 ug/m³ (3 year average of annual arithmetic mean). Current 24-hour standard is 65 ug/m³ (3 year average of 98th percentile 24-hour concentrations)
 Source: U.S. EPA. "Review of the National Ambient Air Quality Standards for Particulate Matter: A Policy Assessment of Scientific and Technical Information." Table 5-1(a) on page 5-12. June 2005. Available at www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper_20050630.pdf. Accessed Nov. 18, 2005.

The EPA findings are graphically represented in Figure 2. The mortality estimates for these few cities only begin to represent the dramatic health burden that particulate pollution imposes across the country. For example, in a highly regarded epidemiological study, Arden Pope and his colleagues analyzed the health status of some half a million adults in metropolitan areas across the U.S. and found that for every 10 µg/m³ increase in long-term average fine particulate pollution levels, the risk of mortality in adults goes up by about 4%. Based on this estimate, hundreds of premature deaths each year are attributable to fine particulate pollution in Salt Lake City, Denver, Las Vegas, Phoenix, and Albuquerque, even though these cities meet the current standards.

The fine particulate pollution standards limit long-term concentrations over the course of an entire year and short-term concentrations over 24 hours. Different health effects are associated

with short- and long-term exposure, and people need to be protected against both types of exposure.

To protect Americans from the death and disease resulting from particulate pollution, the American Lung Association and over 100 prominent environmental health researchers and physicians have recommended that EPA Administrator Stephen Johnson strengthen the fine particulate pollution health standards as follows:

- 12 ug/m³ for the annual standard; and
- 25 ug/m³ for the 24-hour standard (3-year average of 99th percentile 24-hour concentrations)

THE AGRI-BUSINESS LOBBY SEEKS EXEMPTIONS FOR AGRICULTURAL POLLUTION

In addition to short- and long-term standards for fine particles 2.5 microns and smaller, EPA must also decide

whether to strengthen the health standard for larger or “coarse” particulate pollution in the size ranging from 2.5 to 10 microns in diameter. Both the American Lung Association and over 100 prominent environmental health researchers and physicians have recommended EPA establish a stringent 24-hour coarse particulate pollution health standard that applies equally to all areas of the country. But lobbyists for the agricultural industry are opposing any EPA action to set new standards for coarse particles. In fact, agricultural pollution can contain harmful contaminants including pesticides, metals, and biological toxins. If EPA grants this exemption, the health of the communities near these sources will not be protected. The Clean Air Act mandates that EPA adopt national standards that protect all Americans from harmful particulate pollution.

A cleaner, healthier future

Once the particulate standard is updated to reflect current scientific evidence on the human health impacts of particulate pollution, EPA and the states will develop strategies to achieve the new standards. The Supreme Court has made clear that these health-based standards must be based solely on human health considerations and that

EPA is *prohibited* from considering the cost of emission controls when it sets national ambient air quality standards. But the cost of pollution controls is considered when EPA and the states take up the issue of how best to implement the standards and restore healthy air. Numerous cost-effective pollution control strategies are available today to deliver healthier air and less particulate pollution. Environmental Defense examines just some of the available strategies that would make important progress in preventing death and disease from particulate pollution.

Cutting particulate pollution from today’s diesel engines. In reducing the high levels of particulate pollution in long-lived diesel engines operating today, we recommend immediate and full funding of the bipartisan Voinovich-Carper Diesel Emissions Reduction Act of 2005 that authorizes \$1 billion to cut pollution from existing diesel engines. We also call for states and local governments to expand their support for initiatives to reduce the dangerous particulate pollution in diesel exhaust. Table 2 estimates the national pollution reductions and health benefits of lowering the pollution from the fleet of diesel engines in use today. For example, it shows that if 50% of the diesel engines in use were

TABLE 2
Projected health benefits from reducing particulate pollution from diesel engines in use

Percent of diesel engines retrofit	Efficiency of retrofit technology	Tons of PM reduced annually	Annual health benefits in billions of dollars	Premature deaths avoided annually	Non-fatal heart attacks avoided annually	Respiratory-related hospital admissions avoided annually	Bronchitis and asthma exacerbations avoided annually ^a	Lost work days avoided annually
25%	30%	18,600	\$8.7	1,170	1,490	506	21,300	97,900
	80%	49,700	\$23.2	3,110	3,980	1,350	56,800	261,000
50%	30%	37,300	\$17.4	2,330	2,990	1,010	42,600	196,000
	80%	99,400	\$46.4	6,210	7,970	2,700	114,000	522,000
75%	30%	55,900	\$26.1	3,490	4,480	1,520	63,900	294,000
	80%	149,000	\$69.6	9,320	12,000	4,050	170,000	783,000

^a Figure includes: chronic bronchitis (adults), acute bronchitis (children), and asthma exacerbations (children)

rigorously controlled, the nation would realize more than \$46 billion in health benefits each year, and would annually prevent over 6,000 premature deaths, nearly 8,000 non-fatal heart attacks, 114,000 respiratory illnesses, and over 500,000 lost work days.

Strengthening clean air standards for ships and locomotives. EPA's own data show that commercial ships and locomotives are a significant—and growing—source of air pollution. Marine diesel engines and locomotives will account for nearly one-half of the diesel particulate pollution from all motorized engines by 2030. A major new California study shows that the ports of Los Angeles and Long Beach are responsible for 20% of *all* particulate pollution in the entire Los Angeles Basin and that ships are the predominant source of this pollution, discharging more than 70% of the particulate pollution originating from the ports. EPA committed to propose new emission standards for commercial ships and locomotives by mid-2005 but has failed to meet this deadline.

Modernizing pollution controls for coal plants. Ten years from now, about 40% of the nation's coal-fired capacity will still lack modern pollution controls for particulate-forming SO₂ under the regulatory programs currently in effect, including EPA's recently adopted Clean Air Interstate Rule. The best available health research shows that cutting SO₂ has considerable, immediate health benefits by lowering harmful particulate pollution in surrounding neighborhoods *and* in distant downwind communities. Environmental Defense calls for EPA and the states to strengthen existing programs such as the Clean Air Interstate Rule, to tighten the limits on smokestack pollution to secure vital human health benefits, and to transition

the nation's coal fleet to modern pollution controls. Using EPA's own valuation methodologies, Environmental Defense estimates that broader application of modern SO₂ controls to coal-fired power plants in the eastern United States alone could lower SO₂ emissions by 2.5 million tons annually over existing programs and prevent an estimated 7500 premature deaths, 9800 non-fatal heart attacks, over 300,000 respiratory illnesses, and more than 750,000 lost work days each year. These reductions can be achieved through a variety of existing Clean Air Act tools including market-based systems to curb interstate air pollution and enforcement of the new source review program.

Closing the clean air loophole for industrial boilers and other similar sources. EPA's recent clean air initiatives have largely excluded major industrial source categories such as industrial, commercial and institutional boilers, cement kilns, and stationary internal combustion engines. EPA forecasts show that unless new pollution control programs are adopted, nationwide emissions of SO₂ and NO_x from these stationary sources are expected to rise over the next decade to levels

“This is a familiar pattern. Air quality standards have always been met with claims of economic demise. But then technology catches up. Innovative programs are implemented. Further research bolsters the initial decision. In the end, costs are a fraction of initial claims, and everyone breathes cleaner air.”

Statement of U.S. Senator Max Baucus (Democrat-Montana), 1997, at a Senate Subcommittee hearing in response to EPA's 1997 decision to strengthen the health-based national ambient air quality standards for particulate pollution and ozone.

that will rival the pollution from coal-fired power plants. Among these other stationary sources, industrial boilers are the largest source of SO₂ and NO_x emissions. Large industrial boilers are similar to the boilers used in power plants, except that they produce heat and power for use on site, rather than electricity to be sold for outside use. Environmental Defense estimates that in 2010, SO₂ emissions could be reduced by 1.2 million tons per year, and NO_x emissions by 290,000 tons per year, if modern controls were applied to medium and large industrial boilers in the eastern United States alone. Using EPA methodologies, Environmental Defense projects that

these SO₂ and NO_x reductions would prevent about 4,700 premature deaths annually and result in health benefits valued at \$24 billion each year. A nationwide program would yield even greater benefits.

Each of these readily available and cost-effective measures would yield major progress in protecting millions of Americans from the death and disease associated with particulate pollution. While skeptics will invariably argue that more protective health standards cannot be achieved, the Clean Air Act is time tested in proving that cleaner, healthier air is within reach.



ENVIRONMENTAL DEFENSE

finding the ways that work

National headquarters

257 Park Avenue South
New York, NY 10010
212-505-2100

1875 Connecticut Avenue, NW
Washington, DC 20009
202-387-3500

5655 College Avenue
Oakland, CA 94618
510-658-8008

2334 North Broadway
Boulder, CO 80304
303-440-4901

2500 Blue Ridge Road
Raleigh, NC 27607
919-881-2601

44 East Avenue
Austin, TX 78701
512-478-5161

18 Tremont Street
Boston, MA 02108
617-723-5111

Project Office

3250 Wilshire Boulevard
Los Angeles, CA 90010
213-386-5501