

ISSUE BRIEF

CLEARING THE AIR: THE BENEFITS OF THE CLEAN AIR ACT

INTRODUCTION

In 1970 the Clean Air Act passed unanimously in the U.S. Senate and by a 374-to-1 vote in the House of Representatives. Since then, the act has ushered in vast improvements in air quality across the United States and contributed significantly to the betterment of America's public health.¹ It was so successful at reducing pollution, sickness, and death that strong bipartisan majorities voted to strengthen the act in 1977 and again in 1990.



Moreover, the act has achieved these health goals at a far lower cost than originally anticipated by regulatory agencies and industry. A new analysis by Industrial Economics, Inc. (IEc) commissioned by the NRDC shows that the Clean Air Act (CAA) will continue to save lives, improve public health, and provide economic benefits that far outstrip the costs of the programs it has engendered—as long as it is not gutted by the Trump administration. If left intact, by the end of 2020 the Clean Air Act Amendments (CAAA) of 1990 and related programs will have annual benefits that are up to 32 times greater than the costs. These annual benefits include up to 370,000 avoided premature deaths, 189,000 fewer hospital admissions for cardiac and respiratory illnesses, 147 million fewer acute respiratory symptoms, and 8.3 million fewer lost school days.²

To facilitate a better understanding of the benefits of the CAAA of 1990, the IEc analysis includes a county-by-county interactive map of the associated public health and economic benefits, available [online](#).³ For example, in Dallas County, Texas, the programs implemented under the CAAA will help avoid up to 1,170 premature deaths annually in 2030, as well as \$13 billion in costs associated with both fatal and nonfatal illnesses.

All told, the programs implemented under the CAAA are predicted to have a net economic benefit of \$1.9 trillion to \$3.8 trillion in 2020, growing to \$2.5 trillion to \$5.0 trillion annually by 2030. To put those figures into perspective, the United States spent \$3.5 trillion on health care and health-related activities in 2018, equal to roughly 18 percent of its gross domestic product.⁴ In short, protecting the Clean Air Act will save lives, improve public health, and benefit the economy.

HISTORY OF THE CLEAN AIR ACT

The CAA requires the U.S. Environmental Protection Agency (EPA) to set and periodically review National Ambient Air Quality Standards (NAAQS) for six key air pollutants (also known as “criteria air pollutants”) to protect public health and the environment. To help meet those standards, the EPA also sets limits on emissions from new cars and trucks as well as new and existing stationary air pollution sources, such as power plants. States that exceed NAAQS limits must also adopt—and have the EPA approve—plans to reduce pollution and protect public health.⁵

The 1977 and 1990 amendments strengthened the CAA by expanding on provisions to prevent air quality from deteriorating, establishing a cap-and-trade system designed to lower emissions contributing to acid rain, and listing 188 toxic air pollutants for EPA to control versus only eight that had been regulated. The 1990 amendments also established a new permitting program requiring all major sources of air pollution to operate under permits that set emissions limits.⁶

The CAAA led to substantial, measurable improvements in air quality. Since 1990 fine particulate matter (PM_{2.5}) pollution has declined by 41 percent and concentrations of ozone (O₃), a precursor to smog, have declined by 22 percent.⁷ The progress on ozone has led to a dramatic reduction in smog, as well as lower risk for aggravated asthma, premature death, irregular heartbeat and heart attacks, and respiratory issues.⁸

While the Clean Air Act has historically been used to tackle criteria air pollutants and toxic air pollution, it also gives the EPA a broad array of flexible regulatory tools to reduce greenhouse gas (GHG) emissions responsible for climate change.⁹ In 2007 the U.S. Supreme Court ruled that under the CAA, the EPA was required to regulate GHGs as air pollutants.¹⁰ Under the Obama administration, the EPA used that authority to establish clean car standards and clean truck standards to reduce GHG emissions from the transportation sector. In 2015 the Obama administration also announced the Clean Power Plan, an approach to cutting carbon pollution from the nation’s power plants.¹¹ The plan set flexible and achievable emissions standards on a state-by-state basis, giving each state the power to decide how best to meet those goals.

While tremendous progress has been made, there is still much left to do. Many states are still unable to meet air quality standards—among them Pennsylvania, Ohio, Colorado, Texas, and California. This makes the continued integrity of the CAAA even more important.

ATTACKS ON PUBLIC HEALTH: TRUMP ROLLS BACK SUCCESSFUL CLEAN AIR ACT PROGRAMS

Despite the enormous success of the CAA in protecting public health, the law currently faces attacks on many fronts. The Trump administration, through its appointees to the EPA, has spent the last three years trying to roll back emissions limits on cars, coal-fired power plants, heavy trucks, refineries, pipelines, and more. As of the end of 2019, the administration has completed or is working to complete rollbacks of 95 environmental rules, including 25 dealing with air pollution.¹² These rollbacks include:

- The repeal of the Clean Power Plan. Had the plan simply been strengthened by the Trump administration, an estimated 5,200 premature deaths would have been avoided in 2030.¹³ Instead, in June 2019 the administration finalized a weak replacement plan that, by EPA’s own analysis, would cause as many as 1,630 additional premature deaths in 2030 relative to the original plan.¹⁴
- Significant weakening of GHG and fuel economy standards for passenger cars and trucks, a move that will increase the amount of pollutants in our air and pave the way for a dramatic increase in oil consumption that will cost drivers more than \$176 billion at the pump.¹⁵ The administration also issued a rule that illegally purports to strip California and other states of their longstanding

authority to adopt their own, more protective emissions standards. The rule is being challenged in federal court by 23 state attorney generals, NRDC, and numerous other organizations.¹⁶

- Proposed weakening of the National Emission Standards for Hazardous Air Pollutants, which regulates pollutants (such as mercury, benzene, and formaldehyde) that can cause cancer, birth defects, and other serious health effects. The change would allow “major sources” of pollution to reclassify themselves as “area sources,” a classification that requires fewer control technologies and allows greater rates of emissions. In California alone, it is estimated that these hazardous pollutants “could more than double, increasing by as much as 935 tons per year” and disproportionately affecting lower-income communities according to air pollution experts at the California Air Resources Board.¹⁷
- Pulling back Obama administration rules designed to limit emissions of methane and other harmful pollutants from oil and natural gas operations. Methane (CH₄) is an incredibly potent greenhouse gas that can trap more than 80 times as much heat in our atmosphere as carbon dioxide. The original rules were expected to cut methane emissions in half by reducing leaks from pipelines and other facilities.¹⁸ Instead, under its now-weakened regulations, EPA’s own analysis shows emissions of methane, volatile organic compounds, fine particulate matter, and hazardous air pollutants will all increase.¹⁹ Even without the rollbacks, researchers had already estimated that harmful air pollution from the oil and gas sector will be responsible for nearly 2,000 deaths

annually in the United States in 2025 and thereafter.²⁰

- Establishing a dirty truck loophole that allows companies to sell more new trucks with old, refurbished engines that are not required to meet modern emissions standards. The EPA has estimated that an additional 10,000 of these trucks on the road would result in enough pollution to cause 1,600 premature deaths over the lifetime of these vehicles.²¹ The U.S. Court of Appeals stayed the EPA’s loophole in June 2018 and it was soon followed by EPA temporarily reversing course by announcing that it would continue to enforce the existing standards.²² However, EPA also stated it would “continue to move as expeditiously as possible on a regulatory revision regarding the requirements that apply to the introduction of... [these] vehicles into commerce” suggesting the administration would continue trying to rollback standards.²³

The attacks don’t stop there. Trump’s EPA tried to withdraw a rule limiting dangerous mercury emissions, threatened to slash the EPA’s enforcement budget, and worked to undercut the agency’s longstanding scientific approach to air pollution rules.²⁴

The Trump administration has tried to justify this unprecedented, all-out assault on the Clean Air Act as a way of saving polluting industries money and eliminating “unnecessary” regulations.²⁵ However, the CAA has been subject to ongoing cost-benefit analyses that consistently find costs borne by industry to be a tiny fraction of the economic benefits of improved air quality and public health resulting directly from the CAA.

THE CLEAN POWER PLAN

The Clean Power Plan, which set the first-ever federal limits on carbon pollution from U.S. power plants, was announced by President Obama in 2015. Fossil fueled power plants are the largest stationary sources of carbon pollution in the country.²⁶ Under this plan, carbon pollution limits would phase in beginning in 2022. Each state would have the flexibility to design an implementation plan that fit its individual situation. The plan promised to help speed the transition from dirty fossil fuels to clean, renewable energy and drive down carbon dioxide emissions, a concrete and likely effective effort to avert catastrophic climate change.

The EPA projected the plan would cut U.S. carbon pollution from the electricity sector by 32 percent below 2005 levels by 2030. Additionally, the shift to cleaner power and increased energy efficiency from the plan would save the average American family up to \$85 a year on its electricity bills by 2030. Reductions from the plan in other toxic air pollutants emitted by power plants, such as sulfur dioxide (SO₂), would deliver billions of dollars in additional health benefits.

In October 2017, Trump’s EPA announced a proposal to repeal the Clean Power Plan. To justify this action, the EPA administrator at the time, Scott Pruitt, inflated the costs of the plan and underestimated its benefits, significantly distorting the science and economics behind the previous estimates.²⁷ After Pruitt’s departure due to ethical controversy, his replacement, Andrew Wheeler, shifted from revoking the plan to replacing it.

The replacement plan, officially known as the Affordable Clean Energy Rule, exempts gas-fired power plants, weakens requirements for coal plants to install the most up-to-date pollution controls available, and lets each state decide how much, or even whether, their coal plants must reduce carbon pollution. This replacement plan abdicates the nation’s responsibility to reduce our contribution to catastrophic climate change.

PRIOR ANALYSES OF THE BENEFITS AND COSTS OF THE CLEAN AIR ACT

Under the 1990 CAAA, the EPA is required to perform periodic, comprehensive analysis of the benefits and costs of the programs implemented under the act. Since 1990 there have been three major analyses undertaken (Figure 1): a retrospective report issued in 1997 looking back at the benefits and costs from 1970 to 1990 (area A), a prospective report issued in 1999 looking at the estimated benefits from 1990 to 2010 (area B), and a second prospective report issued in 2011 looking at benefits from 1990 to 2020 (areas B and C).²⁸

These analyses first estimated the costs incurred to achieve emissions reductions, including capital expenditures for emissions controls (e.g., scrubbers) and operational expenses for process changes that reduce air pollution (e.g., buying lower-sulfur coal). They then estimated the public health benefits from the air quality improvements—including reduced hospital admissions, fewer heart attacks and pollution-related illnesses, and a decrease in premature mortality rates—and estimated the economic value of those benefits.²⁹ The analyses also included other economic benefits of reduced air pollution, such as improved agricultural and forest productivity, reductions in regional haze that blocks the vistas for tourists at national parks, and less damage to buildings and crops from acid rain.

In each analysis, the benefits of the Clean Air Act far outweighed the costs. The 1997 analysis, which retroactively estimated benefits and costs of the act's first 20 years (1970–1990), found that nationwide, the

act was responsible for a 40 percent reduction in sulfur dioxide emissions, a 75 percent reduction in suspended particulate matter emissions, a 50 percent reduction in carbon monoxide emissions, a 30 percent reduction in nitrogen oxide emissions, a 45 percent reduction in volatile organic compounds, and nearly a total elimination of lead emissions.³⁰

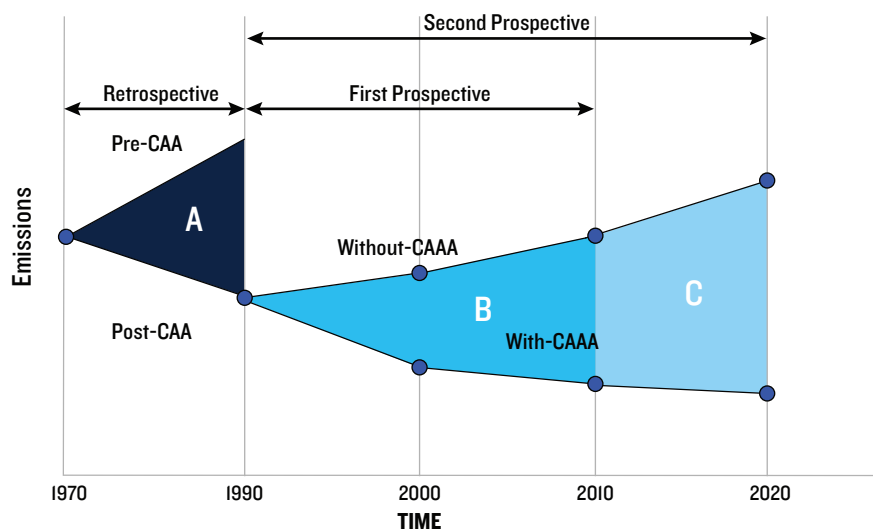
This analysis also estimated that the CAAA programs led to an average annual benefit of \$1.1 trillion (in 1990 dollars) from 1970 to 1990, counting avoided human health effects, visibility improvements, and damage to buildings and crops. Annual industry compliance costs came to \$26 billion (in 1990 dollars). The study concluded that benefits outweighed costs by a factor of more than 42.

In 1999 the EPA released the first forward-looking cost-benefit analysis for the Clean Air Act amendments. This study estimated emissions of air pollutants in 1990, 2000, and 2010; the cost of achieving emissions reductions; and the economic value of the cleaner air from the CAAA.³¹ Again, the economic benefits greatly outweighed the compliance costs.

In 2011 the EPA commissioned and released a third analysis (and second prospective analysis).³² The report used updated air quality modeling and more expansive monitoring and exposure estimates and considered the impact of new air pollution rules passed in the intervening years. The benefit in 2020 from the CAAA was estimated to be \$2.0 trillion (in 2006 dollars), against \$65 billion in compliance costs.

FIGURE 1: PRIOR STUDIES ANALYZING CLEAN AIR ACT

Note: The figure is conceptual to display the methodology, rather than representing actual values, which can be found in the EPA's reports, cited below.



Source: IEC 2020³³



NEW, UPDATED ANALYSIS OF THE CLEAN AIR ACT

NRDC commissioned Industrial Economics, Inc., the consultant that completed the analysis for the EPA's 2011 report, to update and expand on its prior work.³⁴ Updates included:

- Extending the prospective analysis beyond 2020 out through 2030
- Considering 12 major rules more recently adopted under the CAAA by the Obama administration that were not incorporated in the prior analyses
- Updating the assessment tools to account for the latest scientific developments in modeling and epidemiology
- Providing emissions benefits at the county and state levels across the continental United States.

To stay within the timeline and scope of the project, the IEc analysis was limited to public health benefits associated with reductions in criteria pollutants which include both smog-forming gases and particulate matter and to climate benefits from reduced greenhouse gas emissions. Other clean air benefits—more productive agriculture, improved visibility, reduced acidification of water bodies, and less property damage—were not assessed. Health benefits from

reductions in toxic air emissions, such as lower cancer rates from decreased benzene exposure, were also not included. These exclusions mean the estimated benefits from the Clean Air Act amendments presented here are likely underestimated.

We note too that the Trump administration has now repealed, attempted to repeal, or delayed some of the programs implemented under the CAAA at the time of the analysis. The effects of the weakening of rules under the CAAA were not analyzed in the new report, though we can assume that these actions will diminish the benefits estimated by the IEc.

As mentioned above, in addition to refining the modeling and assessment tools, NRDC asked the IEc to analyze emissions at a county level across the continental United States, whereas previous reports were all done at the national level. This allowed IEc and NRDC to estimate emissions reductions (and associated benefits) at the county and state levels. NRDC has created interactive visual tools available [online](#), allowing individuals to see estimates of their county's emission reductions under the CAAA and the associated public health and economic benefits.

AIR POLLUTANTS

Under the Clean Air Act, the U.S. Environmental Protection Agency regulates emissions of six principal, or “criteria,” pollutants that affect air quality; volatile organic compounds; and greenhouse gas emissions. The criteria pollutants include nitrogen dioxide, particulate matter, sulfur dioxide, lead, ozone, and carbon monoxide. Both volatile organic compounds and nitrogen dioxide can also react in the atmosphere in the presence of sunlight to form ground-level ozone, commonly known as smog.

TABLE 1: POLLUTION SOURCES AND THEIR IMPACTS

| Pollutant | Sources | Health and Environmental Effects |
|---|---|---|
| Nitrogen Dioxide (NO₂) A brownish gas that forms quickly when fuel is burned at high temperatures. Contributes to the formation of ground-level ozone and fine-particle pollution. | Motor vehicles, electric utilities, industrial boilers, and off-road equipment. | Irritates the lungs; may cause lung damage and lower resistance to respiratory infections such as influenza. May adversely affect terrestrial and aquatic ecosystems through regional transport and deposition. |
| Particulate Matter (PM) Mixture of solid particles and liquid droplets in the air; particles may be visible or microscopic. | Formed directly from windblown dust, crushing and grinding operations, unpaved roads, construction, fuel combustion (from motor vehicles, power plants, industrial facilities), wildfires, wood stoves, and agriculture (plowing, burning of fields). May also be formed in the atmosphere from gases such as SO ₂ and nitrogen oxides (NO _x). | Causes eye, nose, and throat irritation; decreased lung function; aggravated asthma; chronic bronchitis; irregular heartbeat; nonfatal heart attack; and premature death in people with heart or lung disease. Serves as a carrier for toxic metals, damages human-made materials, and is a major cause of reduced visibility in many parts of the United States. |
| Sulfur Dioxide (SO₂) A highly reactive colorless gas, odorless at low concentrations but pungent at very high concentrations. | Formed when fuel containing sulfur (mainly oil and coal) is burned in industrial, institutional, utility, and residential furnaces and boilers. Other sources include petroleum refineries, smelters, paper mills, and chemical plants. | May cause breathing problems, respiratory illness, alterations in the lungs, aggravation of existing cardiovascular disease, and permanent damage to lungs. Forms acid aerosols and sulfuric acid, which are associated with acidification of lakes and streams, accelerated corrosion of buildings and monuments, and reduced visibility. |
| Lead (Pb) A heavy metal found naturally in the environment and in manufactured products. | Soil, dust, paint, modes of transportation using lead in their fuels, coal combustion, smelters, car battery plants, and combustion of garbage containing lead products. | At elevated levels, may cause brain and other nervous system damage and adversely affect kidney function, blood chemistry, and digestion if ingested or directly inhaled. Children are at special risk due to cumulative effects even at low doses. Can also harm wildlife through deposition onto leaves that are a food source for grazing animals. |
| Ground-Level Ozone (O₃) A colorless gas formed from chemical reactions between volatile organic compounds (VOCs), nitrogen oxides (NO _x), and oxygen in the presence of heat and sunlight. | Motor vehicles, electric utilities, factories, landfills, industrial solvents, and miscellaneous small sources such as gas stations, lawn equipment, etc. | Causes coughing, chest tightness, and wheezing and can inflame and damage lung tissue. Aggravates asthma and can even be a cause of asthma. Irritates the respiratory system, reduces lung function, and makes it difficult to breathe. Aggravates chronic lung diseases and may cause permanent lung damage. May reduce crop yields and damage forests and other vegetation. |
| Carbon Monoxide (CO) An odorless, colorless gas resulting from incomplete fossil fuel combustion. | Motor vehicles, small engines, some industrial processes, boilers, and incinerators. High concentrations can be found in confined spaces like parking garages, poorly ventilated tunnels, and traffic intersections, especially during peak hours. | Impairs the ability of blood to deliver oxygen to vital tissues, affecting the cardiovascular, pulmonary, and nervous systems. Symptoms include dizziness, headache, nausea, fatigue, memory and visual impairment, and decreased muscular control. |
| Volatile Organic Compounds (VOCs) Organic chemicals released into the air from certain products and processes, often at room temperature. Examples include benzene and formaldehyde. | Gasoline, diesel emissions, wood burning, oil and gas extraction and processing, industrial processes, paints and paint strippers, varnishes, adhesives, pesticides, cosmetics. | When inhaled, can irritate the eyes, nose, and throat; cause nausea and difficulty breathing; and damage the central nervous system as well as other organs and systems. Some VOCs can cause cancer. |
| Greenhouse Gases (GHGs) Gases that trap heat in the atmosphere. Major GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. | Released mainly through the burning of fossil fuels in combustion-engine vehicles, to produce electricity, for industrial processes, and in commercial and residential heating. Deforestation and land conversion are also major sources. | Increases in GHGs alter the global climate, which can result in extreme heat waves, rising sea levels, changes in precipitation resulting in flooding and droughts, intense hurricanes, and degraded air quality, all of which directly and indirectly affect the physical, social, and psychological health of humans. |

References: EPA, New Hampshire Department of Environmental Services, and National Institute of Environmental Health Sciences.³⁵

As with the previous EPA studies, the study commissioned by NRDC focused on the following specific criteria pollutants or contributors to criteria pollution: sulfur dioxide (SO₂), fine particulate matter (PM_{2.5}), nitrogen oxides (NO_x), and volatile organic compounds (VOCs).

The study estimated emissions reductions for five broad source categories: electrical generating units (EGUs) providing electricity for sale, other point sources (fixed sources) of pollution such as refineries and large industrial facilities, on-road vehicles, nonroad (or off-road) vehicles, and nonpoint sources such as roadway dust. Costs were also estimated for each of those source categories on the basis of detailed, sector-specific modeling.

Once benefits and costs for 2020 were determined, the study extrapolated estimates out to 2030 using source-specific growth projections that considered population forecasts and other government estimates for each emissions source category.

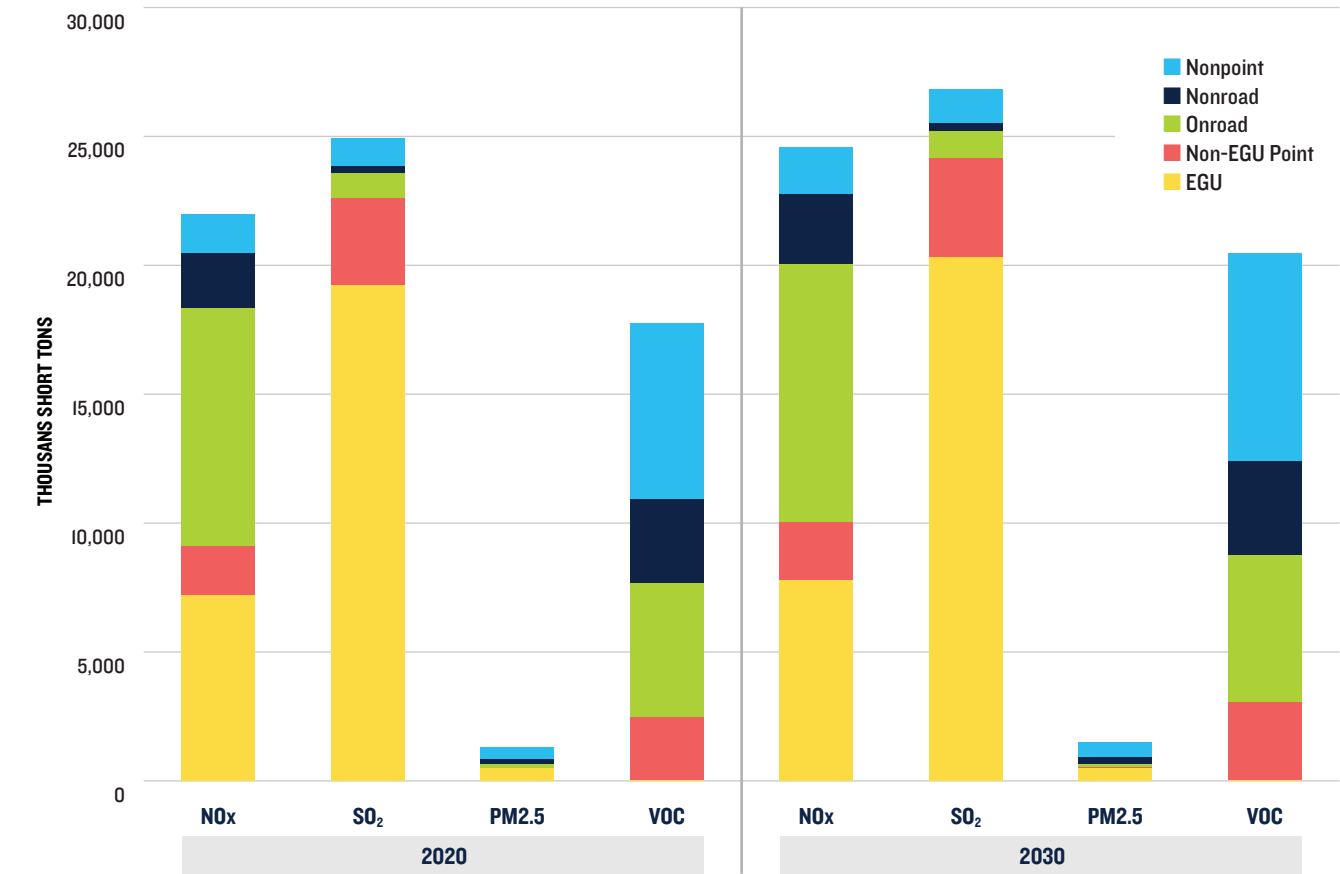
BY THE NUMBERS: REDUCTIONS IN AIR POLLUTION, HEALTH IMPACTS, AND PREMATURE DEATHS

The IEc study completed on behalf of NRDC found that the 1990 CAAA programs in place in 2016 (prior to changes by the Trump administration) had significantly lowered emissions of all studied air pollutants in the United States

and would continue to do so. By 2020, in comparison with a world in which the programs had not gone forward, NO_x emissions would be reduced by an estimated 22 million tons, SO₂ emissions by nearly 25 million tons, VOCs by nearly 18 million tons, and fine PM by nearly 1.3 million tons annually (see Table 2). By 2030, the CAAA will have lowered NO_x emissions by nearly 25 million tons, SO₂ emissions by nearly 27 million tons, VOCs by more than 20 million tons, and fine PM by about 1.5 million tons. Figure 2 shows the pollution reductions across specific sources for both 2020 and 2030.

| TABLE 2: EMISSIONS REDUCTIONS RELATED TO THE CLEAN AIR ACT AMENDMENTS OF 1990 | | | |
|---|-------------------|--------|--------|
| POLLUTANT | | 2020 | 2030 |
| CRITERIA POLLUTANTS (OR PRECURSORS) (1,000 short tons) | NO _x | 21,974 | 24,582 |
| | SO ₂ | 24,937 | 26,837 |
| | PM _{2.5} | 1,299 | 1,489 |
| | VOCs | 17,760 | 20,468 |
| GREENHOUSE GASES (MMT CO ₂ eq) | CO ₂ | 384 | 1,033 |
| | CH ₄ | 24 | 46 |

FIGURE 2: CRITERIA EMISSIONS REDUCTIONS BY POLLUTANT AND SOURCE CATEGORY (CONTINENTAL UNITED STATES)



IEc estimated that these pollution reductions would prevent between 185,000 and 370,000 premature deaths per year by 2020 (Table 2).³⁶ To put this into perspective, about 140,000 people die of stroke in the United States every year.³⁷

Additionally, IEC estimated that CAAA programs would help avoid approximately 46,300 heart attacks; 189,300 hospital admissions for cardiac and respiratory illnesses; 119,000 ER visits by asthma patients; 21.9 million fewer lost work days; and 8.3 million fewer lost school days each year by 2020.

By 2030, that improved air quality will prevent 229,000 to 457,000 premature deaths annually along with 54,600 heart attacks, more than 220,000 hospital admissions for cardiac and respiratory illnesses, and 141,000 emergency room visits for asthma attacks (see Table 2).³⁸ It will also prevent 26 million lost work days and more than 10 million lost school days per year by 2030.

IEc estimated the economic value of these health benefits would be between about \$2.0 trillion and \$3.9 trillion in 2020 (in 2015 dollars), as shown in Table 3. By comparison, the costs of the CAAA programs are estimated to be \$120 billion in 2020. The benefits of the CAAA programs would exceed the costs by a factor of 16 to 32 by 2020 (i.e., the benefit-cost ratio).

TABLE 3: REDUCED INCIDENCE OF ADVERSE HEALTH EFFECTS REALIZED ANNUALLY IN 2020 AND 2030

| Health Effect | 2020 | 2030 |
|---------------------------------|-------------|-------------|
| Premature Mortality—Low Est. | 185,000 | 229,000 |
| Premature Mortality—High Est. | 370,000 | 457,000 |
| Nonfatal Heart Attacks | 46,300 | 54,600 |
| Hospital Admissions—Cardiac | 151,000 | 177,000 |
| Hospital Admissions—Respiratory | 38,300 | 45,200 |
| Acute Respiratory Symptoms | 147,000,000 | 175,000,000 |
| Upper Respiratory Symptoms | 2,630,000 | 3,130,000 |
| Lower Respiratory Symptoms | 2,480,000 | 2,950,000 |
| Asthma Exacerbations | 55,800,000 | 67,100,000 |
| ER Visits—Asthma | 119,000 | 141,000 |
| Lost Work Days | 21,900,000 | 26,000,000 |
| Lost School Days | 8,290,000 | 10,100,000 |

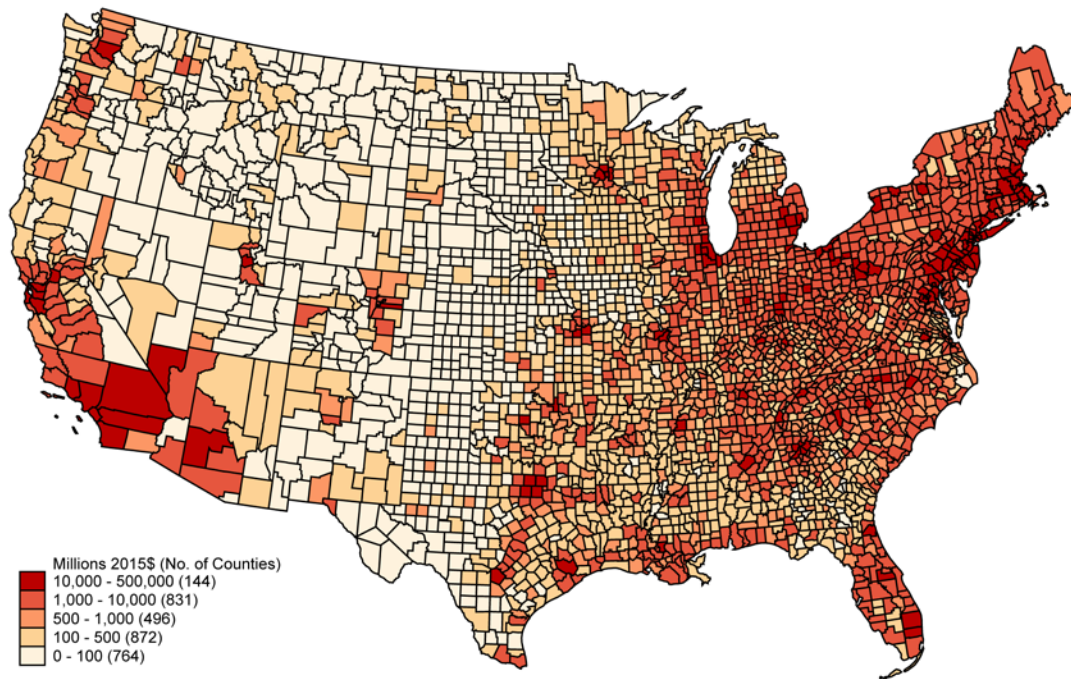
All values are rounded to three significant figures.

TABLE 4: BENEFITS, COSTS, AND NET BENEFITS OF CLEAN AIR ACT POLICIES (IN BILLIONS OF 2015 DOLLARS)

| | 2020 | | 2030 | |
|--|----------------|----------------|----------------|----------------|
| | Low | High | Low | High |
| Benefits | \$1,980 | \$3,900 | \$2,630 | \$5,130 |
| Criteria Pollutants—Avoided Mortality | \$1,930 | \$3,840 | \$2,520 | \$5,030 |
| Criteria Pollutants—Avoided Morbidity | \$35 | \$35 | \$42 | \$42 |
| Greenhouse Gases—Avoided Impacts | \$21 | \$21 | \$63 | \$63 |
| Costs | \$120 | \$120 | \$160 | \$160 |
| Electricity Generation Units (EGUs) | \$24 | \$24 | \$28 | \$28 |
| Non-EGU Point Sources | \$7.7 | \$7.7 | \$8.7 | \$8.7 |
| On-Road Vehicles | \$64 | \$64 | \$99 | \$99 |
| Nonroad Engines | \$1.3 | \$1.3 | \$1.7 | \$1.7 |
| Nonpoint Sources | \$1.5 | \$1.5 | \$2.2 | \$2.2 |
| Local Controls | \$23 | \$23 | \$23 | \$23 |
| Net Benefits | \$1,860 | \$3,780 | \$2,460 | \$4,970 |
| Fuel Savings & Natural Gas Recovery | \$59 | \$59 | \$231 | \$231 |
| Net Benefits (With Fuel Savings & Natural Gas Recovery) | \$1,920 | \$3,840 | \$2,700 | \$5,200 |

Numbers may not add precisely due to rounding. The low and high end represent different estimates from literature on the PM-mortality and ozone-mortality relationships.

FIGURE 3: SPATIAL DISTRIBUTION OF BENEFITS IN 2030 (HIGH END)



These 2030 benefits to public health and avoided mortality will translate to between \$2.6 trillion and \$5.1 trillion in annual economic benefits to the nation (see Table 3). By comparison, the estimated costs of programs implemented under the act will be about \$160 billion in 2030. The benefits of the CAAA will exceed the costs, again, by a factor of 16 to 32 by 2030. IEc's analysis also found that nearly every county analyzed in the continental U.S. will see benefits from CAAA programs.³⁹ Figure 3 shows the spatial distribution of benefits in 2030 (high-end). IEc found that the county-level benefits in the eastern U.S. are generally higher than the western U.S. due to the higher population density in the east together with the benefits from reduced transport of air pollutants from the Midwest to the East Coast. Benefits are also high in major population centers across the U.S., particularly in Southern California where the local topography combined with the large number of emission sources can lead to significant air quality problems.

Beyond public health, it is worth noting that complying with the regulations will also cut energy waste, leading to estimated fuel and energy savings worth up to \$231 billion in 2030. Those economic savings will directly benefit the pocketbooks of consumers and the bottom line of American businesses. These economic savings alone outweigh the entire costs of the CAAA.

The programs implemented under the CAAA will also reduce U.S. GHG emissions. IEc estimates that the reductions in GHGs will lead to more than \$21 billion in economic benefits (or avoided climate-related economic damages) annually by 2020 and more than \$63 billion annually by 2030, using figures developed by the Interagency Working Group on the Social Cost of Greenhouse Gases.⁴⁰ We note that these numbers are likely underestimated, as they do not include the avoided costs of climate change impacts such as forest fires, crop damage from temperature extremes, and effects of drought on food prices and on energy and water supplies; health impacts from degraded air quality related to climate change; and potential catastrophic events (e.g., a 20-foot sea level rise from collapsing ice sheets).⁴¹ Another reason these estimates may understate the full value is that the data on GHG reductions resulting from the Clean Air Act are incomplete, particularly for many of the rules developed in the 1990s and early 2000s.

The bottom line is this: By 2030 the rules adopted under the CAAA will have saved taxpayers money, improved public health, and reduced the greenhouse gas emissions that are driving climate change.



TAKING ACTION TO PROTECT THE CLEAN AIR ACT PROGRAMS

The analysis by IEc clearly shows that the CAAA programs have cost-effectively reduced pollution, providing outsize benefits relative to the costs of compliance. But the monetary value—even trillions of dollars in annual benefits—does not really capture the true worth of the act.

Clean air allows hundreds of thousands of people to live their lives to their full potential rather than facing early mortality from breathing polluted air. It means a better quality of life for millions of Americans and fewer health problems among some of the most vulnerable and affected populations—the elderly, children, and infants. While some of the direct public health gains are captured in monetary terms in this study, it is impossible to put a dollar value on the ability of children to play outside without suffering an asthma attack or the ability of their parents to work and recreate without heightening their risk of a heart attack.

Moreover, the Clean Air Act programs remain one of the primary mechanisms to address GHG emissions at the national level. The *Fourth National Climate Assessment* (2018)—developed by 300 federal and nonfederal experts from government agencies, national laboratories, universities, the private sector, and tribes and Indigenous communities—has made it clear that ongoing GHG emissions and the resulting climate change impacts are a growing threat to human life, property, and ecosystems across the country.⁴²

The U.N. Intergovernmental Panel on Climate Change has reported that the planet will suffer profound impacts from climate change with a global temperature rise of just 1.5 °C above preindustrial levels—and we have already passed 1 °C. If GHG emissions continue to rise at current rates, the world will increasingly suffer from catastrophic, irreversible changes in major ecosystems. The resulting crisis will include food shortages, wildfires, rising seas, and other disasters that will result in a massive number of refugees as populations are forced from their homes.⁴³

The Clean Air Act is invaluable. Clean air wasn't a partisan issue when it was passed in 1970. There is no reason it should be one now. However, the CAA is under attack by the current administration, and we must take immediate steps to protect it.

The U.S. House of Representatives must investigate the EPA's recent attempts to undermine the act and hold the White House and its EPA appointees accountable for these regulatory rollbacks and failures to enforce the agency's own rules. The House should continue to investigate efforts to undermine the role of science and scientists within the agency. Citizens and elected officials should call upon the Trump administration to purge the agency of former lobbyists and defenders of big polluters.⁴⁴ At the same time, our elected representatives should make sure that the EPA has the budget to do its job mandated under the Clean Air Act, including but not limited to enforcement of the rules on the books.

The U.S. House committees must find common ground with

the Senate to advance sensible policies that will continue to build on the progress we've seen in nearly 50 years of the Clean Air Act. Working together, members of Congress should take steps to ensure that the EPA fulfills its core mission: protecting public health and the environment.

Only immediate, ambitious action can avert the worst impacts of the climate crisis. Our representatives must work to halt and reverse the Trump administration's rollbacks to critical, health-protective requirements under the CAA and to also bar other proposals aimed at increasing production and consumption of fossil fuels.

More than ever, to make progress state and local leaders will need to take action, using their own authority to make environmental commitments that counter the Trump administration's efforts to weaken the CAA. Some examples of jurisdictions stepping up to the plate include the following:

- Hawaii, Virginia, New Mexico, New York, Puerto Rico, Washington, and the District of Columbia have passed legislation targeting 100 percent carbon-free electricity by the 2040s.⁴⁵
- Colorado, Minnesota, New Mexico, Nevada, and Washington have either adopted or are considering adopting state clean car programs.⁴⁶
- California—which is already seeing an unprecedented wave of devastating wildfires that are at least partially a result of climate change—recently committed to a goal of 100 percent carbon-free electricity by 2045.⁴⁷ Governor Gavin Newsom should continue to maintain California's international leadership in the battle against climate change.⁴⁸
- Colorado, Connecticut, Maine, Nevada, New Jersey, Rhode Island, and Wisconsin all have executive orders or state goals to achieve 100 percent carbon-free electricity by the 2040s.⁴⁹
- Eight states and the District of Columbia have committed to developing an action plan to put hundreds of thousands more zero-emission trucks and buses onto the road to reduce harmful smog-forming pollutants, particular matter, and greenhouse gas emissions.⁵⁰
- At the municipal level, more than 125 cities have committed to move to 100 percent clean energy, including Cincinnati, Ohio; Madison, Wisconsin; and Abita Springs, Louisiana, among many others.⁵¹
- In the East, 12 states plus Washington, D.C., have been moving forward on the Transportation and Climate Initiative, which is pursuing a holistic approach to reduce the carbon pollution coming from the transportation sector (the largest contributor to climate-warming pollution in both the region and nationally).⁵²

These cities and states are taking action not only to be good global citizens in trying to address a global challenge, but also to improve the health and well-being of their local communities. This is a promising start, but we need more. To avert disaster, we need bold action right now at every level of government, from city hall to Congress.

CONCLUSION

It has been nearly 50 years since Congress passed the Clean Air Act of 1970. The evidence is clear that the act has been an incredible success story, improving the lives of every American and saving the lives of literally millions of people over the past half century.⁵³ NRDC's latest study—like every study before—shows that the costs of complying with the act are a fraction of its quantified benefits. Moreover, the study focuses only on major public health benefits stemming from reductions in criteria air pollutants; a full reckoning of all the CAA's benefits would further tip the benefit-cost ratio in the act's favor. Such additional, uncounted benefits include increased productivity for crops and commercial timber, improved visibility in residential and recreational areas, reduced degradation of buildings constructed with acid-sensitive materials, reductions in organic aerosols and air toxins, and fuel savings to consumers and businesses alike.

But the act is being challenged and undermined daily on multiple fronts. Eroding it will allow polluters to freely ignore the costs that society bears from their pollution. Instead of industries internalizing these costs and limiting their emissions, the public will pay these costs in lives lost prematurely, more days spent in hospitals and emergency rooms, more sick days from work and school, more severe asthma, more heart attacks—and more severe impacts from climate change.

The investments made in clean air over the past 50 years have paid off many times over. There is absolutely no justification for curtailing those investments and allowing polluters to poison our air for their profit while the public pays the costs.

Congress must step up to defend the Clean Air Act and all it has accomplished and ensure that the public continues to see the trillions of dollars' worth of annual benefits from the act's implementation and enforcement.

ENDNOTES

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