



# Community Health Impacts of Air Pollution in the U.S.

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# Abstract

*Community Health Impacts of Air Pollution in the U.S.* focuses on the contributions of the energy and transportation sectors to air pollution in the United States and the role of the Clean Air Act in addressing these emissions.

This report identifies the largest sources of air pollution in the U.S., describes the health impacts of air pollution, and summarizes the air emissions from the energy and transportation sectors. In addition, the report provides an overview of the Clean Air Act, including a description of some of its key programs and the pollutants regulated under the act, and discusses the successes of the Clean Air Act in improving air quality nationwide, while recognizing that disenfranchised and underserved communities bear a disproportionate share of the continuing burden of air pollution. Finally, the report concludes with three case studies demonstrating the impacts of energy- and transportation-related air pollution on the San Pedro Bay ports in southern California, the Ironbound community in Newark, New Jersey, and Petersburg, Indiana.

# About

## The Climate Equity Initiative

Clean Air Task Force (CATF) launched the *Climate Equity Initiative* in May 2021 to conduct research and analysis, and to work with environmental justice leaders, advocates, and community residents to:

- Identify barriers, challenges, and potential opportunities in environmental justice communities;
- Advocate changes and adoption of solutions to systemic barriers and challenges that create and perpetuate environmental injustice, particularly in the context of environmental and climate policies and practices; and
- Ensure that CATF has a clear-sighted understanding of the needs and concerns of environmental justice communities, particularly those most directly impacted by the energy transition currently underway in the United States, and, with their input, develop tools and initiatives to help ensure they have a powerful voice at the table in that transition to a clean energy future.

Too often, proposed climate solutions are developed outside impacted communities and fail to respect the core needs of their residents. As a result, policies, programs, and community engagement initiatives can lack critical success elements, resulting in failed climate-beneficial projects, or perpetuating injustice and inequality. CATF rejects the notion that such failures are inevitable. CATF recognizes that responses to environmental degradation and climate change must consciously employ strategies that to the maximum possible extent not only benefit the climate but also promote environmental justice and community economic development.

## Clean Air Task Force

Clean Air Task Force (CATF) is a global nonprofit organization working to safeguard against the worst impacts of climate change by catalyzing the rapid development and deployment of low-carbon energy and other climate-protecting technologies. With 25 years of internationally recognized expertise on climate policy and a fierce commitment to exploring all potential solutions, CATF is a pragmatic, non-ideological advocacy group with the bold ideas needed to address climate change. CATF has offices in Boston, Washington D.C., and Brussels, with staff working virtually around the world. Visit [catf.us](https://catf.us) and follow [@cleanaircatf](https://twitter.com/cleanaircatf).

# Key Takeaways

- The Clean Air Act (CAA) has reduced overall air pollution levels:
  - The CAA has dramatically reduced air pollution levels in the United States.
  - Since 1970, emissions of criteria and precursor pollutants in the U.S. have dropped by 78%.
  - Between 1990 and 2022, other harmful pollutant concentrations also dropped significantly with CO falling by 81%, ground-level O<sub>3</sub> by 22%, and lead by 88% from 2010.
- EPA has estimated that the **CAA amendments would be responsible for preventing over 230,000 early deaths in 2020**, significantly reducing the frequency of respiratory diseases.
- Nevertheless, **many Americans, especially in low-income and minority communities, remain exposed to dangerous levels of air pollution**. Exposure to elevated pollution levels is not distributed evenly. Instead, the harm of air pollution falls disproportionately on Black, Latino, Indigenous, Asian, and other communities of color and low-income communities across the U.S.
- According to the National Institute of Environmental Health Sciences, **air pollution is “a major threat to global health and prosperity**. Exposure to air pollution is responsible for a variety of adverse health consequences. For example, it can lead to damage to respiratory and cardiovascular systems, premature mortality, worsened mental health, impaired neural function, increased cancer risk, decreased fertility, weakened immune systems, and harm to pregnancies. Air pollution, in all forms is responsible for more than 6.5 million deaths each year globally.”
- Despite the benefits of the Clean Air Act, **many Americans experience unhealthy levels of air pollution in the U.S.** While the Clean Air Act has significantly reduced air pollution, there:
  - are areas in the U.S. where air pollution exceeds legal limits under the Clean Air Act;
  - is research indicating that some existing air pollution standards may not be sufficiently protective of public health; and
  - are significant exposure disparities, especially related to people of color and low-income communities. For example:
    1. A 2022 report by Industrial Economics found that minority groups and low-income populations are 53% and 49% more likely to live where particulate matter levels are above the current NAAQS level, respectively.<sup>1</sup>
    2. According to the American Lung Association, of the 18 million people who live in counties with unhealthy levels of ozone, short-term PM<sub>2.5</sub>, and annual PM<sub>2.5</sub>, 72% are people of color.
- According to a report by the National Association for the Advancement of Colored People and Clean Air Task Force, *Fumes Across The Fence Line: The Health Impacts of Air Pollution from Oil and Gas Facilities on African American Communities*,<sup>2</sup> **over one million African Americans live in counties with a risk of cancer** from toxins emitted by natural gas facilities, and more than 6.7 million African Americans live in counties in the U.S. with oil refineries.<sup>3</sup>
- **Pollution hot spots and limitations of the existing air monitoring system may mask the full extent of air quality problems**. The U.S. has one of the most extensive networks of any country in the world, but, while regulatory monitors have historically been useful in assessing regional trends in air pollution across large geographical areas, these monitors do not fully capture spatiotemporal variation in ambient air pollution. As a result, the network can miss temporary spikes and geographic hot spots of air pollution, and therefore may not fully capture true levels of exposure to air pollution and disparities between People of Color (POC) in this exposure.

- **Criteria pollutants** (*i.e.*, particulate matter (PM), ozone, NO<sub>2</sub>, SO<sub>2</sub>, lead, and CO), **especially PM<sub>2.5</sub> and ozone, have major health impacts.** There have been many discussions among stakeholders regarding the need for more stringent regulations on PM<sub>2.5</sub> and ozone.
- **The energy and transportation sectors are the largest emitters of air pollution in the United States.** For example, in 2015, the energy and transportation sectors emitted the highest amount of SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub>.
- **Burning coal releases many harmful pollutants**, including particulate matter, sulfur dioxide, NO<sub>x</sub>, metals (*i.e.*, mercury, arsenic, and chromium), and other possible carcinogens. Air pollution from coal-fired power plants is linked to asthma, respiratory diseases, cardiovascular diseases, kidney disease, poor birth outcomes, poor quality of life, mental health problems, death, cancer, and neurological problems.
- While natural gas-fired plants do not generate as much particulate matter, mercury, or sulfur dioxide pollution as coal-fired power plants, they do generate NO<sub>x</sub> emissions, which can lead to ozone and PM<sub>2.5</sub> formation. Additionally, methane – a potent greenhouse gas – often leaks from natural gas-fired power plants, which contributes to ozone formation. Natural gas-fired power plants also emit volatile organic compounds, sulfur dioxide, hydrogen sulfide, carbon monoxide, and various hazardous air pollutants, which can lead to adverse cognitive effects, mental health problems, asthma episodes, breathing problems, leukemia, irritation (*i.e.*, skin, eyes, throat, and nose), sleep disturbances, heart disease, hormone disruptions, reproductive harm, and birth defects.



## SECTION 1

# The Energy and Transportation Sectors are the Largest Emitters of Air Pollution in the United States<sup>a</sup>

According to the National Institute of Environmental Health Sciences, air pollution is “a major threat to global health and prosperity. Air pollution, in all forms, is responsible for more than 6.5 million deaths each year globally...”<sup>a</sup> Fossil fuels cause adverse health impacts across their life cycle, from mining to transport to combustion to waste management.<sup>b,5</sup> Impacts manifest on spatial scales from local to global.<sup>6</sup> Each stage of the life cycle of oil, gas, and coal – extraction, processing, transport, and combustion – generates toxic air pollution, water pollution, and greenhouse gas emissions.<sup>7</sup> Most of the health risks come from the final conversion stage (i.e., power plant and automobile) of the energy supply systems. The following sections

discuss air pollution from three categories: (1) power plants; (2) the extraction, processing, and transportation of oil and gas; and (3) the transportation sector.

## 1.1 Power Plant Emissions

Power plants generate electricity using a variety of sources, including fossil fuels such as coal, natural gas, and oil, as well as cleaner sources like wind, solar, and hydropower. Fossil fuel combustion currently contributes the largest share of the world’s power generation, with coal alone accounting for 40% of the global electricity supply.<sup>8</sup> In the United States, fossil fuels accounted for approximately 60% of power generation in 2022 – 39.8% from natural gas and 19.5% from coal.<sup>9</sup>

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<sup>a</sup> This paper does not address petrochemical and plastic sources of air pollution.

<sup>b</sup> “Vehicle emissions, fuel oils and natural gas to heat homes, by-products of manufacturing and power generation, particularly coal-fueled power plants, and fumes from chemical production are the primary sources of human-made air pollution.”

Burning coal releases many harmful pollutants, including particulate matter, sulfur dioxide, NO<sub>x</sub>, metals (*i.e.*, mercury, arsenic, and chromium), and other possible carcinogens.<sup>10</sup> Air pollution from coal-fired power plants is linked to asthma, respiratory diseases, cardiovascular diseases, kidney disease, poor birth outcomes, poor quality of life, mental health problems, death, cancer, and neurological problems.<sup>11</sup> Over 3,000 deaths every year are attributable to PM<sub>2.5</sub> pollution from U.S. coal-fired power plants.<sup>12</sup>

Coal plants also generate coal ash as a waste product, which contains numerous toxic metals such as mercury, arsenic, lead, chromium, cadmium, nickel, and zinc.<sup>13</sup> There are at least 738 coal ash dumps in 43 states, often contaminating groundwater with toxins due to utilities dumping the coal ash in unlined ponds and landfills.<sup>14</sup> Improper storage of coal ash dumps can lead to spill disasters such as the 2008 Kingston coal ash spill.<sup>c</sup> These leakages are often disproportionately located near low-income communities. Breathing in coal ash toxins can cause severe health impacts, including cancer, cardiovascular problems, nervous system damage, and increased health problems in children.<sup>15</sup>

While natural gas-fired plants do not generate as much particulate matter, mercury, or sulfur dioxide pollution as coal-fired power plants, they do generate NO<sub>x</sub> emissions, which can lead to ozone and PM<sub>2.5</sub> formation.<sup>16</sup> Additionally, methane – a potent greenhouse gas – often leaks from natural gas-fired power plants, which contributes to ozone formation.<sup>17</sup> Natural gas-fired power plants also emit volatile organic compounds (VOCs), sulfur dioxide, hydrogen sulfide, carbon monoxide, and various hazardous air pollutants (HAPs), which can lead to adverse cognitive effects, mental health problems, asthma episodes, breathing problems, leukemia, irritation (*i.e.*, skin, eyes, throat, and nose), sleep disturbances, heart disease, hormone disruptions, reproductive harm, and birth defects.<sup>18</sup>

## 1.2 Oil and Gas Extraction, Processing, and Transmission, and Distribution Emissions

The process of extracting, processing, and transporting oil and natural gas (to be used in sectors such as transportation and power) creates its own separate set of harmful emissions. The oil and natural gas cycle begins with exploration, drilling, and extraction. The fossil fuels must then be refined. Between extraction, processing, and reaching its end use, oil and gas must also be transported to many different locations. Crude oil is typically transported via “barges, tankers, over land, pipelines, trucks, and railroads,” while natural gas is transported either through pipelines or liquified natural gas tankers.<sup>19</sup>

The oil and gas industry emits large amounts of methane. In 2021, “natural gas systems” and “petroleum systems” were the two largest categories of energy-related methane emissions in the United States.<sup>20</sup> The oil and gas industry emit 9 million tons of methane and toxic pollutants into the air each year.<sup>21</sup> Methane emissions occur at all stages of natural gas production, processing, transmission, and distribution, both from intentional venting and unintentional leaks. Methane emissions in the oil industry occur mainly from venting gas from oil wells and storage tanks.<sup>22</sup>

Oil and gas operations are also the leading industrial source of VOCs, releasing numerous toxic chemicals (including hydrogen sulfide,<sup>d</sup> toluene, xylene, benzene, and formaldehyde).<sup>23</sup> As a result, oil and gas development is a source of ozone precursors (notably VOCs and NO<sub>x</sub>) and has been associated with elevated regional ozone levels. In addition, HAP emissions can arise from drilling activities, leaks from infrastructure, refining and processing, and end-use combustion. Exposure to oil and gas activity has been linked to negative health impacts, including elevated cancer risk,

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<sup>c</sup> A dike ruptured at a Kingston power plant in Tennessee, which resulted in pouring more than a billion gallons of toxic coal ash into the Emory River. Bourne, Jr., Joel K. (2019, Feb. 19). *Coal's other dark side: Toxic ash that can poison water and people*. National Geographic. <https://www.nationalgeographic.com/environment/article/coal-other-dark-side-toxic-ash>; Donaghy, Tim, and Jiang, Charlie. (2021). *Fossil Fuel Racism: How Phasing Out Oil, Gas, and Coal Can Protect Communities* [White paper]. Retrieved from <http://www.greenpeace.org/usa/fossil-fuel-racism>

<sup>d</sup> Hydrogen sulfide (H<sub>2</sub>S) is a highly toxic and dangerous gas that occurs naturally in oil and gas deposits; it is a serious hazard for workers. See, e.g., Hydrogen Sulfide, Occupational Safety and Health Administration, U.S. Department of Labor. <https://www.osha.gov/hydrogen-sulfide>

pregnancy complications, adverse birth outcomes, and respiratory and cardiovascular disease.<sup>24</sup> For instance, exposure to the oil and gas sector is expected to cause 3,600 emergency room visits, 100,000 lost days of work, 2,000 premature deaths, and over a million asthma exacerbations annually by 2025.<sup>25</sup>

As of 2022, more than 50 million Americans live near oil and gas operations with measured air pollution levels exceeding the federal health standard according to the State Energy Environment Impact Center.<sup>26</sup> Nationally, 17.6 million people live within one mile of an active oil or gas well.<sup>27</sup> Living near oil and gas operations has been associated with “respiratory impacts (e.g., asthma), cancer, poor birth outcomes, cardiovascular impacts, sleep disturbance, and mental health issues.”<sup>28</sup>

### 1.3 Transportation Emissions

The transportation sector in the U.S. consists of on-road vehicles (passenger cars, trucks, and buses) and off-road vehicles (tractors, trains, maritime ships, and airplanes).<sup>29</sup> There are three types of emissions associated with the transportation sector: (1) exhaust emissions (*i.e.*, produced during combustion); (2) abrasion emissions (*i.e.*, produced by the wearing and corrosion of vehicle components, safety barriers, and road materials); (3) and evaporative emissions (*i.e.*, fuel evaporating).<sup>30</sup>

The transportation sector is responsible for over 55% of NO<sub>x</sub> emissions in the U.S. It is also responsible for emissions of significant quantities of other harmful pollutants, including particulate matter and VOCs.<sup>31</sup> In addition, various air pollutants from the transportation sector come together to form smog. The main ingredient in smog is ozone, which, as described above, is produced when sunlight reacts with NO<sub>x</sub> and VOCs in the atmosphere.<sup>32</sup>

In 2016, ozone and particulate matter from vehicle emissions led to 7,100 deaths in the Northeast and Mid-Atlantic regions of the U.S.<sup>33</sup> According to the State Energy and Environment Impact Center of New York University Law, PM<sub>2.5</sub> pollution from vehicle emissions contributes to 320 deaths, and 870 hospitalizations and emergency department visits yearly in New York City.<sup>34</sup> In addition, tailpipe emissions are also transported to other states, which harms communities in cities and states downwind of major polluting areas.<sup>35</sup>



## SECTION 2

# Health Impacts of Air Pollution

Exposure to air pollution is responsible for a variety of adverse health consequences. For example, it can lead to damage to respiratory and cardiovascular systems, premature mortality, worsened mental health, impaired neural function, increased cancer risk, decreased fertility, weakened immune systems, and harm to pregnancies.<sup>36</sup> This section highlights some of the main impacts associated with exposure to specific air pollutants regulated under the CAA.

## 2.1 Criteria Pollutants

### 1.) Particulate Matter<sup>37</sup>

PM pollution is the largest environmental health risk factor in the United States, accounting for 63 percent of deaths from environmental causes.<sup>38</sup> PM pollution is a mixture of solid particles and liquid droplets suspended in the air. Exposure to PM has been associated with a wide range of health problems including cardiovascular disease (e.g., irregular heartbeat, nonfatal heart attacks, ischemic heart disease (IHD)), respiratory issues (e.g., lung cancer, aggravated asthma, COPD, lower respiratory infections (LRIs), decreased lung function, irritation of the airways, coughing), stroke, diabetes, and adverse birth outcomes. In 2016, there were 205,000 premature deaths in the U.S. due to PM<sub>2.5</sub> exposure from energy-related sectors.<sup>39</sup>

EPA regulates two types of PM differently, based on their size: PM<sub>2.5</sub> (particles with a diameter of less than 2.5 micrometers known as “fine particulate matter” and PM<sub>10</sub>; particles with a diameter less than 10 micrometers; particles between 2.5 and 10 micrometers are called “coarse particulate matter”).<sup>40</sup> Fine particulate matter is the most damaging to human health because it can penetrate deep into the lungs and eventually enter the bloodstream.<sup>41</sup> For instance, EPA has found that there is strong epidemiological evidence for a relationship between short-term PM<sub>2.5</sub> exposure and “several respiratory-related endpoints, including asthma exacerbation, chronic obstructive pulmonary disease (COPD) exacerbation, and combined respiratory-related disease.”<sup>42</sup> In addition, long-term PM<sub>2.5</sub> exposure is likely associated with cancer and harms the nervous system.<sup>43</sup>

### 2.) Ozone

Ground-level ozone, the main ingredient in smog, is formed through photochemical reactions involving nitrogen oxides and VOCs in the presence of sunlight; its formation is accelerated by higher temperatures.<sup>44</sup> According to EPA, depending on the level of exposure, ozone can cause coughing, sore or scratchy throat, breathing problems, damage and inflammation of the airways, increase in asthma attacks, susceptibility to lung

infection, and aggravation of lung diseases (*i.e.*, asthma, emphysema, and chronic bronchitis).<sup>45</sup> Ozone exposure contributes to 51,000 deaths in the U.S. and more than one million deaths globally per year.<sup>46</sup>

### 3.) Other Criteria Pollutants

Other criteria pollutants similarly produce an array of harmful health and environmental consequences:

- SO<sub>2</sub> is linked with asthma, bronchitis, smog, and acid rain. Short-term exposures to SO<sub>2</sub> can harm the human respiratory system and make breathing difficult.<sup>47</sup> High atmospheric SO<sub>2</sub> concentrations can generally lead to the formation of other sulfur oxides (SO<sub>x</sub>), which in turn can be precursors for the formation of secondary PM.<sup>48</sup>
- Short-term NO<sub>2</sub> exposures can aggravate respiratory diseases (*i.e.*, asthma), which can lead to respiratory symptoms (*i.e.*, coughing, wheezing, or difficulty breathing), hospital admissions, and visits to emergency rooms. Longer exposures to NO<sub>2</sub> may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. NO<sub>2</sub> also reacts with other chemicals to form both PM and ozone.<sup>49</sup>
- Short-term exposure to carbon monoxide (CO) can cause cardiovascular morbidity, in particular by reducing oxygen transport to the heart and causing angina.<sup>50</sup>
- Lead (Pb) can have negative effects on kidney function, the nervous system, the immune system, reproductive and developmental systems, and the cardiovascular system.<sup>51</sup> Large amounts of lead can damage children's brains and kidneys while minimal exposure can affect their IQ and ability to learn.<sup>52</sup>

## 2.2 Hazardous Air Pollutants

As mentioned above, HAPs cause cancer and other serious health impacts.<sup>53</sup> Exposure to sufficient concentrations of HAPs can lead to damage to the immune system, neurological disorders, reproductive disorders, developmental disorders, and respiratory and other health problems.<sup>54</sup> A common HAP is benzene, a carcinogen; it can cause both short-term effects (eye, skin, and lung irritations) and long-term effects (blood disorders, neurological disorders, developmental disorders, and reproductive disorders). Another HAP, formaldehyde, can lead to certain types of cancer and respiratory symptoms.<sup>55</sup>

Another important HAP is mercury, a bio-accumulative<sup>°</sup> pollutant that can cause nerve damage, cardiovascular damage, digestive damage, immune system damage, endocrine disruption, and diabetes risk, and is a serious threat to child development (*i.e.*, permanent neurological damage and neurocognitive issues).<sup>56</sup> Since the 1990s, the largest sources of anthropogenic mercury emissions in the U.S. have been coal-fired power plants, waste combustion, and industrial sources.<sup>57</sup>

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<sup>°</sup> Once mercury is released into the atmosphere, it contaminates lands, oceans, and streams then it can convert into methylmercury (MeHg), a harmful toxic, which can accumulate in food and eventually into people.



## SECTION 3

# Overview of the Clean Air Act

The Clean Air Act (“CAA”) is the primary federal law addressing the public health and environmental impacts of air pollution. The 1970 Clean Air Act Amendments established the “basic architecture of the US air pollution control system” and for the first time gave the federal government a serious regulatory role in protecting the environment.<sup>58</sup> More specifically, the 1970 CAA Amendments required the establishment and implementation of the National Ambient Air Quality Standards (“NAAQS”), authorized new source performance standards (“NSPS”) and hazardous air pollutants emissions standards (“NESHAP”) for stationary sources, required reductions in automobile emissions, and strengthened federal enforcement authority.<sup>59</sup>

In 1977 Congress passed further amendments modifying the auto emission standards, extending attainment deadlines for the NAAQS, and adding a preconstruction permit (New Source Review) program. And in 1990 Congress again made significant amendments to the CAA, creating new classifications for areas exceeding the ambient air quality standards, tightening mobile source emission standards, adding fuel requirements in polluted areas, strengthening the air toxics program, adding a program to address acid rain, establishing a permit program run by the states for major sources of air pollutants, phasing out stratospheric ozone-depleting chemicals, and updating enforcement provisions.

In the half-century since Congress passed the 1970 CAA Amendments, the statute has saved millions of lives, protected millions more from serious health problems, and reduced harmful impacts on wildlife and ecosystems. This section summarizes the key provisions of the Act.

## 3.1 The National Ambient Air Quality Standards

Much of the CAA’s improvement in air quality has been driven by the NAAQS, which are the foundation of many of the Act’s programs. The CAA directs the EPA to publish a list of criteria air pollutants, the “emission of which . . . cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare.”<sup>60</sup> Since the passage of the CAA, EPA has listed six criteria pollutants: (1) ozone; (2) carbon monoxide; (3) sulfur dioxide; (4) nitrogen dioxide; (5) particulate matter; and (6) lead. EPA then must set NAAQS for these listed “criteria” pollutants.<sup>61</sup> In setting primary air quality standards, EPA must “identify the maximum airborne concentration of a pollutant that the public health can tolerate, decrease the concentration to provide an ‘adequate’ margin of safety, and set the standard at that level.”<sup>62</sup> The CAA requires EPA to review the air quality criteria and the NAAQS every 5 years, though EPA has struggled to complete those reviews on time.<sup>63</sup> The table below lists the current NAAQS.

**Table 1: National Ambient Air Quality Table**

Pollutant (links to historical tables of NAAQS reviews)		Primary / Secondary	Averaging Time	Level	Form
<a href="#">Carbon Monoxide (CO)</a>		Primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
<a href="#">Lead (Pb)</a>		Primary and Secondary	Rolling 3 month average	0.15 µg/m³	Not to be exceeded
<a href="#">Nitrogen Dioxide (NO₂)</a>		Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	1 year	53 ppb	Annual mean
<a href="#">Ozone (O₃)</a>		Primary and Secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
<a href="#">Particle Pollution (PM)</a>	PM <sub>2.5</sub>	Primary	1 year	12.0 µg/m³	Annual mean, averaged over 3 years
		Secondary	1 year	15.0 µg/m³	Annual mean, averaged over 3 years
		Primary and Secondary	24 hours	35 µg/m³	98th percentile, averaged over 3 years
	PM <sub>10</sub>	Primary and Secondary	24 hours	150 µg/m³	Not to be exceeded more than once per year on average over 3 years
<a href="#">Sulfur Dioxide (SO₂)</a>		Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

National Ambient Air Quality Standards for six principal pollutants which can be harmful to public health and the environment.

Source: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

In recent years, EPA has revised the NAAQS standards for five of the six criteria pollutants,<sup>64</sup> specifically for PM<sub>2.5</sub> (2006, 2012), ground-level ozone (2008, 2015), SO<sub>2</sub> (2010), NO<sub>2</sub> (2010), and lead (2008). In 2011, EPA decided to retain the existing standards for CO.<sup>65</sup>

Under the CAA, the EPA Administrator must appoint an independent scientific review committee called the Clean Air Scientific Advisory Committee (CASAC), which plays a key part in the process of reviewing and updating the NAAQS.<sup>66</sup> CASAC has seven members including at least one physician, one member of the National Academy of Sciences, and one state air pollution control agency representative,<sup>67</sup> and EPA has typically added additional experts in the form of a pollutant-specific panel to aid CASAC as reviewing the scientific literature and NAAQS standards requires scientific knowledge and expertise across a range of disciplines.<sup>68</sup>

In December 2020, EPA issued two final actions declining to update the NAAQS for PM and ozone.<sup>69</sup> On June 10, 2021, EPA announced it would reconsider the decision not to strengthen the PM standards.<sup>70</sup> On October 28, 2021, EPA announced it would also reconsider the decision to retain the ozone standard.<sup>71</sup>

On January 27, 2023, EPA published a proposal to revise the primary annual PM<sub>2.5</sub> NAAQS to 9-10 µg/m<sup>3</sup> while taking comment on levels as low as 8 µg/m<sup>3</sup> and as high as 11 µg/m<sup>3</sup>, and retaining the other standards for PM on January 27, 2023.<sup>72</sup> According to the Spring 2023 Unified Agenda of Regulatory and Deregulatory Actions, EPA intends to finalize that rule in the fall of 2023.<sup>73</sup> EPA sent its final PM NAAQS rule to the White House Office of Management and Budget for review on September 22, 2023.<sup>74</sup>

EPA had also indicated that it intended to issue a proposal regarding the ozone NAAQS by spring 2024.<sup>75</sup> In June 2023, CASAC sent a letter to EPA in which six out of seven members of the committee recommended strengthening the ozone NAAQS to a level between 55 and 60 ppb.<sup>76</sup> Subsequently, in August 2023, EPA abandoned its reconsideration process and announced instead that it would complete a full review of the ozone NAAQS, which it will complete by 2025 at the earliest.<sup>77</sup>

## 3.2 Implementation of the NAAQS

Each time EPA revises one of the NAAQS, it creates a “cascading effect” on air quality policies and programs across the states and local regions. States and regions are supposed to ensure that sources of pollution decrease their emissions so that areas can meet the new national standard.<sup>78</sup> EPA first reviews air quality data to determine which parts of the country have pollution levels above or below the revised NAAQS. It designates areas that comply with the NAAQS as “attainment” and those that do not as “nonattainment.”<sup>79</sup> Next, state governments must develop State Implementation Plans (SIPs), which describe how nonattainment areas will be brought into compliance.<sup>80</sup> A SIP is a collection of the policies a state will use to achieve attainment: state rules/statutes and programs and site-specific plans. State plans are generally due 3 years after EPA designates areas as nonattainment.<sup>81</sup> EPA reviews SIPs to ensure that they meet statutory requirements.<sup>82</sup> If a state fails to act or develops an inadequate plan, EPA can step in to issue a Federal Implementation Plan, ban state permits, and withhold federal funding.<sup>83</sup>

Under section 110(a)(2)(D)(i)(I) of the CAA, in addition to reducing emissions to achieve the NAAQS within its own boundaries, each state must have a plan to prohibit emissions that contribute significantly to other states failing to attain or struggling to maintain attainment with the NAAQS. This is particularly an issue for ground-level ozone, as emissions of ozone precursors can travel long distances and cause attainment problems for downwind states. If a state fails to prohibit these emissions in a State Implementation Plan, EPA must step in with a Federal Implementation Plan (FIP) to address these emissions, as has often been the case historically.

## 3.3 Regulation of Hazardous Air Pollutants

The CAA also requires the EPA to regulate emissions of hazardous air pollutants (“HAPs” or “air toxics”) from a variety of stationary sources.<sup>84</sup> “Hazardous air pollutants are those known to cause cancer and other serious health impacts.”<sup>85</sup> In the CAA amendments of 1990, Congress listed 189 substances it “deemed to be hazardous” as HAPs.<sup>86</sup> EPA has subsequently removed and added pollutants from the list through rulemaking, leaving 188 currently listed HAPs. Examples include benzene, perchloroethylene, asbestos, cadmium, mercury, and chromium.<sup>87</sup> Thirty of these HAPs are known to cause serious health effects in urban areas:

**Table 2: List of 30 Urban Air Toxics**

List of 30 Urban Air Toxics		
Acetaldehyde	Dioxin	Mercury compounds
Acrolein	Propylene dichloride	Methylene chloride (dichloromethane)
Acrylonitrile	1,3-dichloropropene	Nickel compounds
Arsenic compounds	Ethylene dichloride (1,2-dichloroethane)	Polychlorinated biphenyls (PCBs)
Benzene	Ethylene oxide	Polycyclic organic matter (POM)
Beryllium compounds	Formaldehyde	Quinoline
1,3-butadiene	Hexachlorobenzene	1,1,2,2-tetrachloroethane
Cadmium compounds	Hydrazine	Tetrachloroethylene (perchloroethylene)
Chloroform	Lead compounds	Trichloroethylene
Chromium compounds	Manganese compounds	Vinyl chloride

These 30 HAPs are known to cause serious health effects in urban areas.  
Source: <https://www.epa.gov/urban-air-toxics/urban-air-toxic-pollutants>

Section 112 of the CAA requires the EPA to regulate HAP emissions from all major sources and certain area sources in multiple phases. The first phase requires EPA to set technology-based standards for different categories of sources. More specifically, maximum achievable control technology (MACT) standards for new sources can be no less stringent than the performance achieved by the best controlled similar source, while standards for existing sources can be less stringent, but no less stringent than the average emission limit achieved by the best performing 12 percent of existing sources (for source categories with at least 30 sources).<sup>88</sup> The next phase involves a health-based residual risk review to ensure that the remaining risks (after promulgation of the initial MACT standards) from the source categories' HAP emissions are acceptable. In addition, EPA must conduct a technology review, under which it revises the standards if necessary to account for developments in practices, processes, and control technologies. EPA must complete both of these reviews within eight years of setting the MACT standards, and it must continue to conduct technology reviews every eight years thereafter. Since EPA's promulgation of the Mercury and Air Toxics Standards ("MATS") rule in 2012,

coal- and oil-fired power plants have been regulated source categories under section 112.<sup>89</sup> EPA proposed to strengthen these standards pursuant to its technology review in April 2023.<sup>90</sup>

## 3.4 Other Key CAA Provisions

### 1) New Source Performance Standards

Under Section 111 of the Clean Air Act, EPA establishes technology-based standards called New Source Performance Standards ("NSPS") for new major stationary sources. These are uniform standards for criteria air pollutant and other air pollutant emissions from source categories based on the best system of emission reduction adequately demonstrated, taking costs into account. These standards are reviewed every 8 years. Section 111 also authorizes standards for existing stationary sources for pollutants that are not criteria air pollutants or hazardous air pollutants. The standards are also based on the best system of emission reduction but are supposed to be implemented in a manner similar to the NAAQS, giving states significant responsibility and discretion in implementation.

## **2) Emissions Standards for Mobile Sources**

Title II of the CAA addresses mobile sources. These provisions address both the fuels used in mobile sources and emissions standards for the actual sources, the latter typically focusing on manufacturers of new sources. For example, section 202 of the CAA requires EPA to prescribe standards for any air pollutant from new motor vehicles or vehicle engines that cause or contribute to air pollution reasonably anticipated to endanger public health or welfare. These standards apply nationwide and preempt state vehicle emissions standards, except that California can receive a preemption waiver that allows the state to adopt more protective standards, and other states are allowed to adopt California's standards.

## **3) New Source Review**

The 1977 CAA Amendments created the New Source Review program, which is a preconstruction review and permitting process for new or modified sources of air pollution. These permits can address the construction that is allowed, the air emissions limits on the source, and how the source can be operated.<sup>91</sup> Sources in nonattainment areas are subject to the Nonattainment NSR program, which imposes particularly strict requirements on new major sources of air pollution (including installation of the Lowest Achievable Emissions Rate controls), while major sources in attainment areas are subject to the Prevention of Significant Deterioration (PSD) program, which includes installation of the Best Available Control Technology. The PSD program regulates criteria pollutants and some other pollutants, while the Nonattainment NSR program only regulates criteria pollutants. Sources that emit less than a certain threshold fall under the Minor NSR program, over which states have significant control, and which is part of their State Implementation Plan. NSR permits are usually issued by state or local agencies.

## **4) Title V Permits**

The 1990 CAA Amendments added Title V, which established a comprehensive permitting system run by the states that consolidates all of the limitations and requirements imposed on a stationary source under various CAA provisions. Sources that emit above a certain amount of pollution are subject to Title V, and sources must report emissions every year to demonstrate compliance. Permits state how much of various air pollutants a source is allowed to emit and must be renewed at least every five years. EPA can veto a permit if there is a major permit change.



## SECTION 4

# The Clean Air Act Has Reduced Overall Air Pollution Levels, But Has Not Eliminated Exposure Disparities

### 4.1 The CAA Has Dramatically Reduced Air Pollution Levels in the United States

Since the EPA was established, air quality in the U.S. has improved dramatically due to a combination of successful regulations controlling criteria pollutants like SO<sub>2</sub> and NO<sub>2</sub> and by strictly regulating emissions of dangerous hazardous air pollutants.<sup>92</sup> Since 1970, emissions of criteria and precursor pollutants in the U.S. have dropped by 78%. Between 1990 and 2022, other harmful pollutant concentrations also dropped significantly with CO falling by 81%, ground-level O<sub>3</sub> by 22%, and lead by 88% from 2010.<sup>93</sup>

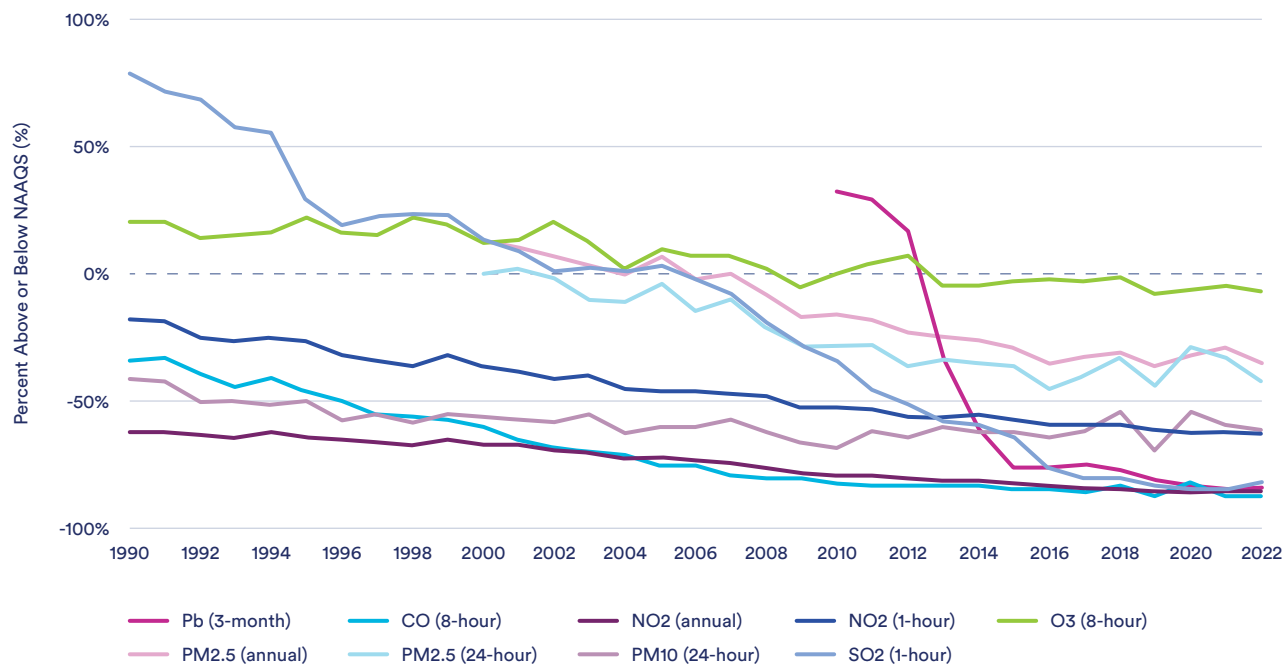
EPA has also quantified enormous benefits attributable to the 1990 CAA amendments programs. In EPA's Second Prospective Study of benefits and costs of the CAA, the agency estimated that the CAA amendments would be responsible for preventing over 230,000 early deaths in 2020 and significantly reducing the frequency of respiratory diseases (Table 3).<sup>f,95</sup>

The central estimate of the monetized value of the benefits attributed to the 1990 CAA amendments exceeded the costs by a factor of more than 30 to one, with a high estimate of the benefits exceeding costs by 90 times.<sup>96</sup>

**Figure 1: Declining National Air Pollutant Concentration Averages in the U.S. 1990 - 2022**

Between 1990 and 2022, other harmful pollutant concentrations also dropped significantly with CO falling by 81%, ground-level O<sub>3</sub> by 22%, and lead by 88% from 2010.<sup>94</sup>

Source: U.S. Environmental Protection Agency. Our Nation's Air. <https://gispub.epa.gov/air/trendsreport/2023/#home>



**Table 3: Types of Health Effects and Prevention Number**

Types of Health Effects	Prevention Number
Adult Mortality	230,000
Infant Mortality	280
Chronic Bronchitis	75,000
Asthma Exacerbation	2,400,000
Acute Myocardial Infarction	200,000
Ozone Mortality	7,100
Emergency Room Visits	120,000
Lost School Days	5,400,000
Lost Workdays	17,000,000

Since the formation of the EPA, public health has improved by preventing a series of illnesses and mortalities.

Source: U.S. Environmental Protection Agency. (2022, Aug. 8). Benefits and Costs of the Clean Air Act 1990-2020, the Second Prospective Study. <https://www.epa.gov/clean-air-act-overview/benefits-and-costs-clean-air-act-1990-2020-second-prospective-study>

## 4.2 Nevertheless, Many Americans, Especially in Low-income and Minority Communities, Remain Exposed to Dangerous Levels of Air Pollution

While the Clean Air Act has produced these immense health benefits across the United States, many Americans still experience unhealthy levels of air pollution. EPA reports that “approximately 85 million people nationwide lived in counties with pollution levels above the primary NAAQS in 2022.”<sup>97</sup> Even this number may be an underestimate; a study by Resources For the Future used high-resolution satellite-derived data to conclude that “54 counties in 11 states, home to 24.4 million people, are misclassified” as PM<sub>2.5</sub> attainment areas.<sup>98</sup> The American Lung Association’s 2023 “State of the Air” report found that 119.6 million people in the United States “live in places with failing grades for unhealthy levels of ozone or particle pollution.”<sup>99</sup> And in 2016, CATF analysis found that 9 million people in 238 counties face cancer risks above EPA’s 1-in-a-million level of concern because of HAP emissions from oil and gas operations.<sup>100</sup>

Exposure to elevated pollution levels is not distributed evenly. Instead, the harm of air pollution falls disproportionately on Black, Latino, Indigenous, Asian, and other communities of color and low-income communities across the U.S. For example, a 2022 report by Industrial Economics found that minority groups and low-income populations are 53% and 49% more likely to live where particulate matter levels are above the current NAAQS level, respectively.<sup>101</sup> According to the American

Lung Association, of the 18 million people who live in counties with unhealthy levels of ozone, short-term PM<sub>2.5</sub>, and annual PM<sub>2.5</sub>, 72% are people of color (POC).<sup>9,102</sup>

As shown in Figure 2, a 2021 study in *Science Advances* found that POC have higher exposures to particulate matter from almost all sectors of emissions.<sup>103</sup> Industry, light-duty gasoline vehicles, construction, heavy-duty diesel vehicles, residential gas combustion, and commercial cooking, exhibit particularly high exposure disparities.<sup>104</sup> Additionally, the study found that exposures vary more by race-ethnicity than by income. For instance, the difference in exposure between POC and whites is 2.4 times larger than the range in POC exposure among income levels.<sup>105</sup>

The energy and transportation sectors contribute to these disparities. For example, environmental justice and low-income communities are disproportionately located near oil and gas facilities. Over 1 million African Americans live in counties with a risk of cancer from toxins emitted by natural gas facilities; more than 6.7 million African Americans live in counties in the U.S. with oil refineries.<sup>106</sup> Communities near refineries are exposed to a range of air toxics, as detailed above.

Additionally, highways and polluting facilities have historically been sited in or next to low-income neighborhoods and communities of color, creating disproportionate impacts for these communities.<sup>107</sup> People who live, work, or attend school near major roads often have increased health problems, specifically “higher rates of asthma onset and aggravation, cardiovascular disease, impaired lung development in children, pre-term and low-birthweight infants, childhood leukemia, and premature death.”<sup>108</sup>

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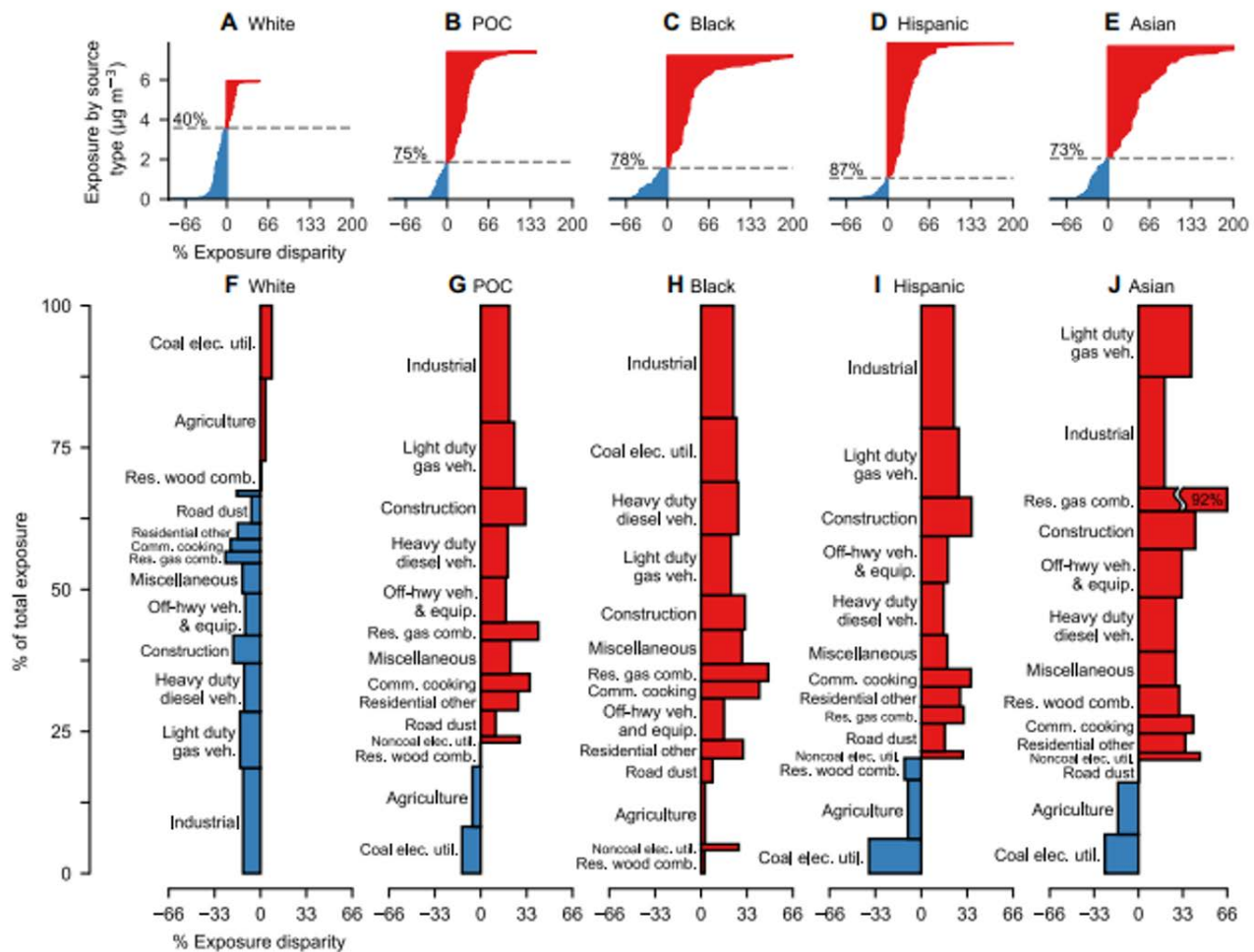
<sup>f</sup> Similarly, a 2020 Natural Resources Defense Council study concluded that the “annual benefits [of the CAA] include up to 370,000 avoided premature deaths, 189,000 fewer hospital admissions for cardiac and respiratory illnesses, 147 million fewer acute respiratory symptoms, and 8.3 million fewer lost school days.” Simon Mui & Amanda Levin, NRDC, *Clearing the Air: The Benefits of the Clean Air Act 2* (May 2020), <https://www.nrdc.org/sites/default/files/benefits-clean-air-act-ib.pdf> (citing Jason Price et al., NRDC, Indus. Econ., *The Benefits and Costs of U.S. Air Pollution Regulations* (2020), <https://www.nrdc.org/sites/default/files/iec-benefits-costs-us-air-pollution-regulations-report.pdf>

<sup>9</sup> People of color (POC) is being used based on the original source’s terminology.

**Figure 2: Source Contributions to Racial-ethnic Disparity in PM<sub>2.5</sub> Exposure**

Different types of sources that contribute to the racial-ethnic disparity in PM<sub>2.5</sub> exposure for each group.

Source: Tessum, Christopher W., Paoella, David A., et al. (2021). PM<sub>2.5</sub> pollutants disproportionately and systemically affect people of color in the United States. *Science Advances*, 7(18). DOI: [10.1126/sciadv.abf4491](https://doi.org/10.1126/sciadv.abf4491)



### 4.3 Pollution Hot Spots and Limitations of the Existing Air Monitoring System May Mask the Full Extent of Air Quality Problems

Because of limitations in the ambient air quality monitoring network, the full extent of exposure to unhealthy levels of air pollution – and disparities in those exposures – may well be greater than described above. One of EPA’s duties under the CAA is to “promulgate regulations establishing an air quality monitoring system throughout the United States...”<sup>109</sup> Pursuant to EPA’s regulations and guidance, state, local, and tribal governments as well as EPA itself operate a variety of ambient air quality monitoring networks. Examples of these networks include the State or Local Air Monitoring Stations (“SLAMS”), the National Core (“NCore”) Network multipollutant monitors, the Photochemical Assessment Monitoring Stations (“PAMS”) Network measuring ozone precursors, and the National Air Toxic Trend Sites (“NATTS”) Network monitoring hazardous air pollutants.<sup>110</sup>

Regulatory monitoring is largely carried out by large, stationary monitors.<sup>111</sup> EPA’s regulations mandate that monitoring to determine compliance with the NAAQS be conducted by either Federal Reference Monitors (FRMs) or Federal Equivalent Methods (FEMs).<sup>112</sup> Regulatory air monitoring networks produce estimates of air pollution that can be compared with the NAAQS,<sup>113</sup> and therefore support improvements in air quality across the country. Indeed, the U.S. has one of the most extensive networks of any country in the world. But while regulatory monitors have historically been useful in assessing regional trends in air pollution across large geographical areas, these monitors do not fully capture spatiotemporal variation in ambient air pollution.<sup>114</sup> As a result, the network can miss temporary spikes and geographic hot spots of air pollution, and therefore may not fully capture true levels of exposure to air pollution and disparities between groups in this exposure.<sup>115</sup>

The U.S. Government Accountability Office (GAO) has identified several ways in which the air monitoring network needs to be modernized and improved. A recent GAO report emphasized the following priorities:

- Increasing local-scale, real-time air quality information;
- Improving air toxics monitoring;
- Providing better information on persistent and complex pollution, including PM<sub>2.5</sub>, ozone formation and transport, and the effects of wildfires;
- Improving integration of low-cost air sensors in air monitoring.<sup>116</sup>

Recent actions by Congress have made some progress in addressing the funding limitations that have hampered the air quality monitoring system. Specifically, the American Rescue Plan and the Inflation Reduction Act contained significant funding for EPA to distribute to improve and expand and maintain the air quality monitoring system. But even if this funding results in additional monitors, there are still likely to be gaps and locating pollution hot spots is still likely to be difficult without additional tools.



## SECTION 5

# Case Studies

This section discusses three examples of communities suffering from the health impacts of energy- or transportation-related air emissions, providing concrete examples of the problems discussed in the preceding sections of this paper. The first case provides an example of a community primarily impacted by pollution from a transportation hub – in this case, the Ports of Los Angeles and Long Beach. The second discusses Ironbound, a community in Newark facing multiple transportation-related pollution sources, as well as waste-to-energy incinerator. The third involves Petersburg, Indiana, a community surrounding one of the largest and most-polluting coal-fired power plants in the country.

### 5.1 San Pedro Bay Ports (Port of Los Angeles and Port of Long Beach)

The San Pedro Bay Ports, also known as the South Bay Port Complex, consists of both the Port of Los Angeles (POLA) and Port of Long Beach (POLB). The POLA is

one of the busiest ports in the United States. In 2022, it handled 16% of all containerized cargo in the United States; the two San Pedro Bay ports combined accounted for 29%.<sup>117</sup> Through drayage trucking,<sup>h</sup> the cargo is transferred from container ships first onto diesel trucks and then diesel-powered trains.<sup>118</sup>

The San Pedro Bay Ports are the single largest fixed source of air pollution in Southern California.<sup>119</sup> In 2021, POLA was responsible for 10% of diesel particulate matter emissions in the South Coast Air Basin, 8.1% of NO<sub>x</sub> emissions, and 4.1% of SO<sub>x</sub> emissions.<sup>120</sup> The ports' pollution is equivalent to having 6 million more cars driving around every day, contributing to an estimated 1,300 premature deaths in Los Angeles and Long Beach yearly.<sup>121</sup> Sources of emissions at the ports include docked ships, harbor craft, cargo handling equipment including cranes, trucks, and locomotives.<sup>122</sup> The California Air Resources Board (CARB) estimates that port air pollution creates cancer risks exceeding 500 in 1 million for tens of thousands of residents.<sup>123</sup>

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<sup>h</sup> Drayage trucking is the hauling of containerized cargo from ports to distribution centers, and railyards.

## Diesel Emissions

Diesel exhaust comes from trucks, ships, and trains that operate around the ports, railyards, and heavily traveled roadways. Diesel engines emit a mixture of air pollutants including gaseous and solid material.<sup>124</sup> The solid material is diesel particulate matter (DPM), a subset of PM<sub>2.5</sub>, which is less than 1 micrometer in size.<sup>125</sup> DPM is composed of soot or black carbon and numerous organic compounds, including over 40 known carcinogenic organic substances (including polycyclic aromatic hydrocarbons, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene).<sup>126</sup> Gaseous pollutants emitted by diesel engines include VOCs and NO<sub>x</sub>.<sup>127,128</sup> According to the USC Environmental Health Centers, the short-term effects of exposure to diesel exhaust are irritation to the eyes, nose, throat, and lungs, cough, headache, and nausea.<sup>129</sup> Chronic exposure to diesel pollution can also cause or worsen asthma, respiratory inflammation, cardiovascular disease, and heart attacks.<sup>130</sup> As a result, the long-term effects are lung cancer, bladder cancer, worse allergies, asthma attacks, lung illnesses, and heart disease.<sup>131</sup>

According to the USC Environmental Health Centers, a disproportionate number working low-income households and people of color live near diesel sources.<sup>132</sup> Workers (e.g., railroad workers, truck

drivers, dock workers, and other jobs) and communities living in proximity to diesel hotspots (e.g., ports, rail yards, distribution centers, and freight roadways) disproportionately bear the negative health impacts associated with diesel exhaust.<sup>133</sup>

## Impact of COVID Supply Chain Disruptions

One consequence of the coronavirus (COVID-19) pandemic was global supply chain disruptions.<sup>134</sup> These changes eventually resulted in significant shipping and trucking congestion at the San Pedro Bay ports.<sup>135</sup> Container ships would have to wait offshore for entry, which increased diesel emissions. As a result, between 2020 and 2021, DPM and NO<sub>x</sub> emissions at the Port of Los Angeles increased by 56% and 54%, respectively.<sup>136</sup> This increase resulted in a surge in pollution and worsening smog in the Inland Empire (also known as San Bernardino County) and in fine-particle pollution in downtown L.A.<sup>137</sup>

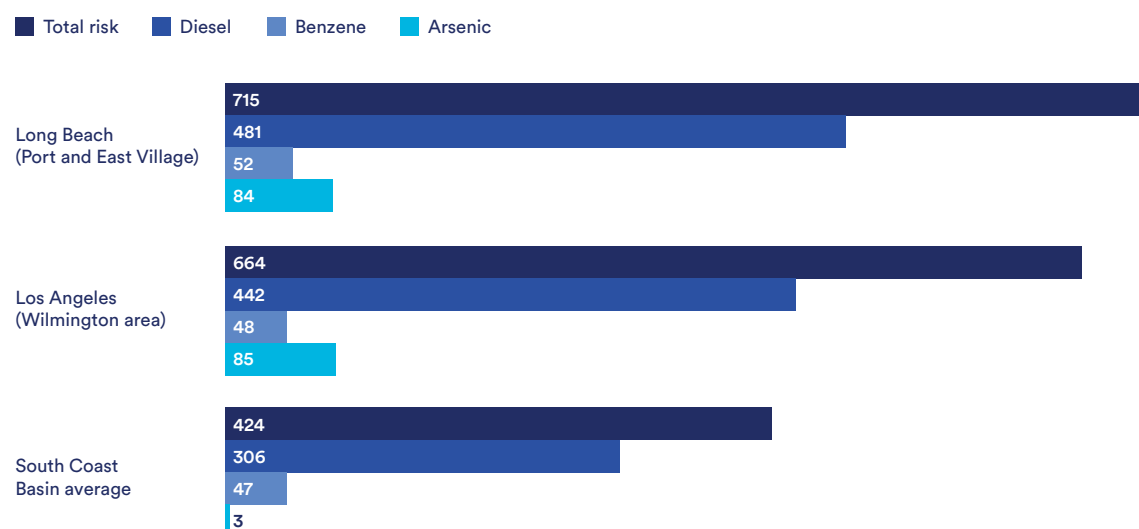
## Communities Impacted

The neighborhoods around San Pedro Bay have been characterized as a “Diesel Death Zone.”<sup>138</sup> Approximately, 500,000 people live within this zone.<sup>139</sup> In these communities, people live in proximity of major sources of pollution: the two busiest ports in the nation, five oil refineries, nine rail yards, four major freeways, several

**Figure 3: Port Communities have a High Cancer Risk from Air Pollution**

*The emissions and total risk of the Long Beach (zipcode: 90802) and Wilmington (zipcode: 90744) community vs. the South Coast Basin average. The Long Beach port area and Wilmington have a higher risk of contracting cancer from breathing air toxics in the region.<sup>142</sup>*

Source: South Coast Air Quality Management.<sup>143</sup>



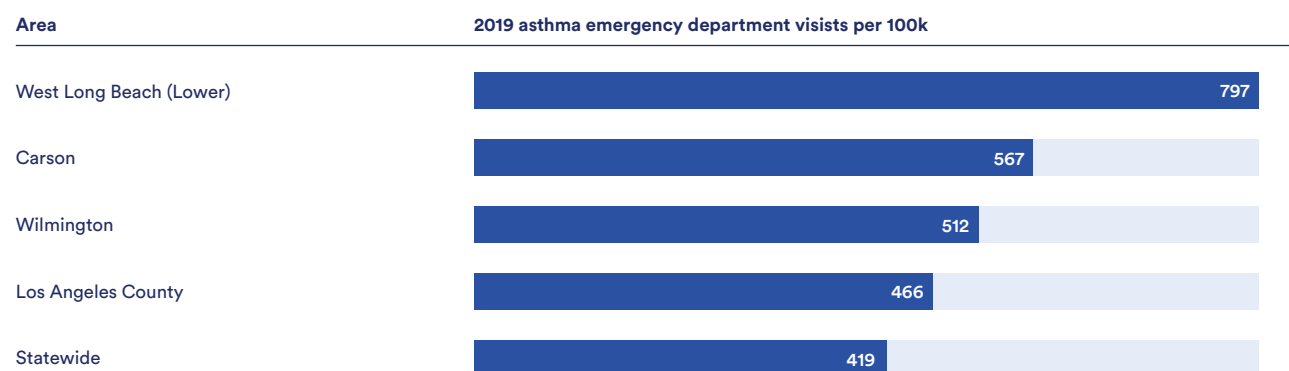
chemical facilities, and the third largest oilfield in the contiguous U.S. These port communities are exposed to tons of smog-forming gases, toxic fumes, and noxious odors that permeate their homes.<sup>140</sup> Residents breathe high levels of pollutants, especially diesel exhaust, which puts them at an increased risk of cancer – 98% higher in Wilmington than the rest of the Los Angeles basin. In addition, according to the USC Center for Health, asthma rates in Wilmington and San Pedro are among the highest in the state.<sup>141</sup>

These communities are more than half Latino, and more than a third of residents are Asian American and African American. They also face high rates of poverty and unemployment. For example, one of every five residents in Wilmington lives below the nation's poverty threshold.<sup>144</sup>

#### Figure 4: Asthma Emergency Department Visits Statewide, Countywide, and Communitywide

The asthma emergency department visits in 2019 per community vs. the whole county and state.

Source: California Department of Public Health.<sup>145</sup>



#### Wilmington

The Wilmington community is about 89% Latino.<sup>146</sup> Wilmington is also surrounded by the Philips 66 refinery, which is one of the largest industrial polluters in the Los Angeles basin, releasing more than 1,500 tons of smog-forming gases and 60 tons of toxic air contaminants in 2020 according to SCAQMD data.<sup>147</sup> Monitoring stations at the POLA and POLB recorded 23 days in 2021 when fine particulate levels violated the NAAQS. In Wilmington, people have a 664 in a million risk of contracting cancer due to their pollution exposure. Wilmington's cancer risk from air pollution ranks in the top 2% for the entire basin, which includes most of Los Angeles, Orange, San Bernardino, and Riverside counties.<sup>148</sup>

#### West Long Beach

West Long Beach is an industrial, working-class, and largely Latino section of Long Beach.<sup>149</sup> People in the West Long Beach community frequently suffer from asthma attacks that result in emergency room visits.<sup>150</sup> A 2019 community health survey found that adults in Long Beach are hospitalized with asthma at a rate about 35 percent higher than in the rest of California.<sup>151</sup> In addition, African American Long Beach residents were hospitalized with asthma at eight times the rate – and Latinos at twice the rate – of white residents. According to local health officials, zip codes in West Long Beach have the city's highest death rates.<sup>152</sup>

## Efforts to Reduce Emissions

Local communities continue to suffer adverse impacts from these pollution sources, despite efforts over the last two decades to reduce emissions. The main sources of emissions at the San Pedro Bay ports are mobile sources such as ships, trucks, and locomotives. Under the CAA, these sources are primarily regulated by the federal government, which reduces the legal options available to community groups or the State of California to address them. Nevertheless, both local residents and the SCAQMD have taken action to address port-related air pollution. More recently, Congress has enacted legislation increasing federal funding for efforts to reduce air pollution at ports.

In 2001 several environmental groups and local residents sued the Port of Los Angeles, alleging that its approval of a new container complex violated the California Environmental Quality Act (CEQA). In 2002, the California Court of Appeals ruled in the plaintiffs' favor.<sup>153</sup> The parties subsequently settled the case, with the Port committing to establish a \$50 million fund to mitigate its impacts on the surrounding communities, including specific commitments to reduce air pollution.<sup>154</sup> These efforts eventually resulted in the ports' Clean Air Action Plan (CAAP), first issued in 2006, and later revised in 2010 and 2017.<sup>155</sup> CAAP programs or strategies included Clean Trucks Programs, vessel pollution reduction programs, and advanced new technology (i.e., the world's first hybrid tugboat).<sup>156</sup>

With the 2006 CAAP, port emissions improved drastically. By 2011, total port air pollution had declined 45 percent and truck pollution by 80 percent. With the 2017 update to the plan, both L.A. Mayor Eric Garcetti and Long Beach Mayor Robert Garcia pledged to transform the ports into largely zero-emission operations by 2035.<sup>157</sup> Despite the CAAP and other efforts to reduce shipping emissions, POLA and POLB are still the largest fixed source of pollution in Southern California.<sup>158</sup> Moreover, as described above, 2021 saw dramatic increases in emissions at the ports. California still needs to reduce NO<sub>x</sub> and soot emissions to meet federal health standards.<sup>159</sup>

The SCAQMD has also started to develop an Indirect Source Rule for the Ports of Los Angeles and Long Beach. Under the section 110 of the CAA, states can adopt "indirect source review program[s]."<sup>160</sup> An "indirect source" is "a facility, building, structure, installation, real property, road, or highway which attracts, or may attract, mobile sources of pollution."<sup>161</sup> The SCAQMD announced in February 2022 that it would begin developing a regulation pursuant to this authority ("Proposed Rule 2304") to reduce port emissions.<sup>162</sup>

In addition, both California and the federal EPA have recently proposed or adopted regulations that will reduce emissions from heavy-duty trucks – one of the largest sources of emissions at the San Pedro Bay ports. For example, the California Air Resources Board adopted the Advanced Clean Trucks regulation in January 2021 and the Advanced Clean Fleets rule in April 2023. The latter requires all drayage trucks entering seaports to be zero-emission by 2035.<sup>163</sup>

Looking forward, the federal government is providing significant funding to reduce air pollution at ports. Section 60102 of the Inflation Reduction Act amended the Clean Air Act to add a new section 133, 42 U.S.C. § 7433, "Grants to Reduce Air Pollution at Ports." This provision appropriates \$2.25 billion for grants and rebates to be used for climate action planning at ports and the purchase of zero-emission port equipment. It also appropriates a further \$750 million for those purposes at ports in nonattainment areas. The San Pedro Bay ports are in ozone nonattainment areas and are therefore eligible for both categories of funding.

## 5.2 The Ironbound Community, New Jersey

The Ironbound is a four-square-mile community located on the eastern edge of the city of Newark, New Jersey.<sup>164</sup> It is Newark's most densely populated area (with approximately 50,000 residents) and one of the most toxic communities in the country according to the New Jersey Public Broadcasting Service (PBS).<sup>165</sup> The majority of Ironbound residents are immigrants from Brazil, Portugal, Spain, Cape Verde, Latin American countries, and African Americans.<sup>166,167</sup>

There is a 10-mile stretch, known as the "chemical corridor," that borders the Ironbound Community.<sup>168,169</sup> Within this corridor, there is a heavy concentration of industrial facilities, warehouses, and traveling freight trucks.<sup>170</sup> For instance, Ironbound residents live next to a trash incinerator, multiple fossil fuel-fired power plants, Newark International Airport, an animal fat rendering plant, a sewage treatment plant, active and abandoned industrial facilities, Superfund sites,<sup>i</sup> major roads (including Interstate 95), railroad tracks, and heavy truck traffic from the East Coast's busiest port, Port of Newark.<sup>171</sup> Ironbound contains one of the country's most contaminated land sites (a former Agent Orange dioxin factory) and is bordered by the Passaic River, one of the most polluted bodies of water in the U.S.<sup>172</sup>

The state calls the Ironbound community an “overburdened community,” where 35% of households qualify as low income and 40% of community members identify as a minority.<sup>173</sup> In addition, Ironbound was historically a “redlined” community.<sup>i,174</sup> Maria Lopez-Núñez, the Deputy Director of Ironbound Community Corporation (ICC), believes Ironbound has become a “sacrifice zone” for wealthier, White suburban communities that do not want to bear any toxic burdens:

*In New Jersey, pollution is racially segregated, and we see the effects of that... Our health statistics don't look great. When I think about the White suburbs – Montclair and Summit, New Jersey – they have a lot of green lawns. They have a lot of trees. They don't have fat-rendering plants and natural-gas plants and sewage-treatment plants.<sup>175</sup>*

Newark and Ironbound have lower median household incomes and greater incidences of poverty compared to the state and Essex County as a whole. The population residing near the Covanta incinerator has a median household income of \$29,731 for the host census tract and an average of \$35,816 for census tracts within the two-mile area. The census tract hosting the incinerator has a 20% poverty rate while the state's and Essex county's poverty rates are 10% and 18% for Essex County.<sup>176</sup>

### Covanta Essex Emissions

The Covanta Holding Corporation<sup>k</sup> operates the Essex County Resource Recovery incinerator in the Ironbound. It is New Jersey's largest garbage incinerator, burning 20 million tons of trash each year while generating enough electricity to power one million homes.<sup>177</sup> The incinerator is a “waste-to-energy” or “energy from waste” facility, which turns the heat from incinerated garbage into steam-driving turbines that generate electricity.<sup>178</sup> The incinerator is responsible for the incineration of 12% of New York City's garbage, 90% of Newark ports' garbage, and all of Essex county's garbage.<sup>179</sup>

Covanta claims that the incinerator preserves valuable natural resources while also generating clean energy. In addition, Covanta says it meets state emission

standards and has invested \$90 million to reduce its emissions.<sup>180</sup> However, according to a 2022 report from 2005 to 2019, Covanta Essex had 824 total air permit violations.<sup>181</sup> Nevertheless, the Department of Environmental Protection (DEP) has consistently granted its permit renewal requests.<sup>182</sup>

The Covanta plant emits HAPs such as dioxin, lead, cadmium, mercury, vinyl chloride, and formaldehyde.<sup>183</sup> According to ICC, the Covanta incinerator emits more lead into the air than any other U.S. incinerator.<sup>184</sup> In 2020, Covanta Essex emitted 38,077 pounds of HAPs, 11 pounds of Hg, 70,695 pounds of PM<sub>2.5</sub>, 19 pounds of lead, and 1,525,395 pounds of NO<sub>x</sub>.<sup>185</sup> Covanta Essex is the number two emitter of arsenic, hydrogen chloride, mercury, and nitrogen oxides in New Jersey, number 3 emitter of beryllium, number 4 emitter of carbon tetrachloride, number 5 emitter of lead and sulfur dioxide, and number 6 emitter of carbon monoxide.<sup>186</sup>

For the past few years, thick plumes of bright pink and purple smoke have billowed out of the waste incinerator.<sup>187,188</sup> Covanta reported that the pink smoke was the result of burning iodine, which they claimed got into their trash pile, likely from photography, print studios, and other manufacturing sites.<sup>189,190</sup> Later, Covanta admitted the pink smoke was from waste that a pesticide manufacturer had improperly disposed of.<sup>191</sup> Inhaling iodine has serious adverse health effects such as lung irritation (*i.e.*, coughing and shortness of breath), pulmonary edema (buildup of fluid in the lungs), skin irritation, bronchitis, thyroid gland disturbance, rapid heartbeat, tremors, and liver and kidney damage.<sup>192</sup> Nevertheless, the company claimed that the plumes were low-risk.<sup>193</sup>

### Other Pollution Sources

The Ironbound is also harmed by multiple other sources of air pollution. The Port Newark Container Terminal is part of the Ports of New York and New Jersey, which collectively are the busiest container terminals on the east coast and second busiest in the United States.<sup>194</sup> The Ironbound is also near Newark Liberty International Airport, major highways, and multiple rail lines. Diesel

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<sup>i</sup> New Jersey has the most toxic sites on the Environmental Protection Agency's “Superfund” priority list containing 114 out of over 1300. Four of the Superfund sites are in Newark, which also has hundreds of toxic sites that do not qualify as Superfund. EPA National Priorities List. <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state>

<sup>j</sup> Redlining is a form of racial discrimination in housing.<sup>206</sup> Neighborhoods were ranked from “A” to “D.” In the 1930s and 1940s, federal housing officials ranked neighborhoods from “A” to “D.” They refused to insure home loans to African Americans in “A” areas. In addition, housing officials declared areas where communities of color lived to be “hazardous” and “a slum,” and ranked them “D.”

<sup>k</sup> Covanta is a corporation that provides waste management and incineration services. The company also has 36 similar facilities across the US.

trucks pass through the community on their way to or from the port.<sup>195</sup> In addition, diesel garbage trucks come through Ironbound to dump garbage at the incinerator.<sup>196</sup> According to Masood's (n.d.) article, "Newark's Ironbound Community Loses Against Incinerator," the drivers of these trucks also tend to illegally dump garbage around the community.<sup>197</sup> In addition, the Passaic Valley Sewerage Commission has proposed to build an 84-megawatt backup gas-fired power plant in the Ironbound community for its Newark-based sewage treatment plant – the fifth-largest in the country.<sup>198</sup>

## Health Effects

Essex County, where Newark is located, and neighboring Camden County<sup>1</sup> have the highest rates of asthma hospitalizations and asthma-related emergency room visits in the state.<sup>199</sup> According to the American Lung Association, Essex County has the highest population at risk of developing pediatric asthma due to air pollution in New Jersey. One in four kids in Newark has asthma.<sup>200</sup> Asthma mortality rates overall are three times higher for African Americans and Latinos, who are disproportionately exposed to the polluting industry in these cities, than for other residents of New Jersey.<sup>201</sup> Besides asthma, there are other health impacts such as cancer, autism, and birth defects.<sup>202</sup> Moreover, nearly 25% of children under the age of 16 have elevated levels of lead in their bloodstreams.<sup>203</sup> Iris Alvarez, an Ironbound resident and a community leader, explains that the community has dealt with many health disparities for decades:

*As residents of the Ironbound for over 60 years, my family has suffered the devastating effects of pollution on the environment. We have endured lung cancer, breast cancer, colon cancer, and asthma – some of the most heinous of malignancies that have affected our loved ones. I stand against the development of any further incinerators or pollution-causing chemical or manufacturing plants in the Ironbound. We deserve to breathe clean air!*<sup>204</sup>

## Efforts to Reduce Emissions

The Ironbound community has been fighting the Covanta Essex incinerator and other major pollution sources for over forty years.<sup>205</sup> The ICC, which was founded

in 1969, has been a key advocate for the community. The community organized to oppose the original plans to build the incinerator, but the Newark City Council nevertheless approved it in 1985.<sup>206</sup> More recently, the ICC and community members worked with EPA to conduct a citizen science air monitoring program.<sup>207</sup> Community members worked with Earthjustice to urge the New Jersey Department of Environmental Protection to investigate air permit violations at the Covanta Essex plant.<sup>208</sup> In October 2020, Covanta agreed to a consent order requiring the company to "develop new waste management practices, improve employee training, conduct a health impact assessment and install monitoring cameras," as well as pay a \$24,000 fine.<sup>209</sup> As mentioned above, the community is opposing a proposed backup power plant at a sewage treatment plant.

On a statewide level, in September 2020, ICC helped pass New Jersey's Environmental Justice Law, which New Jersey Governor Phil Murphy signed the law, which may be the strongest environmental justice provision in any state.<sup>210,211</sup> It requires the DEP to "deny certain types of pollution permits to a business if the pollution would impose a disproportionate burden on a community that is substantially low-income or a community of color." In addition, this bill prevents already overburdened<sup>m,212</sup> communities from having to accept additional contamination sources.<sup>213</sup> The bill applies to landfills, power plants, sewage treatment plants, waste transfer stations, recycling and solid waste facilities, garbage incinerators, and other major sources of air pollution under the CAA.<sup>214</sup> However, this bill does not address the "massive sources of legacy pollution that produce ongoing harms."<sup>215</sup>

## 5.3 Petersburg, Indiana

Petersburg, Indiana, is home to the Petersburg Generating Station, a coal-fired power plant owned by AES Indiana, a subsidiary of the AES Corporation. AES Indiana was formerly the Indianapolis Power & Light Company (IPL) but changed its name in 2021. AES Indiana is a utility company that provides electric service to Indianapolis and to more than 470,000 customers. The Petersburg plant currently employs about 300 people and is one of the largest taxpayers in Pike County.<sup>216</sup>

<sup>1</sup> Camden is one of the poorest cities in the nation; it is a predominantly African American community. It has similar environmental issues as Essex.

<sup>m</sup> The legislation defines an "overburdened community" as any census tract with at least half of households qualifying as low-income under federal guidelines, or at least 40 percent identifying as Black, Hispanic or Latino, or members of a state-recognized tribal community.

## Pollution

According to a Center for Public Integrity investigation, the Petersburg plant is the ninth-largest emitter of toxic air pollutants in the United States and the 35th-largest emitter of greenhouse gases.<sup>217</sup> Table 4 summarizes the plant's air pollutant emissions, according to EPA data.

## Communities Impacted

2,662 people live within three miles of the plant. 27% of the residents are low-income and 4% are people of color.<sup>219</sup> The average household income is \$52,378 and the poverty rate is 9.4%.<sup>220</sup> Moreover, the Petersburg community has historically depended on the coal plant.<sup>221</sup> For instance, IPL is one of the two biggest employers in Pike County.<sup>222</sup>

**Table 4: Petersburg Station Emissions**

Pollutant	Emissions (Pounds)	Year
NO <sub>x</sub>	6,505,768.00	2021
SO <sub>2</sub>	6,379,622.00	2021
VOCs	264,616.22	2017
Ozone Precursors	4.43	2019
PBTs	206.00	2021
Benzene	5,720.18	2017
CO	2,210,421.67	2017
Chromium III	129.55	2017
Formaldehyde	45.74	2017
Hydrochloric Acid	35,045.72	2017
Lead	26.03	2017
Mercury	55.77	2017
Primary PM <sub>2.5</sub> (filterables and condensibles)	514,347.16	2017
Primary PM <sub>2.5</sub> (filterable portion only)	266,590.44	2017
Primary PM (condensable portion, less than 1 micron)	247,756.78	2017

*The air pollution emissions of the Petersburg plant in recent years.*

Source: EPA<sup>218</sup>

## Health Impacts

The communities surrounding the Petersburg plant and other coal plants in southwestern Indiana suffer a variety of health impacts from the plants' air pollution. According to Anderson (2020), the Petersburg plant is responsible for 251 premature deaths, 150 heart attacks, and 1647 asthma attacks per year.<sup>223</sup> Wendy Bredhold, the senior campaign representative for the Sierra Club's Beyond Coal campaign in Indiana, said in a statement, "Southwest Indiana's families and children living with health impacts from the Petersburg plant need bold plans to move rapidly away from dangerous fossil fuels that are poisoning our air and water and threatening our health."<sup>224</sup> According to this article, there may be a link between Indiana's pollution and the infant mortality rate in the state.<sup>225</sup> According to Norma Kreilein, a pediatrician, there is a direct link between the pollution from the power plants and the many respiratory problems in children: "They're constantly full of snot and full of infection and it takes major amounts of medications to get them where they are healthy."<sup>226</sup> The Indiana State Department of Health reported asthma attacks that sent nearly 1,674 people to emergency rooms and required 350 people to be hospitalized in southwestern Indiana's nine counties in 2015.<sup>227</sup>

## Legal Issues

The Petersburg plant's four units have been cited for more than a dozen violations of environmental regulations in the past five years.<sup>228</sup> In 2015, the EPA documented hundreds of hours in which IPL failed to operate Petersburg's pollution control equipment and spewed excess sulfur dioxide into the air.<sup>229</sup> During 2008, 2015, and 2016, EPA and the Indiana Department of Environmental Management conducted investigations of the Petersburg Generating Station due to the alleged CAA violations. As a result, EPA issued three Findings and Notices of Violation to IPL for the following CAA violations.<sup>230</sup>

Due to air permit violations of the Clean Air Act, in August 2020, there was a settlement between IPL and the EPA, the U.S. Department of Justice, and the Indiana Department of Environmental Management. As a result, IPL must undertake measures to improve its environmental compliance at the Petersburg Generating Station. Ultimately, the settlement requires IPL to reduce the Petersburg Station's emissions of NO<sub>x</sub>, SO<sub>2</sub>, PM, and sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub> or SAM). In addition, IPL must pay a total civil penalty of \$1.525 million, of which \$925,000 will go to the United States and \$600,000 to the State of Indiana.<sup>231,232</sup> As a result, IPL must undertake measures to improve its environmental compliance at the Petersburg Generating Station. According to the Department of Justice (DOJ), IPL also will spend \$5 million at Petersburg to offset the "harm to the environment caused by the plant's excess emissions."<sup>233</sup>

## Unit Closures

IPL announced in 2019 that it would close one of the Petersburg plant's four units in 2021 and another in 2023. Unit 1 closed in May 2021 as scheduled. Although AES reported that it planned to close Unit 2 in June 2023,<sup>234</sup> it apparently remains in operation as of July 2023.<sup>235</sup> At the time of the 2019 announcement, APL stated that it planned to continue operating Units 3 and 4 plan through 2042.<sup>236</sup> In October 2022, however, AES announced that it would convert those units to run on gas by 2025.<sup>237</sup>

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