Air Pollution and Environmental Justice

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Particulate matter emissions give rise to the environmental problem with the worst public health consequences. Despite a half century of regulatory efforts, they still lead to 85,000 to 200,000 additional deaths each year and produce more than 100,000 heart attacks and almost nine million cases of exacerbated asthma. These enormously serious adverse health consequences are borne disproportionately by communities of color and individuals of low socioeconomic status. Nonetheless, attacking the root cause of the problem—excessive air pollution from a myriad of sources that mixes in the air and often has its most serious health impacts hundreds of miles from where it was emitted—has not been a core concern of environmental justice advocates or of environmental justice efforts undertaken by the federal government.

With respect to particulate matter emissions, U.S. environmental policy took two seriously wrong turns. First, the Environmental Protection Agency failed over the last two decades to strengthen the National Ambient Air Quality Standards for particulate matter, which limit the permissible concentration of this pollutant in the ambient air. The agency repeatedly relied on a syllogistic tautology for not considering whether more stringent standards would be preferable on environmental justice grounds: that because the National Ambient Air Quality Standards reduce pollution, and because pollution has disproportionate impacts on disadvantaged communities, it follows that the National Ambient Air Quality Standards have good environmental justice consequences. The Environmental Protection Agency's second wrong turn was its acquiescence in a state of permanent nonattainment of the National Ambient Air Quality Standards. In particular, the Environmental Protection Agency has repeatedly revealed a lack of political will to seriously and credibly impose

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sanctions on states that fail to meet their statutory obligations and deadlines. And the agency has maintained this posture despite repeated losses in the courts.

Three recent developments, however, could augur a beneficial change, turning the reduction of particulate emissions into a core environmental justice concern for both advocates and the federal government. First, the COVID-19 crisis brought to light that disadvantaged communities have significantly higher death rates from the virus as a result of their exposure to greater particulate matter concentrations. Second, the Environmental Protection Agency announced in June 2021 that it would reopen the Trump administration's 2020 decision to not strengthen the National Ambient Air Quality Standards for particulate matter, giving the agency a vehicle for making an about-turn and giving environmental justice considerations a meaningful role in the process for revising the National Ambient Air Quality Standards. Third, the Biden administration, beginning on Inauguration Day on January 20, 2021, put issues of equity and justice for disadvantaged communities at the center of its environmental agenda.

INTRODUCTION

Of all pollutants, particulate matter has by far the worst impacts on public health. According to a report by the Office of Management and Budget, 98 to 99 percent of the monetized benefits of rules promulgated by the Environmental Protection Agency (EPA) come from air quality rules under the Clean Air Act.[1] Despite decades of regulatory activity, particulate matter emissions currently lead to 85,000 to 200,000 additional deaths each year,[2] as well as a variety of serious morbidities, including more than 100,000 additional heart attacks and almost nine million cases of exacerbated asthma.[3]

These enormously serious adverse health consequences are borne disproportionately by communities of color and people of low socioeconomic status.[4] However, a significant cause of this disproportionate impact, which is pollution from sources far from the disadvantaged communities, has not been the primary concern of environmental justice advocates.[5] In the early days of the environmental justice movement, advocates focused on the impact of waste sites on proximate communities. Over time, they extended their concern to include other proximate sources, such as refineries and power plants. More recently, environmental justice advocates have broadened their geographic lens to consider non-proximate impacts on communities. However, they have mostly sought remedies that can be implemented locally, for example, by protecting affected communities from the prospective siting of additional environmentally

1. OFF. OF MGMT. & BUDGET, EXEC. OFF. OF THE PRESIDENT, 2016 DRAFT REPORT TO CONGRESS ON THE BENEFITS AND COSTS OF FEDERAL REGULATIONS AND AGENCY COMPLIANCE WITH THE UNFUNDED MANDATES REFORM ACT 2, 7–8, 11–12 (2016), https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/legislative_reports/draft_2016_cost_benefit_report_12_14_2016_2.pdf.

2. *See* Christopher W. Tessum et al., *$PM_{2.5}$ Polluters Disproportionately and Systemically Affect People of Color in the United States*, SCI. ADVANCES, Apr. 28, 2021, at 1. For other, comparable estimates, see Neal Fann et al., *The Estimated Change in the Level and Distribution of $PM_{2.5}$-Attributable Health Impacts in the United States 2005–2014*, 167 ENV'T RSCH. 506, 509 (2018), and Yuqiang Zhang et al., *Long-Term Trends in the Ambient $PM_{2.5}$ and O_3-related Mortality Burdens in the United States Under Emission Reductions from 1990 to 2010*, 18 ATMOSPHERIC CHEMISTRY & PHYSICS 15,003, 15,007–08 (2018).

3. *See* Fann et al., *supra* note 2, at 511 tbl.3.

4. *See infra* Subart II.A.

5. *See infra* Part I.

undesirable uses. Their traditional focus has been on local problems and local remedies, instead of on attacking the root cause of the problem—excessive air pollution from a myriad of sources that mixes in the air and often has its most serious health impacts hundreds of miles from where it was emitted.

In part as a result, U.S. environmental policy on particulate matter emissions took two seriously wrong turns. First, EPA failed over the last two decades to further strengthen the National Ambient Air Quality Standards (NAAQS) for particulate matter, which limit the permissible concentration of this pollutant in the ambient air.[6] When revising the standards in 2006, 2012, and 2020, EPA ignored calls to strengthen the standards despite strong evidence of significant health benefits. Even more gallingly, it failed to contemplate the possibility that stronger standards would better comport with its environmental justice obligations set forth in President Clinton's Executive Order on environmental justice.[7] Instead, EPA acted inconsistently with the most basic requirement of regulatory analysis, which calls for consideration of alternatives in evaluating the desirability of public policies.[8] And EPA never asked whether a more stringent alternative to the one chosen would be preferable on environmental justice grounds. Furthermore, the agency relied on a syllogistic tautology to justify this failure: that because the NAAQS reduce pollution, and because pollution has disproportionate impacts on disadvantaged communities, it follows that the NAAQS have good environmental justice consequences. But in doing so, the agency failed to carry out its obligation to consider whether more stringent standards should be adopted on environmental justice grounds.

EPA's second wrong turn was its acquiescence in what looks like a state of permanent nonattainment with the NAAQS.[9] These standards are the centerpiece of the Clean Air Act. Ensuring compliance with them was a key congressional concern when it enacted the modern version of the statute in 1970, and amended it in 1977 and 1990. However, over the years EPA was a willing participant in institutionalizing nonattainment and seemingly making it a permanent feature of the legal landscape. In particular, EPA repeatedly revealed a lack of political will to push seriously and credibly for attainment of the NAAQS and has maintained this posture despite repeated losses in the courts.

Despite the enormously negative consequences of these two wrong turns, combating them has not, so far, been a core environmental justice concern. Three recent developments, however, could augur a beneficial change on this score. First, the COVID-19 crisis brought to light that disadvantaged communities have

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6. *See infra* Part III.

7. *See generally* Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Exec. Order No. 12898, 59 Fed. Reg. 7629 (Feb. 11, 1994).

8. *See* OFF. OF MGMT. & BUDGET, EXEC. OFF. OF THE PRESIDENT, CIRCULAR A-4, REGULATORY ANALYSIS 5–7 (2003), https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf.

9. *See infra* Part IV.

significantly higher death rates from the virus as a result of their exposure to greater particulate matter concentrations.[10] Second, EPA announced in June 2021 that it would reopen the Trump administration's 2020 decision not to strengthen the NAAAQS for particulate matter, giving the agency a vehicle for making an about-turn and giving environmental justice considerations a meaningful role in the process for revising the NAAQS.[11] Third, the Biden administration, beginning on Inauguration Day on January 20, 2021, put issues of equity and justice for disadvantaged communities at the center of its environmental agenda.[12]

This Article is organized as follows. Part I details the increasingly broad domain of environmental justice concerns, from beginnings focused on the negative impacts of waste sites on disadvantaged communities to more attention over the last two years on the relationship between COVID-19 death rates and high particulate matter concentrations. Part II shows that disadvantaged communities are subject to higher particulate matter exposure, and finds that, as a result of both this higher exposure and higher susceptibility, they experience significantly worse health outcomes. Turning to the policy front, Part III details how environmental justice claims were cast aside by EPA in the revisions of the NAAQS for particulate matter. Finally, Part IV explains how, because of a lack of political will and some technical challenges, EPA has institutionalized a state of permanent nonattainment with the NAAQS despite the deleterious environmental justice consequences of this action. The Article concludes with a brief, more optimistic blueprint for future action.

I. THE ENVIRONMENTAL JUSTICE MOVEMENT'S EXPANDING FOCUS

This Part outlines the evolution of the environmental justice movement, analyzing its expanding focus over the last five decades. For the purposes of this Article, references to the environmental justice movement encompass the work of advocates, academics, and government actors in bringing attention to the plight of disadvantaged communities and devising policies to combat the negative effects of pollution on these communities.

Subpart A addresses the early stages of the movement, which focused on the siting of hazardous waste sites in the proximity of disadvantaged

10. *See infra* Subpart I.D.

11. Press Release, EPA, EPA to Reexamine Health Standards for Harmful Soot that Previous Administration Left Unchanged (June 10, 2021), https://www.epa.gov/newsreleases/epa-reexamine-health-standards-harmful-soot-previous-administration-left-unchanged.

12. *See* Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, Exec. Order No. 13985, 86 Fed. Reg. 7009 (Jan. 25, 2021); Modernizing Regulatory Review, 86 Fed. Reg. 7223, 7223 (Jan. 20, 2021).

communities.[13] Subpart B discusses how, over time, the movement expanded its concern to include a broader set of polluting facilities, including power plants and refineries, but continued to focus on environmentally undesirable uses that are sited close to disadvantaged communities. In its third phase, discussed in Subpart C, the environmental justice movement broadened its geographic lens and began to express concern about high concentrations of air pollution affecting disadvantaged communities even if the sources of the emissions were far away. Despite this regional and national attention to the sources of pollution, the remedies sought continued to be constrained to what might be done to limit the siting of sources close to the affected communities rather than on how to address the sources of the problem, which might be hundreds of miles away. Subpart D then shows that combatting high air pollution concentrations, regardless of their origin, became a more central environmental justice concern in the last two years as a result of the COVID-19 pandemic.

A. Early Environmental Justice Focus on Hazardous Waste Siting

The birth of the environmental justice movement is generally linked to the 1982 activism in Warren County, North Carolina,[14] where the siting of a hazardous waste facility in a predominantly Black and low-income community drew protests.[15] After 31,000 gallons of polychlorinated biphenyl were dumped across North Carolina, the state identified two potential landfills to hold the waste long-term.[16] The first option for the proposed landfill was a publicly owned site in Chatham County, which was 27 percent Black with 6 percent of its families living under the poverty line.[17] Because the site was publicly owned, Chatham County gave residents the opportunity to participate in the waste siting decision.[18] The second option, the one that North Carolina ultimately chose for the waste site, was located in Warren County, a 60 percent Black county with 25 percent of its families living under the poverty line.[19] Protests over this decision drew the attention of civil rights groups, which were concerned about the way in

13. This Article uses the phrasing "disadvantaged communities" to refer to communities of color and communities that experience socioeconomic inequality. A recent presidential memorandum, *Modernizing Regulatory Review*, used the term "disadvantaged, vulnerable, or marginalized communities." Modernizing Regulatory Review, 86 Fed. Reg. at 7223. This Article has chosen "disadvantaged communities" as the consistent term for such communities.

14. *See* CLIFFORD VILLA ET AL., ENVIRONMENTAL JUSTICE: LAW, POLICY & REGULATION 3–4 (3d ed. 2020); Renee Skelton & Vernice Miller, *The Environmental Justice Movement*, NRDC (Mar. 17, 2016), https://www.nrdc.org/stories/environmental-justice-movement.

15. This Article uses the term "Black" throughout, including where sources used the term "African American."

16. *See* Spencer Banzhaf et al., *Environmental Justice The Economics of Race, Place, and Pollution*, 33 J. ECON. PERSPS. 185, 185 (2019).

17. *See id.*

18. *See id.*

19. *See id.*

which race, class, and access to public participation had affected waste siting decisions.[20] These protests garnered national attention and spurred the publication of two foundational studies ubiquitously referenced in the environmental justice literature.[21]

The first of these studies, *Siting of Hazardous Waste Landfills and Their Correlation with Racial and Economic Status of Surrounding Communities*, was published by the U.S. Government Accountability Office in 1983.[22] Its objective was to identify any correlation between the location of hazardous waste sites and the racial and economic composition of nearby communities by examining the location standards, public participation requirements, and permitting processes for the four offsite landfills located in EPA Region IV, which covers the southeastern United States.[23] The study found that three of the four sites were located in majority-Black communities, and that in all four sites the nearby Black population was disproportionately below the poverty level and constituted the majority of those below the poverty level in the relevant census tracts.[24]

The second study, *Toxic Wastes and Race in the United States*, was published by the United Church of Christ's Commission for Racial Justice in 1987.[25] It concluded that race was the most significant factor associated with the location of hazardous waste facilities across the country. The study found that "three out of every five African Americans and Hispanic Americans and approximately half of all Asian/Pacific Islanders and American Indians reportedly lived in communities with uncontrolled toxic waste."[26] Further, the study found that in communities with two or more landfills, or with one of the

20. *See* Eileen Maura McGurty, *From NIMBY to Civil Rights The Origins of the Environmental Justice Movement*, 2 ENV'T HIST. 301, 302 (1997). The environmental justice movement had antecedents in community organizing and civil rights activism in the 1970s. *See* Daniel Faber & Deborah McCarthy, *The Evolving Structure of the Environmental Justice Movement in the United States New Models for Democratic Decision-Making*, 14 SOC. JUST. RSCH. 405, 411 (2001); Rich Newman, *Making Environmental Politics Women and Love Canal Activism*, 29 WOMEN'S STUD. Q. 65, 68–69 (2001); Skelton & Miller, *supra* note 14.

21. *See* Robert D. Bullard et al., *Toxic Wastes and Race at Twenty Why Race Still Matters After All of These Years*, 38 ENV'T L. 371, 373 (2008); Julia C. Rinne & Carol E. Dinkins, *Environmental Justice Merging Environmental Law and Ethics*, 25 NAT. RES. & ENV'T 3, 3 (2011).

22. *See generally* U.S. GEN. ACCT. OFF., GAO/RCED-83-168, SITING OF HAZARDOUS WASTE LANDFILLS AND THEIR CORRELATION WITH RACIAL AND ECONOMIC STATUS OF SURROUNDING COMMUNITIES (1983), https://www.gao.gov/assets/rced-83-168.pdf (the General Accounting Office was renamed in 2004 as the Government Accountability Office).

23. *See id.* at 2.

24. *See id.* at 3.

25. *See* COMM'N FOR RACIAL JUST., UNITED CHURCH OF CHRIST, TOXIC WASTES AND RACE IN THE UNITED STATES (1987). For a more recent study in this genre, see Bullard et al., *supra* note 21, at 385–86; *see also* Paul Mohai & Robin Saha, *Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research*, 43 DEMOGRAPHY 383, 396 (2006) (finding that early environmental justice studies demonstrated variation in the magnitude of disparities in the distribution of environmental hazards, but that updated distance-based methods demonstrated even greater racial and socioeconomic disparities).

26. Rinne & Dinkins, *supra* note 21, at 3.

five largest sites, the average minority population was three times larger than that in areas with no landfill facilities.[27] The report explained that "racial and ethnic communities" facing various socioeconomic issues did not have the "luxury" of being concerned about local environmental quality, which also made them vulnerable to siting hazardous waste facilities in their community in the name of jobs and the economy.[28] The study urged the federal government to consider the impact of environmental regulations on communities of color,[29] including through the formation of a specialized "Office of Hazardous Wastes and Racial and Ethnic Affairs" and a "National Advisory Council on Racial and Ethnic Concerns" within EPA.[30] It also urged state governments to revise siting criteria of hazardous waste facilities to take into account the class and race characteristics of the neighboring communities.[31]

B. Expansion of the Movement to a Broader Conception of Local Environmental Risks

In the early 1990s, the environmental justice movement expanded beyond hazardous waste siting to focus more broadly on air, water, and soil pollution. However, it retained a strong focus on local sources of pollution in close proximity to the affected communities. Environmental justice work at this time emphasized "water quality, air quality, and contamination from brownfields sites, Superfund sites, and landfills" and acknowledged that "[m]any communities are adversely affected by the cumulative impacts caused by more than one environmental hazard."[32] And, to this day, local pollution sources remain a focus of much environmental justice activism and legislation.[33]

Nearly a decade after the Warren County protests, the environmental justice movement coalesced around certain principles at the People of Color Summit in 1991. The Summit "broadened the environmental justice movement beyond its early anti-toxics focus to include issues of public health, worker safety, land use, transportation, housing, resource allocation, and community empowerment."[34] Despite its concern with a broader set of polluters, the Summit's focus remained local. It defined the environment as "where we live, where we work, and where

27. *See id.*

28. COMM'N FOR RACIAL JUST., *supra* note 25, at xii.

29. This Article uses the term "communities of color" and "minority communities" interchangeably.

30. COMM'N FOR RACIAL JUST., *supra* note 25, at xv.

31. *See id.*

32. Rinne & Dinkins, *supra* note 21, at 4.

33. *See, e.g.*, Jena Brooker, *Detroit's First New Assembly Line in 30 Years Will Compound Pollution in Black Neighborhoods*, GRIST (June 17, 2021), https://grist.org/equity/detroits-first-new-assembly-line-in-30-years-will-compound-pollution-in-black-neighborhoods/; Environmental Justice for All Act, S. 872, 117th Cong. § 7 (2021) (focusing on impacts located in, or immediately adjacent to, the area in which the major source is, or is proposed to be, located).

34. Bullard et al., *supra* note 21, at 377.

we play,"[35] thus limiting environmental justice efforts to the immediate vicinity of affected communities.[36]

Reflecting this approach, People Organized in Defense of Earth and Her Resources was formed in 1991 to address the environmental issues faced by a largely Latino and Black community in East Austin, Texas.[37] The organization challenged a number of local siting decisions, including the locations of a tank farm, a garbage truck facility, recycling plants, and a power plant, as well as the establishment of a high-tech industry corridor.[38] The clear focus of this work was on the proximity of polluting sources to disadvantaged communities.

As the conception of environmental justice expanded, awareness of the cumulative impacts of multiple polluting sources increased. In an article published in 2011, Julia C. Rinne and Carol E. Dinkins give three representative examples of environmental justice issues caused by cumulative environmental impacts on communities. These examples show that "poor and minority communities appear to bear a disproportionate burden of the environmental hazards associated with landfills and other polluting land uses."[39] The first example is Bayview Hunters Point, an Asian, Latino, and Black neighborhood in San Francisco that contains numerous contaminated sites,[40] a former power plant, and a sewage treatment plant that deposits sewage into the Bay during periods of heavy rainfall. And, in Southern Louisiana, poor and predominantly Black communities are located in an area with a high concentration of chemical plants, a coal-fired power plant, chemical production facilities, and oil refineries. Rinne and Dinkins also discuss Chester, Pennsylvania, which continued to house one of the nation's largest trash incinerators, as well as a sewage plant, a sludge incinerator, and gas-fired power plants, all of which create air and noise pollution and other environmental hazards. In each of these examples, the community faces multiple major sources of local pollution, proximity to which has direct impacts on its air, land, and water.

The broad set of environmental hazards faced by disadvantaged communities was also the subject of governmental attention. In 1992, EPA issued an Environmental Equity Report, which focused on the disproportionately

35. Robert Gottlieb, *Reconstructing Environmentalism Complex Movements, Diverse Roots*, 17 ENV'T HIST. 1, 2 (1993).

36. For the Summit's 17 principles to guide the environmental justice movement, see *Principles of Environmental Justice*, 21 RACE POVERTY & ENV'T 82, 82–83 (2017).

37. *See* Faber & McCarthy, *supra* note 20, at 409.

38. *See id.*

39. Rinne & Dinkins, *supra* note 21, at 5.

40. Following census categories, this Article has adopted the terms Asian and Latino to refer to these respective communities. *See* RACHEL MARKS & NICHOLAS JONES, U.S. CENSUS BUREAU, COLLECTING AND TABULATING ETHNICITY AND RACE RESPONSES IN THE 2020 CENSUS 9 (2020) (citing to Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity, 62 Fed. Reg. 58,782, 58,782 (Oct. 30, 1997)), https://www2.census.gov/about/training-workshops/2020/2020-02-19-pop-presentation.pdf.

greater exposure of communities of color and low-income communities to environmental pollutants.[41] The report found that "racial minority and low-income populations" faced higher-than-average air pollution, dietary, and pesticide exposure (for farmworkers), and resided near hazardous waste sites at higher rates.[42] The report, moreover, focused on local sources. For example, it suggested that disadvantaged communities are exposed to higher levels of air pollution due to a tendency to live in urban areas, "in closer proximity to air polluting facilities."[43] And, the report defined residence near waste sites as proximity to a commercial waste facility or uncontrolled hazardous waste site.[44]

In Congress, a number of bills addressing environmental justice concerns were proposed during this time that took a broad view of the types of pollutants but focused on proximate sources. For example, the Environmental Justice Act of 1992, introduced by Representative John Lewis, declared a moratorium on the siting of toxic chemical facilities in "environmental high impact areas."[45] These areas were defined as "the 100 counties with the highest total weight of toxic chemicals present," if emissions were at quantities found to cause significant adverse health impacts.[46] The bill defined "toxic chemicals" to include air pollutants, water pollutants, and pesticides, as well as hazardous waste.[47] Similarly, the proposed 1993 Environmental Equal Rights Act called for the rejection of proposed waste sites in "environmental[ly] disadvantaged communit[ies]" where the proposed facility would adversely affect the health of community members or the "air, soil, water, or other elements of the environment of such community."[48] The bill defined an "environmental disadvantaged community" as an area within two miles of the proposed site that contains certain hazardous waste or toxic emissions sources and where the community has a greater than average minority or low-income population.[49] Both bills defined targeted communities based on proximity to proposed or existing sources of

41. *See* EPA, 1 ENVIRONMENTAL EQUITY: REDUCING RISK FOR ALL COMMUNITIES 3 (1992), https://www.epa.gov/sites/default/files/2015-02/documents/reducing_risk_com_vol1.pdf.

42. Letter from Robert M. Wolcott, Chair, Env't Equity Workgroup, & Warren A. Banks, Special Assistant, Off. of the Adm'r, to William K. Reilly, Adm'r, EPA (May 29, 1992), *preface to* EPA, *supra* note 41.

43. EPA, *supra* note 41, at 26. The report also found that a higher proportion of Black and Latino residents live in nonattainment areas compared to white residents. *See id.* at 11. Exposure in a nonattainment area may include exposure to non-local pollutants as the specific sources of the pollutants were not identified in this report. However, the report also notes that the "most serious non-attainment problems occur in urban areas" and suggests that a general improvement in air quality pursuant to the Clean Air Act would create higher relative benefits for disadvantaged communities due to their overrepresentation in these areas. *Id.* at 22.

44. *See id.* at 7.

45. *See* Environmental Justice Act, H.R. 5326, 102d Cong. §§ 101(2), 403 (1992).

46. *Id.* § 101(2).

47. *Id.* § 101(4).

48. Environmental Equal Rights Act, H R. 1924, 103d Cong. § 7014(b)(2) (1993).

49. *Id.* § 7014(d)(1).

pollution, keeping the assessment of sources at the county or mile-radius level, respectively.[50]

The law review literature published in the 1990s similarly showcased a broader focus on pollution, rather than a narrower emphasis solely on wastes, but continued to focus on local pollution issues. For example, in the prominent article *Pursuing "Environmental Justice": The Distributional Effects of Environmental Protection*, Richard Lazarus discussed a broad sweep of environmental pollution issues, including air, water, soil, and toxics pollution.[51] Lazarus noted how communities of color are more likely to live in close proximity to polluting industries and cannot afford to decline work or housing in polluted areas.[52] He argued that minority groups have traditionally been un- or under-represented in policy making, and that insufficient enforcement resources are allocated to environmental protection. In part because of these factors, policymakers fail to focus on issues most affecting communities of color. For example, Lazarus claimed policymakers pay more attention to water pollution in wilderness areas than to local and urban water pollution issues, fail to provide access to environmental goods in communities of color (such as public parks and water quality treatment facilities), and overlook siting criteria in ways that ultimately lead to the placement of highways and landfills in such communities.[53] In terms of air pollution, this participation gap leads to ambient air quality standards that improve air quality generally, but do not as effectively reduce emissions where people, "disproportionately minorities, . . . live in the immediate geographic vicinity of the toxic polluting source."[54] Again, the concern about pollution is broad but the geographic lens is narrow.[55]

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50. Environmental justice became an official part of federal policy in 1994 with the promulgation of President Clinton's Executive Order 12898, which makes "achieving environmental justice" part of each federal agency's mission and created an interagency working group on environmental justice. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Exec. Order No. 12898, § 1-101, 59 Fed. Reg. 7629, 7629 (Feb. 11, 1994). While the order focused its attention very broadly on any "disproportionately high and adverse human health or environmental effects of [governmental] programs, policies, and activities on minority populations and low-income populations," *id.*, it was not explicit about whether its concern was limited to proximate sources. Neither was the guidance provided by the Council on Environmental Quality. *See generally* COUNCIL ON ENV'T QUALITY, EXEC. OFF. OF THE PRESIDENT, ENVIRONMENTAL JUSTICE: GUIDANCE UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT (1997), https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf.

51. Richard J. Lazarus, *Pursuing "Environmental Justice" The Distributional Effects of Environmental Protection*, 87 NW. U.L. REV. 787 (1993); *see also id.* at 791 nn.14–15 (review of the environmental justice literature).

52. *See id.* at 808.

53. *See id.* at 815, 829–31, 839.

54. *Id.* at 814; *see also id.* at 796 n.36 (discussing exposure of Black populations to higher levels of PM and SO_x, but focusing on the geographic localization in urban areas and issues of nearby polluting industries).

55. For other prominent work in this genre, see Vicki Been, *What's Fairness Got to Do with It? Environmental Justice and the Siting of Locally Undesirable Land Uses*, 78 CORNELL L. REV. 1001, 1001–02 (1993), which poses the question of how best to site land uses that have benefits diffused across society

A more recent study, conducted in 2005, analyzed the health risk posed by industrial air pollution, mapping the risks onto each square kilometer in the United States.[56] Although the methodology may have allowed for analysis of non-local pollution, the author highlighted two families who lived in neighborhoods "nestled among" or just across the river from steel mills, focusing on the proximity of their neighborhoods to the plants.[57]

A powerful indication of the environmental justice movement's focus on proximity to polluting sources is the use of the term "fenceline" to refer to communities facing environmental harms.[58] As the term implies, fenceline communities are ones that live close to the fenceline of polluting facilities.[59] For example, a 2017 report by the National Association for the Advancement of Colored People (NAACP), *Fumes Across the Fence-Line*, defines fenceline communities as "communities that are next to a company, industrial, or service facility and are directly affected in some way by the facility's operation (e.g., noise, odor, traffic, and chemical emissions)."[60] Gregg P. Macey calls the fenceline metaphor an "organizing principle" for the environmental justice movement, as it points out the close location of locally undesirable land uses to homes, schools, and playgrounds in disadvantaged communities. Macey thus calls for an awareness of sub-local risks and a reorientation of risk assessment to the level of a single specific place.[61]

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yet the costs and risks of which are heavily concentrated on a small group of neighbors, and also Scott L. Cummings & Ingrid V. Eagly, *A Critical Reflection on Law and Organizing*, 48 UCLA L. REV. 443 (2001), and Sheila Foster, *Justice from the Ground Up Distributive Inequities, Grassroots Resistance, and the Transformative Politics of the Environmental Justice Movement*, 86 CALIF. L. REV. 775 (1998).

56. *See* Bullard et al., *supra* note 21, at 379; *see also* David Pace, *Minorities Suffer Most from Industrial Pollution*, NBC NEWS (Dec. 13, 2005), https://www.nbcnews.com/id/wbna10452037.

57. *See* Pace, *supra* note 56.

58. *See, e.g.*, Robert D. Bullard & Beverly Wright, *Disastrous Response to Natural and Man-Made Disasters An Environmental Justice Analysis Twenty-Five Years After Warren County*, 26 UCLA J. ENV'T L. & POL'Y 217, 225 (2008); Ciprian N. Radavoi, *Fenceline Communities and Environmentally Damaging Projects An Asymptomatically Evolving Right to Veto*, 29 TUL. ENV'T L.J. 1, 1 (2015). The term "frontline" is also used in similar contexts, although less clearly defined in terms of its presence in environmental justice work. These terms are understood to be additive, not exclusive, of one another. *See infra* text accompanying note 89.

59. *See* Gregg P. Macey, *Boundary Work in Environmental Law*, 53 HOUS. L. REV. 103, 107 (2015).

60. LESLEY FLEISCHMAN & MARCUS FRANKLIN, CLEAN AIR TASK FORCE & NAACP, FUMES ACROSS THE FENCE-LINE: THE HEALTH IMPACTS OF AIR POLLUTION FROM OIL & GAS FACILITIES ON AFRICAN AMERICAN COMMUNITIES 6 (2017), http://www.catf.us/wp-content/uploads/2017/11/CATF_Pub_FumesAcrossTheFenceLine.pdf.

61. Macey, *supra* note 59, at 108. Similarly, a 2021 article uses the term "fenceline" to highlight the problem with using air quality data collected miles away from a landfill in assessing the air pollution impact that the landfill had on the immediate community. *See* Marianne Engelman-Lado et al., *Environmental Injustice in Uniontown, Alabama, Decades After the Civil Rights Act of 1964 It's Time for Action*, AM. BAR ASS'N (May 21, 2021), https://www.americanbar.org/groups/crsj/publications/human_rights_magazine_home/vol—44—no-2—housing/environmental-injustice-in-uniontown—alabama—decades-after-the/.

C. Recent Emphasis on Concentration of Air Pollutants from Non-Proximate Sources

In recent years, there has been a partial shift in environmental justice narratives from a focus on local sources of pollution to concern over concentrations of pollutants, particularly of air pollutants, which are often the product of sources that are not proximate to the affected populations.[62] This shift does not imply a current lack of concern with proximate sources, which continues to be a mainstay of environmental justice concerns.[63] Instead, this shift is indicative of a broadening of the geographic lens of the environmental justice movement to include a focus on faraway sources of air pollution. Yet even when this broader lens is employed to determine the existence of an environmental justice concern, the suggested remedies continue to be almost exclusively local.[64]

The environmental justice community has increasingly acknowledged the adverse impacts of non-local sources of pollution.[65] For example, the 2017 NAACP report investigated the impacts that air pollutants from oil and gas facilities have on the health of Black communities living both near and far from these facilities.[66] Although the report was primarily concerned with proximity to polluting sources and the exposure to pollutants at the fenceline, it also considered the health impacts of upwind air pollution.[67] The study focused on the Baltimore-Washington, D.C. corridor, which has a significant Black population and saw increasingly high levels of methane and other natural gas emissions. The report referred to a 2015 study by the University of Maryland, which found that this increased exposure was due to emissions from natural gas facilities in Pennsylvania and Ohio traveling to Maryland.[68] The NAACP report

62. *See, e.g.*, Banzhaf et al., *supra* note 16, at 190–91; Anna Rosofsky et al., *Temporal Trends in Air Pollution Exposure Inequality in Massachusetts*, 161 ENV'T RSCH. 76, 77 (2018).

63. *See* Lisa Friedman, *Kamala Harris and Alexandria Ocasio-Cortez Release Climate Equity' Plan*, N.Y. TIMES (July 29, 2019), https://www.nytimes.com/2019/07/29/us/politics/kamala-harris-aoc-climate-change.html ("Under the plan, any environmental regulation or legislation would be rated based on its impact on low-income communities, which are disproportionately affected by climate change because they are often in flood zones, near highways or power plants, or adjacent to polluted lands known as brownfields.").

64. *See, e.g.*, Environmental Justice for All Act, S. 872, 117th Cong. § 7(b) (2021) (discussed *infra* in text accompanying note 80).

65. An earlier study, the 2002 report *Air of Injustice* by the Black Leadership Forum, also addressed the issue of non-local pollution sources, specifically looking at particulate matter formed downwind of power plants. *See* BLACK LEADERSHIP F. ET AL., AIR OF INJUSTICE: AFRICAN AMERICANS & POWER PLANT POLLUTION 7–8 (2002), http://www.energyjustice.net/files/coal/Air_of_Injustice.pdf. However, that was the only reference to non-local air pollution in the report; the bulk of it focused on proximate sources. *See id.* at 6–7.

66. *See* FLEISCHMAN & FRANKLIN, *supra* note 60, at 3.

67. *See id.* at 16.

68. *See id.*

emphasized that this transportation of non-local air pollution is an environmental justice issue.[69]

Similar concerns are evident in the work of the Environmental Justice Forum, which is composed of environmental justice organizations from across the country.[70] In 2017, the group developed a toolkit to assist stakeholders in integrating environmental justice considerations into the preparation of State Implementation Plans—the documents that states are required to prepare to show how they will comply with NAAQS.[71] This toolkit specifically calls for collaboration among neighboring states, agencies, community organizations, and other stakeholders "to ensure the [State Implementation Plans] work in concert to attain air quality standards in the region."[72]

The environmental justice literature has also adopted new methodologies and shifted its emphasis from "emissions," which tend to cabin the inquiry to localized sources of pollution, to ambient concentrations or exposures, which capture the impacts of non-local sources.[73] A 2018 study by Anna Rosofsky et al. modeled concentrations of $PM_{2\,5}$ and nitrogen dioxide (NO_2), noting that these pollutants "have significant public health burdens but are not typically dominated by local emissions from hazardous facilities, reinforcing the importance of an exposure-based analytical approach to identify [environmental inequality] occurring at smaller spatial scales."[74] This study looked at pollution concentrations in Massachusetts over an eight-year period and found that concentrations are highest in Black and Latino communities in urban areas.[75] The study also found that although all populations saw a decrease in absolute exposures over time, inequality has increased across socioeconomic and racial lines.[76]

Other recent developments in low-cost monitoring technology facilitate a better understanding of air pollution exposures.[77] For example, a 2021 study

69. *See id.*

70. *See* ENV'T JUST. LEADERSHIP F. ON CLIMATE CHANGE, http://weact.nyc/Portals/7/Full%20member%20list%20June%202009.pdf (last visited July 15, 2021).

71. ENV'T JUST. LEADERSHIP F. ON CLIMATE CHANGE, CLEANER AIR, CLEANER COMMUNITIES: 6 STEPS TO DEVELOP ENVIRONMENTALLY JUST STATE IMPLEMENTATION PLANS 1 (May 2017), http://projects.skeo.com/wp-content/uploads/2017/06/Cleaner-Air-Cleaner-Communities-Web-Version-May-2017.pdf.

72. *Id.* at 3.

73. In the late 1990s, some scientific studies adopted the plume modeling approach to integrate air dispersion modeling, a departure from the then-standard spatial coincidence or distance-based modeling. *See, e.g.*, H. Spencer Banzhaf et al., *Environmental Justice Establishing Causal Relationships*, 11 ANN. REV. RES. ECON. 377, 380 (2019) (citing the demographic impact of a polluting source as analyzed through dispersion analysis compared to distance). However, a 2018 study notes that most studies to date were still done using proximity-based methods. *See* Rosofsky et al., *supra* note 62, at 76.

74. Rosofsky et al., *supra* note 62, at 77.

75. *See id.* at 76.

76. *See id.* at 84.

77. *See* MEREDITH FOWLIE ET AL., BROOKINGS INST., CLIMATE POLICY, ENVIRONMENTAL JUSTICE, AND LOCAL AIR POLLUTION 7 (2020); *see also* Janet Currie et al., *What Caused Racial*

used satellite-derived measurements of $PM_{2.5}$ as opposed to the "indirect" proximity proxy for exposure, which does not account for air transport or mobile sources.[78] Attempting to close the gap between knowing that there are racial differences in proximity to toxic facilities sites and knowing how those differences translate into measured exposures, the study traced the Black-white racial gap in exposure over twenty years and found that inequality in air quality exposure has increased over time.[79]

Recently proposed environmental legislation accounts for the impacts of cumulative emissions affecting an area, regardless of the location of the source. For example, the proposed 2021 Environmental Justice for All Act calls for cumulative impacts analyses for the census block or tribal census block group located in or adjacent to the area where a major source is, or is proposed to be, located.[80] The bill defines "cumulative impacts" as "any exposure to a public health or environmental risk, or other effect occurring in a specific geographical area, including from an emission, discharge, or release," including environmental pollution released "from any source, whether single or multiple."[81] The assessment is to be "based on the combined past, present, and reasonably foreseeable emissions and discharges affecting the geographical area."[82] Reflecting the broadening of the geographic lens used in environmental justice inquiries, the bill refers to "any source" and not just to proximate sources.[83]

However, under the bill, cumulative impacts would be remedied only through a localized process. With respect to the initial permitting and permit renewal processes, the bill calls for an evaluation of the impacts of that source considering cumulative impacts, other pollution sources, and risk factors within the community.[84] The permitting authority may either impose certain additional standards or deny the permit if it finds that the source, considering cumulative impacts, may cause harm to the population or a subpopulation of the census block that houses the major source or is adjacent to the major source.[85] Therefore, although the cumulative impacts assessment accounts for the existence of non-local and ambient air pollution, the remedy is limited to local sources; the bill

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Disparities in Particulate Exposure to Fall? New Evidence from the Clean Air Act and Satellite-Based Measures of Air Quality 5 (Nat'l Bureau of Econ. Rsch., Working Paper No. 26659, 2021) (noting a "recent explosion" of research, circa 2016, that uses "spatially-continuous satellite measurements of pollution correlates").

78. Currie et al., *supra* note 77, at 1, 21.
79. *Id.*
80. *See* Environmental Justice for All Act, S. 872, 117th Cong. § 7(b) (2021).
81. *Id.* § 7(b)(1).
82. *Id.*
83. *Id.*
84. *Id.* § 7(b)(2)(B).
85. *Id.*

makes no effort to address the faraway sources of the pollution affecting the community in which the permit is at issue.

Even though this legislation failed to pass, President Biden's Executive Order on Tackling the Climate Crisis at Home and Abroad ("the Order") reflects a conception of environmental justice concerns that is not limited to the impact of proximate sources. For example, it directs the Council on Environmental Quality to develop a new Climate and Economic Justice Screening Tool[86] that would focus on the impacts of both proximate and non-proximate sources.[87] The Order also directs EPA to create a community notification program to provide real-time data on environmental pollution in communities with "the most significant exposure to such pollution."[88] By framing the pollution in terms of exposure, the Order is not limiting the scope of analysis based on proximity.

The Order is also notable in its use of the phrase "frontline and fenceline communities," pairing two terms that appear to refer to different types of environmental justice concerns. Compared to "fenceline communities," which typically references close proximity to specific sources,[89] "frontline communities" allows for a broader conception of the many issues, environmental justice and otherwise, that the relevant community faces. For example, section 205 of the Climate Equity Act, proposed by then-Senator Harris and Representative Ocasio-Cortez, defined a frontline community as a community that has "experienced systemic socioeconomic disparities, environmental injustice, or another form of injustice, including . . . a low-income community . . . an indigenous community; and . . . a community of color" as well as "a community or population that is the most vulnerable and will be the most adversely impacted by environmental and climate injustice and inequitable climate actions. . . ."[90] This broad language is not limited to the impacts of proximate sources.

The increased emphasis on concentrations of air pollutants, wherever they might be emitted, can also be seen at the state level, principally in California, which has extensive legislation that incorporates environmental justice into agency decision making.[91] For example, Assembly Bill 617, enacted in 2017,

86. Tackling the Climate Crisis at Home and Abroad, Exec. Order No. 14008, § 222(a), 86 Fed. Reg. 7619, 7631 (Jan. 27, 2021). The tool would build on EJScreen, which was developed in 2012 to determine whether communities may be disproportionately affected by pollution. *See Purposes and Uses of EJScreen*, EPA, https://www.epa.gov/ejscreen/purposes-and-uses-ejscreen (last visited July 12, 2021).

87. EJScreen uses annual average $PM_{2.5}$ concentrations estimated from a combination of monitoring data and air quality modeling to assess the $PM_{2.5}$ index. *See* EPA, EJSCREEN: ENVIRONMENTAL JUSTICE MAPPING AND SCREENING TOOL, TECHNICAL DOCUMENTATION 40 (2015), https://www.epa.gov/sites/production/files/2015-05/documents/ejscreen_technical_document_20150505.pdf.

88. Exec. Order No. 14008, 86 Fed. Reg. at 7631.

89. *See, e.g.*, FLEISCHMAN & FRANKLIN, *supra* note 60; *supra* text accompanying notes 58–61.

90. Climate Equity Act, H.R. 8019, 116th Cong. § 205(b)(2) (2020).

91. *See, e.g.*, A.B. 1628, 2019–2020 Leg., Reg. Sess. (Cal. 2019) (revising the statutory definition of "environmental justice" to include the "meaningful involvement of people of all races, cultures,

which deals with nonvehicular air pollutants, directs the California Air Resources Board to develop a statewide strategy to address pollution levels in communities affected by high cumulative exposures.[92] Assembly Bill 617 provides for both community air monitoring systems, which measure and record "air pollutant concentrations in the ambient air at or near sensitive receptor locations and in disadvantaged communities,"[93] and fenceline monitoring systems, which measure and record "air pollutant concentrations at or adjacent to a stationary source."[94] By providing two separate mechanisms for analysis, the legislation shows concern for both local and non-local sources of pollution. And California's Office of Environmental Health Hazard Assessment, which facilitates the sophisticated monitoring framework, CalEnviroScreen,[95] explicitly defines "sources of pollution" as "including those outside the geographic area that are nevertheless responsible for pollution that reaches the area."[96] Nonetheless, the remedies are local, focusing on the siting of new major polluting sources located within communities that may be affected by non-local and other types of air pollution, and not on the sources that are already causing the problem.[97]

In summary, in recent years, non-proximate sources of air pollution have come within the ambit of environmental justice concerns. These concerns are no longer limited to sources of pollution that are in the vicinity of the affected communities. However, the proposed remedies for these exposure problems are generally limited to actions that can be undertaken in these communities and do not extend to reductions in the emissions of faraway sources.

D. COVID-19, Air Pollution, and Environmental Justice

The COVID-19 pandemic has hit disadvantaged communities in the United States particularly hard. The virus infects Black individuals at about the same rate as white individuals, but Black individuals are about three times more likely

incomes, and national origins with respect to" the actions of the Office of Planning and Research in coordinating state and federal regulations).

92. *See generally* A.B. 617, 2017–2018 Leg., Reg. Sess. (Cal. 2017).

93. *Id.* § 7(a)(1).

94. *Id.* § 7(a)(3); *see also* CTR. FOR CLEAN AIR POL'Y, *California's AB 617 A New Frontier in Air Quality Management. . .If Funded*, (Aug. 1, 2017), https://www.ccap.org/post/california-s-ab-617-a-new-frontier-in-air-quality-management-if-funded.

95. *CalEnviroScreen*, CAL. OFF. OF ENV'T HEALTH HAZARD ASSESSMENT, https://oehha.ca.gov/calenviroscreen. Note that CalEnviroScreen is currently being updated to version 4.0, but that version is still in public comment period, so this discussion focuses on version 3.0 which is currently in place.

96. Lisa S. Adams & Joan E. Denton, CUMULATIVE IMPACTS: BUILDING A SCIENTIFIC FOUNDATION, CALIFORNIA OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT 21 (2010), https://oehha.ca.gov/media/downloads/calenviroscreen/report/cireport123110.pdf.

97. *See* A.B. 617, § 7(6)(c).

to be hospitalized and twice as likely to die from the virus.[98] Outcomes are even worse for Indigenous and Latino individuals.[99] There are several socioeconomic explanations for racial differences in coronavirus outcomes, including disparities in health insurance access, pre-existing health conditions, in-person employment, and crowded housing conditions.[100] But one crucial factor is that disadvantaged communities breathe more polluted air.[101] In particular, high $PM_{2\,5}$ concentrations are linked to high COVID-19 mortality rates.[102] Emissions of NO_2 are also linked to higher rates of COVID-19 mortality.[103]

This Subpart shows how, as a result, the pandemic has brought increased attention to the environmental justice consequences of air pollution, particularly of $PM_{2\,5}$. First, it explores the serious impact of air pollution as a comorbidity that increases the negative health outcomes of individuals exposed to COVID-19. Second, it shows that during the pandemic, there has been greater attention in the media to environmental justice in general and to the link between air pollution and environmental justice in particular. Third, it details how, over the last two years, political leaders have raised the visibility of the significant relationship among high pollution concentrations, the health consequences of COVID-19, and environmental justice issues.

1. Air Pollution as a Comorbidity

Long-term exposure to air pollution is correlated with increased COVID-19 infection and fatalities, likely due to the significant health impacts caused by such exposure.[104] All discussions of COVID-19, air pollution, and environmental justice are rooted in a scientifically demonstrated link between COVID-19 outcomes and air quality. Long-term exposure to air pollution causes medical issues that are COVID-19 comorbidities, like heart disease and

98. *See Risk for COVID-19 Infection, Hospitalization, and Death by Race/Ethnicity*, CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html (last updated Mar. 25, 2022).

99. *See id.*

100. *See* Christine Ro, *Coronavirus Why Some Racial Groups Are More Vulnerable*, BBC (Apr. 20, 2020), https://www.bbc.com/future/article/20200420-coronavirus-why-some-racial-groups-are-more-vulnerable.

101. *See* Eric B. Brandt et al., *Air Pollution, Racial Disparities, and COVID-19 Mortality*, 146 J. ALLERGY & CLINICAL IMMUNOLOGY 61, 62 (2020) ("Lower income communities of color are more likely to have historical exposures to higher levels of air pollution.").

102. *See Coronavirus and Air Pollution*, HARVARD T.H. CHAN SCH. OF PUB. HEALTH: CTR. FOR CLIMATE, HEALTH, AND THE GLOB. ENV'T, https://www.hsph.harvard.edu/c-change/subtopics/coronavirus-and-pollution/ (last visited July 15, 2021) ("[H]igher death rates that have been observed among the poor and people of color in the United States reflect existing health and economic inequalities that both contribute to, and result from, greater exposure to air pollution.").

103. *See* Donghai Liang et al., *Urban Air Pollution May Enhance COVID-19 Case-Fatality and Mortality Rates in the United States*, 1 INNOVATION 1, 1 (2020).

104. *See, e.g.*, Nurshad Ali & Farjana Islam, *The Effects of Air Pollution on COVID-19 Infection and Mortality—A Review on Recent Evidence*, FRONTIERS PUB. HEALTH, Nov. 26, 2020, at 1.

respiratory illness.[105] Part II establishes that Black, Latino, Native, and low-income individuals in the United States are exposed to air pollution at substantially higher rates, increasing the likelihood of having these comorbidities. Because disadvantaged communities disproportionately suffer from COVID-19 comorbidities, members of these communities are more likely to die from COVID-19, making air pollution one of several factors contributing to racially disproportionate COVID-19 cases and mortality in the country.[106]

The most cited, and most compelling, evidence of air pollution as a COVID-19 aggravator is an article authored by scientists in the Biostatistics Department of the Harvard T.H. Chan School of Public Health.[107] The study used COVID-19 mortality rates and the distribution of $PM_{2.5}$ emissions to conduct an ecological regression analysis. The authors found a statistically significant link between county $PM_{2.5}$ pollution and the COVID-19 mortality rate: every 1 $\mu g/m^3$ $PM_{2.5}$ increase is associated with an 11 percent increase in the COVID-19 mortality rate.[108] The same study observed the links between race and coronavirus mortality, finding that for every 14.1 percent increase in a county's number of Black residents, there was a 49 percent increase in COVID-19 mortality rates.[109] Notably, the study concludes that its findings "provide a strong scientific argument for revision of the NAAQS $PM_{2.5}$ and other environmental policies in the midst of a pandemic."[110]

The Massachusetts Attorney General's Office also released a report finding that communities of color have the highest rates of COVID-19 infection across the state and specifically linking that disparity to environmental injustice.[111] The report examined environmental quality, and air quality specifically, as a "key indicator" of COVID-19.[112] Black and Latino communities in the state suffer from the highest levels of $PM_{2.5}$ and NO_2, in part because industrial facilities and highways are concentrated in these communities.[113] These communities were

105. *See* Brandt et al., *supra* note 101, at 61.

106. *See id.* For example, in Chicago, more than 50 percent of COVID-19 cases and nearly 70 percent of deaths involved Black individuals, although they make up only 30 percent of the city's population. *See id.* at 62. In Michigan, 33 percent of cases and 44 percent of deaths involved Black individuals, although just 14 percent of the state population is Black. *See id.* Nationwide, about 28 percent of deaths involved Black individuals, more than twice the proportion of the national Black population. *See id.*

107. X. Wu et al., *Air Pollution and COVID-19 Mortality in the United States Strengths and Limitations of an Ecological Regression Analysis*, SCI. ADVANCES, Nov. 4, 2020, at 1.

108. *Id.*

109. *Id.* at 2.

110. *Id.* at 5.

111. OFF. OF MASS. ATT'Y GEN. MAURA HEALY, COVID-19'S UNEQUAL EFFECTS IN MASSACHUSETTS: REMEDYING THE LEGACY OF ENVIRONMENTAL INJUSTICE & BUILDING CLIMATE RESILIENCE (2020), https://www.mass.gov/doc/covid-19s-unequal-effects-in-massachusetts/download.

112. *Id.* at 5. The report also lists a number of risk factors, including poverty, overrepresentation as essential workers, and a greater likelihood of pre-existing serious medical conditions, among others. *See id.*

113. *See id.*

also hardest hit with COVID-19 in the state, which ranked fourth in the nation for total number of cases and third for total deaths in May 2020.[114] A mapping tool released by the Boston University School of Public Health demonstrates that areas with the lowest environmental quality were both communities of color and COVID-19 hotspots, illustrating the link between environmental justice and COVID-19.[115]

2. Media Attention

Searches on ProQuest, Google News, and Westlaw provide useful information about the growing interest in the link between air pollution and environmental justice concerns before and after the beginning of the pandemic, and strongly suggest that the pandemic increased the interest in this link.[116] The discussion below uses March 2020 as the pandemic's approximate start, as that was the month when the World Health Organization declared that the virus's spread had reached pandemic levels and when most U.S. lockdowns and stay-at-home orders took effect.[117]

On ProQuest, the number of articles, blogs, podcasts, and websites mentioning "environmental justice" increased notably between April 2019 and March 2021.[118] Between April 2019 and March 2020, monthly mentions of "environmental justice" ranged between 89 (August 2019) and 197 (February 2020), averaging 124.5 mentions. In contrast, between March 2020 and March 2021, the comparable number ranged between 112 (March 2020) and 487 (March 2021), for an average of 263.5 mentions—more than twice the pre-COVID

114. *See id.* at 3, 11 n.7.

115. *See id.* at 6–7. A similar link was also established in Cancer Alley, a stretch on the Mississippi River that houses a large number of industrial facilities. *See* Rachel Ramirez, *Wake-up Call As Coronavirus Ravages Louisiana, Cancer Alley' Residents Haven't Given up the Fight Against Polluters*, GRIST (May 4, 2020), https://grist.org/justice/as-coronavirus-ravages-louisiana-cancer-alley-residents-havent-given-up-the-fight-against-polluters/; Kimberly A. Terrell & Wesley James, *Racial Disparities in Air Pollution Burden and COVID-19 Deaths in Louisiana, USA, in the Context of Long-Term Changes in Fine Particulate Pollution*, ENV'T JUST., Sept. 2020, at 1, 3; Krista Karlson, *Cancer Alley Now Coronavirus Alley*, SIERRA (June 9, 2020), https://www.sierraclub.org/sierra/cancer-alley-now-coronavirus-alley.

116. While the following data does indicate that interest in air pollution in the context of environmental justice has risen since the start of the pandemic, air pollution is not necessarily unique among environmental issues on this score. For example, similar ProQuest searches reveal that wastes were more frequently mentioned in the environmental justice context following the pandemic.

117. *See* Tanya Lewis, *How the U.S. Pandemic Response Went Wrong—and What Went Right—During a Year of COVID*, SCI. AM. (Mar. 11, 2021), https://www.scientificamerican.com/article/how-the-u-s-pandemic-response-went-wrong-and-what-went-right-during-a-year-of-covid/.

118. This data was obtained by conducting an "advanced search" on ProQuest, which entailed entering the search terms in quotation marks and defining one-month time ranges (for example, 3/1/2020–3/31/2020). Given the length of the publication process, books influenced by the COVID-19 pandemic are not likely to have yet been published. Therefore, for the purposes of this project, ProQuest searches were limited to newspaper articles, magazine articles, and the category of "blogs, podcasts, and websites," since those media are generally able to quickly respond to social developments.

average. Further, a significant proportion of these articles (around 64 percent) specifically referenced COVID-19, indicating that the pandemic has likely had some influence on the significant increase of "environmental justice" mentions.

There was a similar increase in attention around air pollution and environmental justice. From April 2019 through March 2020, monthly media mentions of both "environmental justice" and "air pollution" ranged from nine (May 2019) to forty-one (February 2020), averaging 20.3 mentions. From March 2020 through March 2021, in contrast, monthly media mentioning both terms ranged from fourteen (March 2020) to seventy-nine (July 2020), averaging 45.5—more than twice as many as in the pre-COVID period. As was the case with "environmental justice," the average number of articles, websites, and podcasts mentioning both "environmental justice" and "air pollution" has more than doubled since the COVID-19 pandemic began. Moreover, from March 2020 through March 2021, around 50 percent of the articles that mentioned "environmental justice" and "air pollution" also mentioned the coronavirus, further indicating that the pandemic played a meaningful role in spurring discussions about air pollution in the environmental justice context.

This same procedure was undertaken using Google News, the subset of Google that searches only within news articles.[119] As was the case with ProQuest media, the number of news articles mentioning both "environmental justice" and "air pollution" nearly doubled after March 2020. From April 2019 through March 2020, there were an average of 353 news articles published per month that mentioned both "environmental justice" and "air pollution." From March 2020 through March 2021, the average monthly news articles mentioning both terms rose to 625. Also, between March 2020 and March 2021, around 60 percent of these articles published also mentioned COVID-19. These figures therefore supported the results of the broader ProQuest search.

3. Political Attention

Increased attention to connections among air pollution, negative COVID-19 outcomes, and environmental justice has also entered the political mainstream. For example, Joe Biden's environmental justice plan on his 2020 presidential campaign website begins as follows: "The current COVID-19 pandemic reminds us how profoundly the energy and environmental policy decisions of the past have failed communities of color – allowing systemic

119. The Google News search mechanism is not as reliable as ProQuest's search mechanism; from April 2019 through January 2020, approximately 23 percent of the news articles mentioning both "environmental justice" and "air pollution" also mentioned COVID-19, even though the virus did not yet exist, or had not yet spread in the U.S. This inaccuracy is likely because Google News searches pick up the words in article advertisements, dampening the accuracy of numbers of search results.

shocks, persistent stressors, and pandemics to disproportionately impact communities of color and low-income communities."[120]

Similar concerns are reflected in the American Rescue Plan, the $1.9 trillion COVID-19 stimulus package that President Biden signed into law on March 11, 2021.[121] The stimulus package allocated $100 million to address poor air quality in disadvantaged communities.[122] About half of that money is for environmental justice grants.[123] EPA will distribute the other half to state, local, and tribal agencies to improve air quality monitoring and pollution reduction.[124]

Recent legislative proposals also focus on the connections between air pollution, COVID-19 outcomes, and environmental justice. In May 2020, Representatives Raul Ruiz and Donald McEachin introduced H.R. 6692, the "Environmental Justice COVID-19 Act,"[125] which was a part of the HEROES Act, a never-enacted COVID-19 stimulus bill. Both the House bill and its Senate companion, introduced by Senators Tammy Duckworth, Cory Booker, and Tom Carper,[126] commit $50 million in EPA-administered environmental justice grants to explore the relationship between air pollution and COVID-19 outcomes.[127] Representative Ruiz said about the bill, "COVID-19 has exacerbated what we have known all along. . . . [At-risk communities are] disproportionately breathing polluted air and drinking dirty water due to neglect or decisions by others."[128] Similarly, Rep. Betty McCollum of Minnesota tweeted, "Black, Indigenous, & other communities of color are disproportionately impacted by COVID-19. I'm working with my fellow @AppropsDems to push for $50M in environmental justice grants to address connections between air pollution exposure & coronavirus. Pass the #HeroesAct now!"[129]

These congressional concerns about the relationships between air pollution, COVID-19, and environmental justice were also reflected in constituent work.

120. *See The Biden Plan to Secure Environmental Justice and Equitable Economic Opportunity*, BIDEN HARRIS, https://joebiden.com/environmental-justice-plan/ (last visited July 22, 2021).

121. *See* Jacob Pramuk, *Biden Signs $1.9 Trillion Covid Relief Bill, Clearing Way for Stimulus Checks, Vaccine Aid*, CNBC (Mar. 11, 2021), https://www.cnbc.com/2021/03/11/biden-1point9-trillion-covid-relief-package-thursday-afternoon.html.

122. *See* American Rescue Plan Act of 2021, Pub. L. No. 117-2, § 6002, 135 Stat. 4, 93 (2021); Marianne Lavelle, *Environmental Justice Plays a Key Role in Biden's Covid-19 Stimulus Package*, INSIDE CLIMATE NEWS (Mar. 14, 2021), https://insideclimatenews.org/news/14032021/environmental-justice-plays-a-key-role-in-bidens-covid-19-stimulus-package/.

123. *See* Lavelle, *supra* note 122.

124. *See id.*

125. H.R. 6692, 116th Cong. (2020).

126. S. 3680, 116th Cong. (2020).

127. *See* Angely Mercado, *A Bill in Congress Could Get to the Bottom of How Coronavirus Links Air Pollution and Racism*, GRIST (June 12, 2020), https://grist.org/justice/a-bill-in-congress-could-get-to-the-bottom-of-how-coronavirus-links-air-pollution-and-racism/.

128. *Id.* (alteration in original) (quoting California Representative Paul Ruiz).

129. Rep. Betty McCollum, *@BettyMcCollum04*, TWITTER (Sept. 10, 2020, 4:40 PM EST), https://twitter.com/BettyMcCollum04/status/1304157729112633345.

In July 2020, Senator Ed Markey and Representative Ayanna Pressley wrote a letter to then-EPA Administrator Wheeler requesting air monitors to address poor air quality in Chelsea, Massachusetts, which has been defined as an "environmental justice area" due to the low incomes of residents and high rates of air pollution.[130] In the letter, Markey and Pressley wrote that Chelsea is one of the communities in Massachusetts most affected by COVID-19, and noted the links between air pollution and virus outcomes.[131] When EPA announced that it would comply with the request, Senator Markey responded: "It's now much more clear that the higher levels of coronavirus in Chelsea are also tied to the higher levels particulate matter, [and] to the higher levels of other pollution sources, that then make those people more vulnerable to contracting coronavirus. It's all tied together."[132]

Moreover, as the COVID-19 pandemic was bringing environmental justice issues into focus, a broad racial justice movement was rising throughout the country. The murder of George Floyd by police officer Derek Chauvin spurred widespread protests against police brutality and anti-Black racism in the U.S.[133] Poignantly, environmental justice advocates drew a connection between George Floyd's final words and the respiratory impacts of air pollution and COVID-19, disproportionately felt by Black Americans.[134] At a House hearing on June 9, 2020, Mustafa Santiago Ali, the Vice President of Environmental Justice, Climate, and Community Revitalization at the National Wildlife Federation's National Advocacy Center, stated: "These communities which have been the sacrifice zones for pollution are now also ground zero for the coronavirus, and many of the storms, floods and other climatic events which we have witnessed

130. Letter from Rep. Ayanna Pressley & Sen. Ed Markey to Andrew Wheeler, Adm'r, EPA (July 15, 2020), https://boston.cbslocal.com/wp-content/uploads/sites/3859903/2020/08/Markey-Pressley.pdf.

131. *See id.*

132. Anaridis Rodriguez, *EPA Commits to Monitoring Pollution in Chelsea*, CBS BOS. (Aug. 14, 2020, 8:48 PM), https://boston.cbslocal.com/2020/08/14/epa-air-pollution-monitoring-chelsea-coronavirus/.

133. *See* Larry Buchanan et al., *Black Lives Matter May Be the Largest Movement in U.S. History*, N.Y. TIMES (July 3, 2020), https://www.nytimes.com/interactive/2020/07/03/us/george-floyd-protests-crowd-size.html.

134. *See, e.g.*, Kendra Pierre-Louis, *"I Can't Breathe" What Air Pollution and Police Violence Have in Common*, SIERRA (July 15, 2020), https://www.sierraclub.org/sierra/i-can-t-breathe-covid-pollution; Rick Mullin, *The Rise of Environmental Justice*, CHEM. & ENG'G NEWS (Aug. 24, 2020), https://cen.acs.org/environment/pollution/rise-environmental-justice/98/i32; Isabelle Chapman & Drew Kann, *For Some Environmentalists, I Can't Breathe' Is About More Than Police Brutality*, CNN, https://www.cnn.com/2020/06/27/us/environmental-racism-explainer-trnd/index.html (Aug. 4, 2020, 1:54 PM).

over the past few years."[135] Powerfully, he added "when we say, 'I Can't Breathe' we literally can't breathe."[136]

States have also recognized the links between air pollution, negative COVID-19 outcomes, and environmental justice. In North Carolina, Governor Roy Cooper issued an executive order titled "Addressing the Disproportionate Impact of COVID-19 on Communities of Color."[137] The order included the creation of a task force directed to quantify the "health and welfare benefits of pollution reduction."[138] Similarly, the Minnesota state senate introduced a bill modifying air emission permitting requirements for "impacted area[s],"[139] which includes areas with "dramatically increased high-risk vulnerabilities to the COVID-19 pandemic based on documented racial health disparities including asthma, child lead poisoning, obesity, hypertension, diabetes, heart disease, and cancer related to exposures to toxic environmental pollutants."[140]

In summary, as the COVID-19 pandemic tore through disadvantaged communities, the link between air pollution and environmental justice was brought into sharp focus. Because they experience high levels of exposure to pollution, racial and ethnic minority communities have a greater probability of negative COVID-19 outcomes, including a higher rate of fatalities.[141] As a result, high pollutant concentrations became a core environmental justice concern to a far greater extent than had ever before been the case.

II. DISTRIBUTION OF THE HARMS OF PARTICULATE MATTER POLLUTION

This Part establishes that air pollution concentrations in the ambient air have a disproportionate impact on racial and ethnic minorities as well as socioeconomically disadvantaged communities. Subpart A summarizes the research showing that racial and ethnic minorities as well as lower income individuals are exposed to far higher concentrations of $PM_{2.5}$, which is the pollutant producing the largest number of fatalities.[142] Subpart B shows that certain disadvantaged communities are more susceptible to the harm of $PM_{2.5}$

135. *Pollution and Pandemics Covid-19's Disproportionate Impacts on Communities Hearing Before the Subcomm. on Env't & Climate Change of the H. Comm. on Energy & Commerce* (2020) (testimony of Mustafa Santiago Ali, Vice President, National Wildlife Federation), https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/Witness percent20Testimony_Ali_06.09.20 percent20 percent28Updated percent29.pdf.

136. *Id.*

137. *See* N.C. Exec. Order No. 143, § 1(B)(4)(b) (June 4, 2020), https://files.nc.gov/governor/documents/files/EO143-Addressing-the-Disproportionate-Impact-of-COVID-19-on-Communities-of-Color.pdf.

138. *Id.*

139. Air Emissions Permit Cumulative Impact Analysis Requirements Modification, H.R. 4594, 2020 Leg., 91st Sess. § 2 (Minn. 2020).

140. *Id.* § 2(d)(6).

141. *See Introduction to COVID-19 Racial and Ethnic Health Disparities*, CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/index.html (last updated Dec. 10, 2020).

142. *See supra* text accompanying notes 1–2.

concentrations. As a result, communities of color and socioeconomically disadvantaged communities are disproportionately harmed by $PM_{2.5}$ pollution.

A. Disproportionate Exposure

While $PM_{2.5}$ exposure affects everyone in the United States and the world at large, the effects are not distributed equally. Communities of color, immigrant communities, and low-income communities are disproportionately exposed to higher $PM_{2.5}$ concentrations nationwide. Subpart 1 underscores how these communities bear a disproportionate $PM_{2.5}$ burden and shows that people of color are subject to higher pollution concentrations even when controlling for income. Subpart 2 explores the disparate exposures among the same sub-groups in areas designated as nonattainment counties or areas that were misclassified as attainment areas but are actually in nonattainment.

$PM_{2.5}$ is a non-threshold pollutant—that is, a pollutant that produces adverse health effects at all non-zero concentrations. Thus, it is not just nonattainment areas that should be of concern, since adverse health effects are experienced at all concentrations below the NAAQS.[143] Across the board, communities of color and low-income communities are disproportionately exposed to high concentrations of $PM_{2.5}$

1. Disparities across Racial, Ethnic, and Socioeconomic Groups

According to the American Lung Society, there are 135 million people living in areas with ozone or particulate matter levels above the current NAAQS.[144] While 40 percent of Americans live in areas with $PM_{2.5}$ levels exceeding the NAAQS and other criteria pollutants, people of color are 61 percent more likely than their white counterparts to live in counties above the NAAQS for one pollutant and 300 percent more likely to live in counties exceeding the NAAQS for three pollutants.[145]

A different study underscoring racial and socioeconomic disparities across the country calculated the absolute $PM_{2.5}$ burden in terms of tons per year experienced near the block group of residence for an individual in the American Community Survey between 2009–2013.[146] It found that, on average, the absolute $PM_{2.5}$ burden is 18.8 tons/year for white individuals, 34.5 tons/year for

143. *See* Kimberly M. Castle & Richard L. Revesz, *Environmental Standards, Thresholds, and the Next Battleground of Climate Change Regulations*, 103 MINN. L. REV. 1349, 1397–1417 (2019). For recent studies, see Qian Di et al., *Air Pollution and Mortality in the Medicare Population*, 376 NEW ENG. J. MED. 2513, 2518 (2017), and Jongeun Rhee et al., *Impact of Long-Term Exposures to Ambient $PM_{2.5}$ and Ozone on ARDS Risk for Older Adults in the United States*, 156 CHEST 71, 77 (2019).

144. *See* AM. LUNG ASS'N, STATE OF THE AIR 16 (2021), https://www.lung.org/getmedia/17c6cb6c-8a38-42a7-a3b0-6744011da370/sota-2021.pdf.

145. *Id.* at 11.

146. Ihab Mikati et al., *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status*, 108 AM. J. PUB. HEALTH 480, 482 tbl.1 (2018).

Black individuals, and 26.9 tons/year for Latino individuals.[147] It also calculated the proportional burden as the ratio of the racial subgroup's burden as compared to the overall population's burden, which is 1.54 for Black individuals, 1.20 for Latino individuals, and 0.84 for white individuals.[148]

The disproportionate impact of $PM_{2.5}$ concentrations on people of color manifests itself across all $PM_{2.5}$ emissions sources, which can be categorized into fourteen sectors.[149] A study found that all sectors and most sources within those sectors contribute to disparities in $PM_{2.5}$ exposure faced by Black individuals, who are exposed to 21 percent more $PM_{2.5}$ than white individuals. Overall, people of color are exposed to 14 percent more $PM_{2.5}$ than white people. In contrast, white people face below-average $PM_{2.5}$ concentrations from most sectors.[150] More specifically, minority populations are disproportionately exposed to all emission sources that comprise 75 percent of $PM_{2.5}$ exposure.[151] These findings are consistent across urban and rural areas as well as income levels.[152] Translated into $PM_{2.5}$ concentrations, people of color, Black, Latino, and Asian communities face annual average concentrations of 7.4 $\mu g/m^3$, 7.9 $\mu g/m^3$, 7.2 $\mu g/m^3$, and 7.7 $\mu g/m^3$, respectively, while white communities face $PM_{2.5}$ concentrations of 5.9 $\mu g/m^3$.[153]

State-specific studies also highlight the racial and ethnic disparities in $PM_{2.5}$ exposure. For example, in North Carolina, racial and ethnic minorities and lower income individuals are more likely to experience higher $PM_{2.5}$ exposure.[154] In particular, increases in the percentages of people in poverty, people without a high school education, non-Latino Black individuals, and Latino individuals were associated with increased $PM_{2.5}$ concentrations by 0.12 $\mu g/m^3$, 0.14 $\mu g/m^3$, 0.15 $\mu g/m^3$, 0.04 $\mu g/m^3$, and 0.12 $\mu g/m^3$, respectively.[155] High school education level and percentage of non-Latino Black residents are the most significant predictors of increased $PM_{2.5}$ exposure.[156]

147. *Id.*
148. *Id.*
149. *See* Tessum et al., *supra* note 2, at 1.
150. *Id.*
151. *Id.* at 3.
152. *See id.* at 2. Emission sources that lead to the greatest disparities in $PM_{2.5}$ concentrations include "industry, light-duty gasoline vehicles, construction, and heavy-duty diesel vehicles," as well as "residential gas combustion and commercial cooking." *Id.* at 1. Whites face greater $PM_{2.5}$ concentrations from only two sectors: coal electric generation and agriculture. *Id.*
153. *Id.* Compare these annual concentrations to the annual $PM_{2.5}$ NAAQS of 12 $\mu g/m^3$ and the 24-hour concentration of 35 $\mu g/m^3$. *See NAAQS Table*, EPA, https://www.epa.gov/criteria-air-pollutants/naaqs-table (last visited Feb. 10, 2021). However, since $PM_{2.5}$ is a non-threshold contaminant, there are still profound adverse health effects below these standard concentrations.
154. *See* Simone C. Gray et al., *Race, Socioeconomic Status, and Air Pollution Exposure in North Carolina*, 126 ENV'T RSCH. 152, 152 (2013).
155. *Id.* at 154.
156. *See id.* at 156.

One study used travel activity survey data to document individuals' movements throughout the day.[157] Recognizing that $PM_{2.5}$ concentrations can drastically change depending on the time of day and traffic patterns, the study looked at demographic patterns of traffic-generated $PM_{2.5}$ exposure during daytime and nighttime in Atlanta, Georgia.[158] During the day, all racial groups face similarly high levels of traffic-related air pollution since racial groups comingle downtown for work and segregation is temporarily mitigated in part.[159] However, at night, white commuters who travel home to their neighborhoods further from near-road exposure are less likely to be exposed to traffic-generated $PM_{2.5}$.[160] Other racial groups do not benefit from such a decrease in exposure overnight.[161] Of all the racial groups, Black individuals are the most exposed to higher $PM_{2.5}$ nighttime levels because they live near roadways and thus cannot escape $PM_{2.5}$ overnight.[162] In terms of average $PM_{2.5}$ exposures from traffic sources alone, white individuals are exposed to the lowest average $PM_{2.5}$ concentration (1.18 $\mu g/m^3$), followed by Latino individuals (1.24 $\mu g/m^3$) and then Black individuals (1.3 $\mu g/m^3$).[163]

The exposure differential is not simply the product of de facto segregation, but a direct consequence of urban planning decisions in the Atlanta area during the era of white flight. When white Atlantans fled to the suburbs at the end of the twentieth century, the Metropolitan Atlanta Rapid Transit Authority lines were designed to stop short of the suburbs,[164] as a result of a contentious 1971 referendum on the transit system's routes.[165] People of color are less likely than white people to own a personal vehicle and five times as likely to rely on the transit system, which narrows the radius for where they can comfortably live, thereby "entrap[ping] racial minorities in the inner cities or inner-ring suburbs with high-traffic volumes both during the day and at night."[166]

A cumulative impact analysis centered in Detroit, Michigan quantified the $PM_{2.5}$ exposure disparities within the city.[167] Detroit was selected because of the

157. Yoo Min Park & Mei-Po Kwan, *Understanding Racial Disparities in Exposure to Traffic-Related Air Pollution Considering the Spatiotemporal Dynamics of Population Distribution*, 17 INT'L J. ENV'T RSCH. & PUB. HEALTH 1, 1 (Feb. 2020).

158. *See id.* at 3 ("[T]he region is characterized by a large African-American population, suburbanization of jobs and of whites and the middle class, sprawl-related long commutes, a high level of automobile reliance, and serious traffic congestion that aggravates air pollution.").

159. *See id.* at 10.

160. *See id.*

161. *See id.*

162. *See id.*

163. *Id.* at 5.

164. *See id.* at 10–11.

165. *See* Doug Monroe, *Where It All Went Wrong If Only We Could Undo the MARTA Compromise of 1971*, ATLANTA (Aug. 1, 2012), https://www.atlantamagazine.com/great-reads/marta-tsplost-transportation/.

166. Park & Kwan, *supra* note 157, at 11.

167. Sheena E. Martenies et al., *Disease and Health Inequalities Attributable to Air Pollutant Exposure in Detroit, Michigan*, INT'L J. ENV'T RSCH. & PUB. HEALTH, Oct. 2017, at 1, 13.

high concentration of industry and the disproportionate number of residents with pre-existing conditions.[168] The study area, which is 66 percent Black, 7.3 percent Latino, and 37 percent below the poverty line, is highly industrialized and faces serious pollution burdens. In comparison, people of color make up 23.9 percent of Michigan's population as a whole with 23.7 percent of Michigan residents below the poverty line.[169] The study found that industrial and mobile sources are major contributors to the $PM_{2.5}$ exposure disparities among racial, ethnic, and income groups.[170] Latino residents tend to live near interstate highways and in industrialized areas that lead to pollution hot spots.[171] Relying on the concentration index, a metric that "evaluates how ambient concentrations and health burdens are distributed across units,"[172] it found that, for $PM_{2.5}$ and other pollutants, "[t]he most negative values, indicating the greatest inequality, occur for point source emissions when blocks are ranked by the percentage of residents who identify as Hispanic or Latino."[173]

A study focused on California found that, compared to white Californians, Black, Latino, and Asian Californians are exposed to $PM_{2.5}$ concentrations that are 43 percent, 39 percent, and 21 percent higher, respectively.[174] Compared to the average California resident, Latino and Black Californians face 15 percent and 18 percent higher $PM_{2.5}$ concentrations.[175] Like the study in Atlanta, this study found that Californians who lack personal vehicles tended to have higher $PM_{2.5}$ exposures since they tend to live in "urban areas surrounded by vehicle traffic."[176]

Another study focusing on California examined a racially and socioeconomically diverse thirty-five square mile area in Los Angeles next to ports and busy roadways.[177] These goods movement corridors have a high volume of heavy-duty diesel trucks, which are a common source of $PM_{2.5}$.[178] A greater percentage of Black, Asian, and Pacific Islander individuals live near

168. *See id.* at 3 (noting that asthma hospitalizations in Detroit are three times the average in Michigan).

169. *Id.*

170. *See id.* at 14.

171. *See id*.

172. *Id.* at 6.

173. *Id.* at 14.

174. UNION OF CONCERNED SCIENTISTS, INEQUITABLE EXPOSURE TO AIR POLLUTION FROM VEHICLES IN CALIFORNIA: FACT SHEET 1, 4 (2019), https://www.ucsusa.org/sites/default/files/attach/2019/02/cv-air-pollution-CA-web.pdf. White Californians experience 17 percent less exposure to $PM_{2.5}$ than do Californians on average. *See id.* at 4.

175. *Id.*

176. *Id.* at 2.

177. Douglas Houston et al., *Disparities in Exposure to Automobile and Truck Traffic and Vehicle Emissions near the Los Angeles–Long Beach Port Complex*, 104 AM. J. PUB. HEALTH 156, 156 (2014).

178. *See id.*

parcels with the most traffic-generated $PM_{2.5}$.[179] However, no correlation was found with Latino residents.[180]

Areas segregated from white neighborhoods also face greater $PM_{2.5}$ exposure than more racially integrated neighborhoods.[181] One study looked at $PM_{2.5}$ exposure in racially isolated neighborhoods composed mostly of one racial and ethnic group.[182] Researchers observed that, on the whole, racially isolated tracts have higher average $PM_{2.5}$ concentrations than more integrated areas.[183] In highly racially isolated tracts, Black residents experience the highest $PM_{2.5}$ concentrations. These patterns persist across urban, suburban, and rural areas, with tracts in the rural Midwest, Northeast, and urban South and West demonstrating the strongest positive correlation between increased racial isolation and high $PM_{2.5}$ levels.[184] In the most racially isolated areas in the Northeast, average $PM_{2.5}$ levels are highest for Black and Latino residents, followed by an "other" category, and then white residents at 14.0 $\mu g/m^3$, 14.0 $\mu g/m^3$, 13.8 $\mu g/m^3$, and 13.6 $\mu g/m^3$, respectively. In the least racially isolated areas, average $PM_{2.5}$ levels are highest for Black residents, then Latino residents, followed by "other," and then white residents at 13.7 $\mu g/m^3$, 13.6 $\mu g/m^3$, 13.3 $\mu g/m^3$, and 12.5 $\mu g/m^3$, respectively.[185] This was one of the few studies on racial segregation and air pollution that took non-urban areas into consideration.[186]

Relying on the Panel Study of Income Dynamics, a study confirmed these findings, demonstrating that higher $PM_{2.5}$ concentrations exist in areas that are both urban and intensely racially segregated.[187] White individuals live in neighborhoods with average $PM_{2.5}$ concentrations of 13.13 $\mu g/m^3$, whereas Black and Latino individuals live in neighborhoods with concentrations ranging 2–40 percent higher. This particular study found that Asian respondents experience no disparity as compared to white respondents.[188] The finding that spatial separation from white people contributes to higher exposures to $PM_{2.5}$ remains consistent throughout studies on geographic segregation.[189]

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179. *See id.* at 162.

180. *See id.*

181. *See generally* Mercedes A. Bravo et al., *Racial Isolation and Exposure to Airborne Particulate Matter and Ozone in Understudied US Populations Environmental Justice Applications of Downscaled Numerical Model Output*, 92–93 ENV'T INT'L 247, 247 (2016).

182. *Id.*

183. *See id.* at 252.

184. *See id.*

185. *Id.* at 251 tbl.1. Compare this to the annual $PM_{2.5}$ NAAQS of 12 $\mu g/m^3$. *See NAAQS Table*, *supra* note 153.

186. *See* Bravo et al., *supra* note 181, at 253. This study did investigate the connection between racial isolation and air pollution in rural communities and found that the documented urbanicity trends held fast in rural areas as well. *See id.*

187. *See* Bongki Woo et al., *Residential Segregation and Racial/Ethnic Disparities in Ambient Air Pollution*, 11 RACE & SOC. PROBS. 60 (2019).

188. *Id.* at 62.

189. *See id.* at 65.

Similarly, a multi-ethnic study of the impacts of segregation, using data between 2000 and 2002 from six urban communities in different states, found that individuals residing in neighborhoods where Latino residents constitute over 60 percent of the population, experience 3 percent more $PM_{2.5}$ exposure than those neighborhoods where Latino residents constitute less than 25 percent of the population.[190] Similarly, when census tracts are over 60 percent Asian, $PM_{2.5}$ exposure is also 3 percent higher than when census tracts are less than 25 percent Asian.[191] In contrast with the previous two studies discussed, this study observed no difference among tracts with a high percentage of Black residents, which may have resulted because Black participants in the study are of a higher income group and are potentially more integrated with white communities.[192] Moreover, Chinese individuals included in the study experienced the highest $PM_{2.5}$, followed by Latino, Black, and then white individuals at 19.2 $\mu g/m^3$, 16.9 $\mu g/m^3$, 16.5 $\mu g/m^3$, and 15.7 $\mu g/m^3$, respectively.[193]

Immigrant communities are also disproportionately affected by higher $PM_{2.5}$ concentrations.[194] Researchers observed that compared to American-born individuals, immigrants face 3.8 percent more $PM_{2.5}$ exposure on average, with more pronounced disparities for individuals from Asian, African, and Latin American countries.[195] One possible reason for this discrepancy is that immigrants often move to metropolitan locations where there are long-standing immigrant communities.[196] Furthermore, the variation between predominantly non-white immigrants from Asia, Africa, and Latin America and predominantly white immigrants from Europe, North America, and Oceania roughly mirror the exposure differentials observed between white individuals and racial and ethnic minorities in the United States.[197] Asian immigrants face the highest $PM_{2.5}$ concentrations at 10.02 $\mu g/m^3$, followed by immigrants from Africa and Latin America at 9.99 $\mu g/m^3$ and 9.95 $\mu g/m^3$ respectively.[198] American-born persons on the other hand face on average an annual exposure of 9.52 $\mu g/m^3$, while immigrants from Europe and North America face the lowest average concentrations at 9.49 $\mu g/m^3$ and 8.78 $\mu g/m^3$, respectively.

190. Miranda R. Jones et al., *Race/Ethnicity, Residential Segregation, and Exposure to Ambient Air Pollution The Multi-Ethnic Study of Atherosclerosis (MESA)*, 104 AM. J. PUB. HEALTH 2130, 2130 (2014).

191. *Id.* at 2133.

192. *Id.* at 2135. However, this finding is in contrast to studies where race operates at every income strata. *See* Tessum et al., *supra* note 2, at 1.

193. Jones et al., *supra* note 190, at 2132 tbl.1.

194. *See* Kelvin C. Fong & Michelle L. Bell, *Do Fine Particulate Air Pollution ($PM_{2.5}$) Exposure and Its Attributable Premature Mortality Differ for Immigrants Compared to Those Born in the United States?*, 196 ENV'T RSCH. 1, 1 (2021).

195. *Id.*

196. *See id.* at 5.

197. *See id.* at 9.

198. *Id.* at 3 tbl.1.

Like racial and ethnic minorities, lower-income groups are also disproportionately affected by $PM_{2.5}$ exposure, though the disparities are not as stark.[199] One study found that compared to the highest-income households (>$200,000 annually), the lowest-income households (<$10,000 annually) are exposed to 16 percent higher $PM_{2.5}$ concentrations,[200] and that for every $10,000 increase in annual income, $PM_{2.5}$ exposure decreases by 0.41 percent.[201] Another study found that spending more time in rental housing, a proxy for income, as opposed to owning property is associated with 0.047 higher $PM_{2.5}$ exposure for every 1 $\mu g/m^3$ of $PM_{2.5}$ to which individuals are exposed.[202] Researchers in one study categorized zip code tabulation areas as either high-income or low-income based on percentile ranks for median household income that are grouped into ten income categories.[203] The study found that low-income populations are exposed to 6.9 percent more $PM_{2.5}$ than high-income groups.[204]

A study of residents of California found that the lowest-income areas, defined as households making less than $20,000 per year, experience 10 percent more $PM_{2.5}$ exposure as compared to average income areas, while highest-income areas, defined as households making more than $200,000 per year, have 13 percent lower $PM_{2.5}$ concentrations than the state average.[205] Overall, the lowest-income households are exposed to 25 percent more $PM_{2.5}$ emissions than the highest-income households.[206] The study further disaggregated $PM_{2.5}$ exposure, finding that low-income households experience more exposure from on-road transportation.[207] Finally, relying on low-income qualified census tracts as designated by the U.S. Department of Housing and Urban Development, the study found $PM_{2.5}$ levels from on-road vehicles are 32 percent higher for designated low-income tracts.[208]

A California study, using a metric that combines income and race, calculated the degree to which certain emission sources contribute to the disparities in $PM_{2.5}$ exposure among racial and ethnic, and income groups.[209] The study identified more vulnerable and less vulnerable communities using a tool that quantifies key factors such as socioeconomic and environmental

199. *See* Tessum et al., *supra* note 2, at 3.

200. Jiawen Liu et al., *Disparities in Air Pollution Exposure in the United States by Race/Ethnicity and Income, 1990–2010*, 129 ENV'T HEALTH PERSPS. 127005-1, 127005-8 (2021).

201. *Id.*

202. Nicole Kravitz-Wirtz et al., *The Long-Term Dynamics of Racial/Ethnic Inequality in Neighborhood Air Pollution Exposure, 1990–2009*, 13 DU BOIS REV. 237, 247 tbl. 2 (2016).

203. Abdulrahman Jbaily et al., *Air pollution exposure disparities across US population and income groups*, 601 NATURE 228, 229–30 fig.2 (July 12, 2022), https://doi.org/10.1038/s41586-021-04190-y.

204. *Id.* at 6.

205. UNION OF CONCERNED SCIENTISTS, *supra* note 174, at 2.

206. *Id.* at 4.

207. *See id.*

208. *Id.* at 4–5.

209. Hyung Joo Lee & Hye-Youn Park, *Prioritizing the Control of Emission Sources to Mitigate $PM_{2.5}$ Disparity in California*, ATMOSPHERIC ENV'T, Jan. 2020, at 1, 1.

disadvantage as well as race to rank areas by degree of vulnerability.[210] On average, the most vulnerable communities are exposed to 2.54 μg/m^3 higher $PM_{2.5}$ concentrations daily than least vulnerable communities.[211] In 2014, for example, the average daily $PM_{2.5}$ concentration in the least vulnerable communities is 7.2 μg/m^3, whereas it is 10.6 μg/m^3 in most vulnerable communities. Importantly, in the winter, $PM_{2.5}$ concentrations are 6.0 μg/m^3 for the least vulnerable communities but 13.6 μg/m^3 for the most vulnerable communities.[212]

Similarly, a study that focused on Detroit, Michigan evaluated the percentage of households with income below the federal poverty level and that experienced disproportionately high $PM_{2.5}$ exposure.[213] It examined whether $PM_{2.5}$ exposure was correlated with the median income.[214] The study found that low-income communities experience disproportionately high $PM_{2.5}$ exposures from both point and mobile sources.[215] Using a metric called the concentration index, which measures how $PM_{2.5}$ exposures are distributed among a given geographical unit—here census blocks—it found that the concentration index for the percent of households in poverty is -4.0 for mobile sources and -0.2 for all sources combined.[216] Negative values for concentration indices indicate that the census blocks with the poorest households experience more $PM_{2.5}$ exposure than neighboring areas.

Although $PM_{2.5}$ disproportionately affects low-income communities, it is critical to note that income does not serve as a proxy for race. In other words, at every level of income stratification, race remains an independent, statistically significant variable predicting disproportionate exposure to $PM_{2.5}$.[217] Several studies have attempted to tease apart race and income to evaluate the independent contribution of each. One study found that the percentage of Latino, Black, and Asian/Pacific Islander residents were still statistically significant "predictors of the facility locations" even when controlling for socioeconomic status.[218] Another study that treated Medicaid eligibility as a proxy for income found that Medicaid-ineligible Black people still had a higher risk of death as a result of $PM_{2.5}$ exposure.[219] One theory put forward for this disparity is the convergence of higher $PM_{2.5}$ exposure among Black communities with higher rates of pre-existing conditions like cardiovascular disease and asthma.[220]

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210. *See id.* at 2.
211. *Id.* at 1.
212. *Id.* at 4 tbl.1.
213. Martenies, *supra* note 167, at 1248.
214. *Id.*
215. *See id.* at 1256.
216. *Id.* at 1254.
217. *See* Tessum et al., *supra* note 2, at 2.
218. Bullard et al., *supra* note 21, at 405.
219. Di et al., *supra* note 143, at 2521.
220. *See* Mikati et al., *supra* note 146, at 484.

To further understand the relationship between race and socioeconomic status, subsequent studies have focused on the relationship between race, socioeconomic status, and $PM_{2.5}$ concentrations for individuals or households rather than within a defined geographical boundary like a census tract or ZIP code.[221] In looking at individual exposure between 1990–2009 across 733 metropolitan and micropolitan areas, researchers found that regardless of socioeconomic status, Black individuals experience 14.64 percent more $PM_{2.5}$ than white individuals and Latino individuals experience 15.63 percent more $PM_{2.5}$ than white individuals.[222] Latino individuals are exposed to the highest $PM_{2.5}$ annual averages, followed by Black and then white individuals at 15.27 $\mu g/m^3$, 14.92 $\mu g/m^3$, and 13.00 $\mu g/m^3$, respectively.[223]

In sum, the empirical literature consistently shows that communities of color, immigrant communities, and low-income communities are exposed to disproportionately high $PM_{2.5}$ concentrations. Moreover, the disparities involving people of color persist even controlling for income.

2. Disparities in Nonattainment and Misclassified Areas

The studies discussed in the previous Subpart did not distinguish between attainment and nonattainment areas, which are areas with $PM_{2.5}$ concentrations that exceed the NAAQS. This Subpart evaluates the demographic patterns of $PM_{2.5}$ exposure in studies that examine EPA-designated nonattainment areas as well as areas that, while not technically labeled "nonattainment areas," nevertheless experience $PM_{2.5}$ concentrations that exceed the NAAQS. The racial and socioeconomic disparities that were discussed in Subpart A.1 also appear in nonattainment areas.

A 2011 study found that Black and Latino individuals are disproportionately represented in areas with the worst air quality.[224] Looking at $PM_{2.5}$ monitors in areas with the 20 percent highest and 20 percent lowest $PM_{2.5}$ concentrations, the study found that Latino and Black individuals are overrepresented in areas with the highest $PM_{2.5}$ concentrations.[225] Although the study did not explicitly state that these areas are in nonattainment, it is likely that areas containing monitors with the top 20 percent worst $PM_{2.5}$ concentrations overlap in part with areas of nonattainment. This assumption is further supported by the alignment between

221. *See* Kravitz-Wirtz et al., *supra* note 202, at 246.
222. *Id.*
223. *Id.* at 245 tbl.1.
224. Marie Lynn Miranda et al., *Making the Environmental Justice Grade The Relative Burden of Air Pollution Exposure in the United States*, 8 INT'L J. ENV'T RSCH. & PUB. HEALTH 1755, 1767–69 (2011).
225. *Id.* at 1759, 1764–65.

the most polluted areas in the United States and EPA's list of nonattainment areas.[226]

Area-specific studies also demonstrate the racial and ethnic disparities in $PM_{2.5}$ exposure. A multitude of studies focus on California and in particular, counties in Southern California, many of which are designated as nonattainment areas.[227] These areas are plagued by severe air pollution largely as a result of vehicular emissions. Communities of color bear the brunt of pollution as they live and attend schools near sources of air pollution or in proximity to highways.[228] One study analyzed the exposure 150,323 students, finding that 78 percent of students who attend schools within 150-meter radiuses of high traffic roads are nonwhite.[229] That number decreases to 60 percent once the schools are no longer within that radius.[230] Thus, considering that about 25–30 percent of $PM_{2.5}$ originates from vehicles,[231] the disproportionate exposure of racial and ethnic groups to traffic-generated $PM_{2.5}$ is a serious environmental justice concern. Furthermore, the study found that English language competency was significantly correlated with $PM_{2.5}$ exposure from heavily trafficked roads, thus suggesting that immigrants are more likely to attend schools adjacent to pollution sources.[232]

In another California-centered study, there was an overlap between the communities the study classified as most vulnerable and nonattainment areas designated by EPA.[233] For example, San Joaquin Valley, listed by EPA as a nonattainment area, also contains the most disadvantaged communities.[234]

The Centers for Disease Control and Prevention also conducted a study of the demographic patterns of areas exceeding the NAAQS for the 2006 24-hour $PM_{2.5}$ standard.[235] The study categorized communities in 24-hour $PM_{2.5}$ nonattainment areas by race and ethnicity.[236] It found that 26.6 percent of Latino, 26.2 percent of Asian, 22 percent of Native Hawaiian and other Pacific Islander,

226. *Compare id.* at 1767 fig.4, *with PM-2.5 (2012) Nonattainment Area State/Area/County Report*, EPA, https://www3.epa.gov/airquality/greenbook/kncs.html#CA (last updated Mar. 31, 2022).

227. *See PM-2.5 (2012) Nonattainment Area State/Area/County Report*, *supra* note 226.

228. *See* Jill E. Johnston, *Youth Engaged Participatory Air Monitoring A Day in the Life' in Urban Environmental Justice Communities*, INT'L J. ENV'T RSCH. & PUB. HEALTH, Dec. 2019, at 1, 1.

229. Rochelle S. Green et al., *Proximity of California Public Schools to Busy Roads*, 112 ENV'T HEALTH PERSPS. 61, 61 (2004).

230. *Id.*

231. *See* Johnston, *supra* note 228, at 2.

232. *See* Green, *supra* note 229, at 64.

233. *Compare PM-2.5 (2012) Nonattainment Area State/Area/Count Report*, *supra* note 226 (listing the counties in CA that are in nonattainment), *with* Lee & Park, *supra* note 209, at 3 fig.1 (displaying the California counties that are the more vulnerable (MV) and less vulnerable (LV) communities).

234. *See* Lee & Park, *supra* note 209, at 3.

235. Fuyuen Y. Yip et al., *Unhealthy Air Quality – United States, 2006–2009*, CTRS. FOR DISEASE CONTROL & PREVENTION (Jan. 14, 2011), https://www.cdc.gov/mmwr/preview/mmwrhtml/su6001a5.htm. The 2006 standard was used for 24-hour $PM_{2.5}$ at 35 $\mu g/m^3$. *See NAAQS Table*, *supra* note 153.

236. *Id.*

and 15.2 percent of Black individuals live in nonattainment areas.[237] White individuals experience the lowest levels of exposure, with only 9.7 percent of the population residing in nonattainment areas.[238] The researchers attributed the results to the fact that communities of color live more frequently in urban settings, with 55 percent of Asian individuals living in ten cities with large Asian communities like Los Angeles and New York City that tend to be nonattainment areas.[239]

While most studies demonstrate that communities of color are on the whole disproportionately represented in nonattainment areas, some studies have varied slightly. One study, which found that 39 percent of those living in nonattainment areas are white compared with 67 percent of people living in attainment areas,[240] also found that residents in nonattainment areas are less likely to be Black at 9 percent versus 13 percent for attainment areas, but far more likely to be Latino at 40 percent versus 14 percent.[241]

In addition to racial and ethnic disparities, low-income communities are also disproportionately represented in the most polluted areas.[242] One study found that in the 20 percent of counties with highest $PM_{2\,5}$ annual concentrations, the percentage of people living in poverty is almost four times the percentage for the 20 percent of counties with the lowest $PM_{2\,5}$ levels.[243] Another study found that in nonattainment areas, higher concentrations of $PM_{2\,5}$ are correlated with low levels of education, low rates of home ownership, linguistic isolation, poverty, and unemployment.[244]

Other studies, however, found that household incomes in nonattainment areas are slightly higher than in attainment areas.[245] Relying on satellite data rather than stationary monitors to classify nonattainment areas, one study established that in nonattainment areas, the portion of households earning over $75,000 is 37 percent but that it is only 33 percent in attainment areas, and that the portion of households earning under $35,000 is 32 percent in nonattainment areas but 34 percent in attainment areas.[246]

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237. *Id.*

238. *Id.*

239. *Id.*

240. Daniel M. Sullivan & Alan Krupnick, *Using Satellite Data to Fill the Gaps in the US Air Pollution Monitoring Network* 13–14 (Res. for the Future, Working Paper No. 18-21, 2018), https://media.rff.org/documents/RFF20WP-18-21_0.pdf.

241. *Id.* at 14.

242. *See* Miranda et al., *supra* note 224, at 1765.

243. *Id.* at 1765 tbl.2.

244. JOHN FAUST ET AL., OFF. OF ENV'T HEALTH HAZARD ASSESSMENT, CAL. ENV'T PROT. AGENCY, UPDATE TO THE CALIFORNIA COMMUNITIES ENVIRONMENTAL HEALTH SCREENING TOOL: CALENVIROSCREEN 3.0, at 121–43 (2017), https://oehha.ca.gov/media/downloads/calenviroscreen/report/ces3report.pdf.

245. *See* Sullivan & Krupnick, *supra* note 240, at 14.

246. *Id.* at 30 tbl.3.

Similarly, in another study, the highest-income group was 2 percent more likely than the lowest-income groups to live in $PM_{2.5}$ nonattainment areas, a finding attributed to the higher proportion of high-income households living in urban areas.[247] This study, however, did not use localized $PM_{2.5}$ monitors that can measure concentrations on a granular scale. A localized approach would likely reveal that within an urban nonattainment area, wealthier individuals reside in relatively cleaner areas.[248]

Turning to education, one study found that 21 percent of residents in nonattainment areas did not graduate from high school as opposed to 14 percent in attainment areas, though people had completed college at the same rate in both types of designated areas.[249] Those findings are consistent with a second study, which found that communities with lower educational attainment and lower income were more frequently represented in nonattainment areas.[250] Additionally, as was observed with income levels, households with the lowest and highest educational attainment levels were also more frequently represented in nonattainment areas, at 16.4 percent and 13.2 percent, respectively, whereas people with high school diplomas were 28 percent less likely to live in nonattainment areas.[251] It found that these results that grouped both high and low income as well and high and low educational attainment groups were consistent with the demographic profile observed in many urban areas, which are often designated as nonattainment.[252]

Similar patterns with respect to the overrepresentation of disadvantaged communities are observed in misclassified areas—that is, areas designated as attainment areas when they are likely in fact to be nonattainment areas. Currently, 23.2 million people live in areas officially classified by EPA as nonattainment areas.[253] However, one study found that another 24.4 million people reside in areas that exceed the $PM_{2.5}$ NAAQS but are not formally classified as being in nonattainment.[254] Using high-resolution satellite data, the study identified counties that EPA labeled as attainment areas but that, in fact, violate the NAAQS. Fifty-four counties in eleven different states were found to be misclassified—designated as attainment areas but containing $PM_{2.5}$ concentrations that exceed the NAAQS.[255] Misclassified hotspots include cities such as Chicago, Illinois; Louisville, Kentucky; and Logansport, Indiana.[256] In comparing the demographic makeup of those living in misclassified areas and

247. Yip et al., *supra* note 235.
248. *See id.*
249. Park & Kwan, *supra* note 157, at 14.
250. *See* Yip et al., *supra* note 235.
251. *See id*.
252. *See id.*
253. *See* Sullivan & Krupnick, *supra* note 240, at 2–3.
254. *See id.* at 1.
255. *Id.* at 12–13.
256. *Id.* at 13.

those in accurately designated attainment areas, the study found that 67 percent of non-white residents live in misclassified areas, compared to 39 percent in attainment areas.[257] Broken down by racial group, 40 percent of Latino residents reside in misclassified areas, compared to 14 percent in attainment areas. Also, 9 percent of residents in misclassified areas are non-Black, compared to 13 percent in attainment areas, which indicated that misclassified areas have higher proportions of Black residents than attainment areas.[258]

A different study, which examined the $PM_{2.5}$ concentration in low-income communities of color in New York City, using portable air quality monitors, revealed that regions designated as attainment areas can far exceed the NAAQS.[259] The study focused on $PM_{2.5}$ levels in the South Bronx and in South Williamsburg, both heavily trafficked areas with high pollution and disproportionate numbers of low-income minority residents.[260] In the South Bronx, $PM_{2.5}$ concentrations ranged from 13–50 $\mu g/m^3$ in areas proximate to $PM_{2.5}$ emission sources, compared to the NAAQS of 12 $\mu g/m^3$.[261] In one particular South Bronx hotspot, the average $PM_{2.5}$ concentration over a two-year period was 69 percent more than the neighborhood average.[262]

In sum, both nonattainment areas and misclassified areas contain a disproportionate number of people of color. Some studies also show that they contain a higher proportion of lower-income individuals, but the results of others are less clear because a significant proportion of wealthy individuals live in urban areas with poor air quality.

B. Disproportionate Impacts

This Subpart shows, first, that disadvantaged communities are more susceptible to harm from exposure to $PM_{2.5}$. Second, it shows that these communities have worse health outcomes as a result of exposure to $PM_{2.5}$, which is not surprising given the combination of the greater exposure to $PM_{2.5}$ of disadvantaged communities discussed in Subpart A and their greater susceptibility to harm.

257. *Id.* at 14.
258. *Id.*
259. JALISA GILMORE ET AL., N.Y.C. ENV'T JUSTICE ALL., CAMP-EJ: COMMUNITY AIR MAPPING PROJECT FOR ENVIRONMENTAL JUSTICE 5 (2021), https://nyc-eja.org/wp-content/uploads/2021/02/CAMP-EJ-2020-Report-Final-021821-Reduced.pdf.
260. *Id.* at 8, 15.
261. *Id.* at 16 fig.3.
262. *Id.* at 16 fig.3.

1. Greater Susceptibility Disparities in Health Outcomes at the Same Exposure Levels

While $PM_{2.5}$ exposure remains a health burden to all Americans, the health impacts at the same concentrations are not felt equally among all sub-groups. One study examined a cohort of all U.S. Medicare beneficiaries between 2000 and 2012—about 61 million participants.[263] It found each 10 $\mu g/m^3$ increase in $PM_{2.5}$ increased all-cause mortality for Black, Latino, and Asian beneficiaries by 20.8 percent, 11.6 percent, and 9.7 percent respectively, compared to a 7.3 percent increase for the population as a whole.[264] For Black beneficiaries, who were most acutely affected, the finding persisted even for participants who were ineligible for Medicaid, indicating that race itself and not income alone was affecting the relationship between $PM_{2.5}$ exposure and health impacts.[265]

A Massachusetts study, based on a sample of 130,863 participants,[266] found that individuals in predominantly Black neighborhoods are 1.84 percent more likely to die from $PM_{2.5}$-related cardiovascular disease than individuals in predominantly white areas.[267] Another study found that Black participants experienced cardiovascular events 1.34 times as frequently as white participants.[268]

2. Disparities in Health Outcomes

Given that disadvantaged communities are exposed to higher concentrations of $PM_{2.5}$ and are more susceptible to its harms, it is not surprising that they experience worse health outcomes as a result of $PM_{2.5}$ pollution. A study focused on the consequences of $PM_{2.5}$ exposure for women who had participated in the Central Hillsborough Federal Healthy Start Project in Tampa, Florida.[269] Exposure to $PM_{2.5}$ did not affect all sub-groups equally. Black women were found to be at higher risk for most of the health outcomes the study evaluated, including having low birth weight infants and premature delivery. Black women are three times as likely to have a very-low-birth-weight infant, twice as likely to have a low-birth-weight infant, experience a 31 percent increased risk in delivering preterm, and had an overall 66 percent increased risk of their infant

263. Di et al., *supra* note 143, at 2513.

264. *Id.* at 2519 fig. 2(A).

265. *Id.* at 2521.

266. Maayan Yitshak-Sade et al , *Race or Racial Segregation? Modification of the $PM_{2.5}$ and Cardiovascular Mortality Association*, PLOS ONE, July 27, 2020, at 1.

267. *Id.* at 6.

268. Sebhat Erqou et al., *Particulate Matter Air Pollution and Racial Differences in Cardiovascular Disease Risk*, 38 ARTERIOSCLEROSIS THROMBOSIS & VASCULAR BIOLOGY 935, 938 (2018).

269. Hamisu M. Sailhu et al., *Effectiveness of a Federal Healthy Start Program in Reducing the Impact of Particulate Air Pollutants on Feto-Infant Morbidity Outcomes*, 16 MATERNAL CHILD HEALTH J. 1602, 1602 (2012).

suffering from any morbidity.[270] Hypotheses for why Black women experienced more frequent adverse outcomes centered on the negative consequences of chronic particulate matter exposure.[271] Furthermore, since it was not clear that the study controlled for the same level of $PM_{2.5}$ across all racial sub-groups, it is possible that Black women in the cohort were also disproportionately exposed to ambient air pollution.

Another study examined the demographic pattern of exposure to $PM_{2.5}$ released from fossil-fuel-fired electricity generating units using 2014 mortality rate data.[272] Electricity generating units are a major source of pollution in the United States, causing an estimated 17,000 deaths in 2016.[273] The study found that mortality rates are highest for Black individuals, followed by white individuals at 6.6 and 5.9 deaths per 100,000 people respectively. Mortality rates are lowest for Asian, Native American, and Latino individuals.[274] Mortality rates are highest for Black individuals across all three fuel types: coal-fired electricity generating units, natural gas-fired electricity generating units, and other-fuel type electricity generating units.[275] Latino and Asian individuals experience higher-than-average mortality rates from natural gas electricity generating units but not from coal-fired or other fuel-type electricity generating units.[276] Electricity production is of course just one source of $PM_{2.5}$ emissions. Several sectors contribute to the number of $PM_{2.5}$ deaths and economic impacts annually, with a small number having an outsized impact.[277] Overall, the impacts of $PM_{2.5}$

270. *Id.* at 1606.

271. *See id.* at 1608.

272. Maninder P. S. Thind et al., *Fine Particulate Air Pollution from Electricity Generation in the US Health Impacts by Race, Income, and Geography*, 53 ENV'T SCI. & TECH. 14,010, 14,010 (2019).

273. *Id.* at 14,015.

274. *Id.*

275. *Id.* at 14,012–13.

276. *Id.* at S11 fig.S6(C).

277. *See* Andrew L. Goodkind et al., *Fine-Scale Damage Estimates of Particulate Matter Air Pollution Reveal Opportunities for Location-Specific Mitigation of Emissions*, 116 PROC. NAT'L ACAD. SCIS. 8775, 8775 (2019). Energy consumption, including transportation and electricity generation, results in 57 percent of the $PM_{2.5}$ associated deaths, followed by agriculture, which accounts for 15 percent of premature deaths. *Id.* at 8775. Furthermore, approximately 25 percent of the damages, both to health and the economy, are caused by emissions sources more than 256 kilometers away. *Id.* The bulk of damages from primary $PM_{2.5}$ according to this study occur close to the source, indicating that communities could focus their efforts on local actions to address primary $PM_{2.5}$, see *id.* at 8778, though not secondary $PM_{2.5}$ emissions, which occur when $PM_{2.5}$ reacts with NH_3, NO_x, volatile organic compounds, and SO_2. *See id.* at 8775, 8776 fig.1 (depicting marginal damage estimates at the emission location for each primary and secondary source of $PM_{2.5}$, which tend to be smaller for secondary sources because their damage is incurred downwind of the source). Ground level emissions constitute the majority of adverse health effects and economic losses from a combination of sources, including fuel combustion, road dust, agriculture, non-road mobile sources, and diesel vehicles. *See id.* at 8777 fig.3. With recent declines in $PM_{2.5}$ concentrations, there has been an associated 22 percent decline in economic damage throughout the United States, decreasing from $1010 billion in 2008 to $790 billion in 2014. *See* Peter Tschofen et al., *Fine Particulate Matter Damages and Value Added in the US Economy*, 116 PROC. NAT'L ACAD. SCIS. 19,857, 19,857–58 (2019). In addition to electricity generation and agriculture, transportation and manufacturing form the top four sectors causing the bulk of the economic impacts. *See id.* at 19,858. While it is difficult

exposure, resulting from emissions near and far from at-risk communities, disproportionately affect minority and low-income groups in the United States.

In summary, $PM_{2.5}$ exposure poses a grave health risk. Exposure to $PM_{2.5}$ has been causally associated with countless morbidities as well as the premature death of well over 100,000 Americans each year. Since $PM_{2.5}$ is a non-threshold pollutant, the health and mortality risks it poses do not disappear at concentrations below EPA's NAAQS. Moreover, the harms that $PM_{2.5}$ poses are not evenly felt. They disproportionately affect communities of color and lower income groups both because they are subject to higher concentrations of $PM_{2.5}$ pollution and because they are more susceptible to its harms.

III. STRINGENCY OF THE PARTICULATE MATTER STANDARDS

The Clean Air Act prescribes multiple standards to regulate particulate matter. Primary standards are required to protect public health with an "adequate margin of safety,"[278] while secondary standards protect public welfare.[279] Each of these standards includes both $PM_{2.5}$ standards for fine particles measuring 2.5 micrometers or smaller, and PM_{10} standards for coarse particles measuring 10 micrometers or smaller.[280] Annual standards set the maximum average annual concentration,[281] while 24-hour standards set the maximum average daily concentration.[282]

Under the Clean Air Act, EPA is required to review the NAAQS every five years and update them in light of new scientific evidence about the harms of regulated pollutants. [283] The agency has not always complied with this mandate, and the reviews have generally been less frequent. This Part analyzes the three most recent reviews of the particulate matter standards, which took place in 2006, 2012, and 2020, respectively, to determine how EPA has dealt with environmental justice concerns surrounding the standards. The discussion focuses on the primary standards because environmental justice concerns raised in the particulate matter NAAQS review tend to address public health, rather than welfare. It also focuses on the setting of standards for $PM_{2.5}$ particles, given that exposure to fine particles has far more serious negative health impacts than exposure to PM_{10} particles.[284]

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to disaggregate the industrial sources that contribute the most harm due to ambient $PM_{2.5}$, studies like this demonstrate that it is possible and necessary to mitigate the health and economic impacts.

278. 42 U.S.C. § 7409(b)(1).

279. *See id.* § 7409(b).

280. *See* 40 C.F.R. § 50.13 (2016); *id.* § 50.6 (2006).

281. *See id.* § 50.13.

282. *See id.* § 50 app. N. Compliance with the NAAQS is determined by the 98th percentile of daily particulate matter measurements. *See id.*

283. *See* 42 U.S.C. § 7409(d)(1).

284. *See* EPA, *Particulate Matter (PM) Basics*, https://www.epa.gov/pm-pollution/particulate-matter-pm-basics (last visited Aug. 9, 2021) ("[P]articles less than 2.5 micrometers in diameter, also known as fine particles or $PM_{2.5}$, pose the greatest risk to health.").

Executive Order 12898, which was promulgated in 1994, requires agencies to address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."[285] Yet although EPA acknowledges higher exposure rates in communities of color and low-income populations, it has overlooked these facts when selecting particulate matter NAAQS levels. Across three administrations, both Democratic and Republican—George W. Bush, Barack Obama, and Donald Trump—the agency has consistently declined to analyze whether retaining existing standards disproportionately harms disadvantaged communities, and whether strengthening the standards would better protect these communities. Instead, EPA has relied on the illogical assertion that because the NAAQS is a uniform standard, it cannot have disproportionate effects on particular subpopulations. The agency has further suggested that any standard that constrains particulate matter adequately addresses environmental justice concerns by lowering particulate matter levels in communities facing the highest concentrations. EPA has not analyzed whether more stringent alternatives would better mitigate distributional inequities in particulate matter-related health effects, despite numerous comments urging it to do so.[286]

285. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Exec. Order. No. 12898, § 1-101, 59 Fed. Reg. 7629, 7629 (Feb. 11, 1994); *see also* National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. 2620, 2694 (proposed Jan. 17, 2006) (to be codified at 40 C.F.R. pt. 50) [hereinafter Particulate Matter 2006 Proposed Rule]. Under EPA guidance concerning this order, EPA is required to consider whether these populations "face risks or a rate of exposure to hazards that are significant and that 'appreciably exceed or is [*sic*] likely to appreciably exceed the risk or rate to the general population or to the appropriate comparison group.'" Particulate Matter 2006 Proposed Rule, *supra*, at 2694. EPA has also interpreted the Clean Air Act's legislative history to include protection of at-risk populations. *See, e.g.*, EPA, RESPONSES TO SIGNIFICANT COMMENTS ON THE 2006 PROPOSED RULE ON THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER 171 (2006) [hereinafter 2006 RESPONSES TO SIGNIFICANT COMMENTS], https://www.regulations.gov/document/EPA-HQ-OAR-2001-0017-3203 ("The NAAQS must afford requisite protection with an adequate margin of safety to vulnerable subpopulations, as well as to the general populace." (citing S. REP. NO. 91-1196, at 10 (1970))); National Ambient Air Quality Standards for Particulate Matter, 72 Fed. Reg. 3086, 3090 n.1 (Jan. 15, 2013) (to be codified at 40 C.F.R. pt. 50) [hereinafter Particulate Matter 2013 Final Rule]; Review of the National Ambient Air Quality Standards for Particulate Matter, 85 Fed. Reg. 82,684, 82,686 n.2 (Dec. 18, 2020) [hereinafter Particulate Matter 2020 Final Action].

286. *See, e.g.*, 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171; EPA, RESPONSES TO SIGNIFICANT COMMENTS ON THE 2012 PROPOSED RULE ON THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER, at II-81 (2012) [hereinafter 2012 RESPONSES TO SIGNIFICANT COMMENTS], https://www.regulations.gov/document/EPA-HQ-OAR-2007-0492-10095; EPA, RESPONSES TO SIGNIFICANT COMMENTS ON THE 2020 PROPOSED RULE ON THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER 41 (2020) [hereinafter 2020 RESPONSES TO SIGNIFICANT COMMENTS], https://www.epa.gov/sites/production/files/2020-12/documents/pm_naaqs_response_to_comments_final.pdf.

A. 2006 Review

In its 2006 review conducted during the George W. Bush administration, EPA strengthened the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$, citing uncertainties in health effects below this level as its justification for not adopting an even more stringent standard.[287] The agency relied on similar reasoning in proposing to retain the existing 15 $\mu g/m^3$ annual standard.[288]

EPA dedicated fewer than three pages of its ninety-page proposed rule to environmental justice-related issues. The agency's limited discussion of vulnerable subpopulations focused on the potentially serious public health impacts that $PM_{2.5}$ exposure could have on children, older adults, and those with preexisting conditions, rather than assessing effects on communities of color and low-income populations as required by Executive Order 12898.[289] In its discussion of spatial averaging,[290] EPA cited findings that peak particulate matter levels tend to occur in areas with higher percentages of residents of color and residents with lower education and income.[291] Separately, the agency noted "emerging evidence" that low-income populations may also be vulnerable to particulate matter, without mentioning racial disparities.[292] However, EPA did not refer to either of these findings when justifying its proposals for the 24-hour and annual $PM_{2.5}$ levels.[293]

As part of a section discussing compliance with various executive orders, EPA briefly asserted that its proposed rule complied with Executive Order 12898.[294] Rather than providing a full explanation, EPA simply stated: "[T]he Agency has considered whether these proposals, if promulgated, may have disproportionate negative impacts on minority or low-income populations. The agency expects these proposals would lead to the establishment of uniform NAAQS for PM."[295] EPA implied that because the particulate matter NAAQS

287. *See* Particulate Matter 2006 Proposed Rule, *supra* note 285, at 2649.

288. *See id.* at 2651. EPA also proposed revising the indicator for PM_{10} to limit the types of PM_{10} mixtures subject to monitoring, while lowering the PM_{10} level to provide equivalent health protection as that afforded by the existing indicator and level combination. *See id.* at 2620. The agency proposed revoking the annual PM_{10} standard entirely. *See id.*

289. *See id.* at 2636–37 ("While individual epidemiologic effect estimates may be small in size, the public health impact of the mortality and morbidity associations can be quite large."); Exec. Order No. 12898, 59 Fed. Reg. at 7630.

290. Spatial averaging is a practice where recordings from multiple monitoring sites in an area are averaged, providing they meet certain constraints. *See* National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. 61,144, 61,145, 61,166 (Oct. 17, 2006) (to be codified at 40 C.F.R. pt. 50) [hereinafter Particulate Matter 2006 Final Rule]. This practice allows for an area to be designated as "in attainment" even though one or more monitors record particulate matter levels that exceed the NAAQS. *See id.*

291. *See id.* at 61,166; 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 31.

292. Particulate Matter 2006 Proposed Rule, *supra* note 285, at 2367.

293. *See id.* at 2648–53.

294. *See id.* at 2694; Exec. Order No. 12898, § 1-101.

295. Particulate Matter 2006 Proposed Rule, *supra* note 285, at 2694.

provide a single standard for the entire country, the standard cannot have disproportionately negative impacts on particular subcommunities. This reasoning ignores the fact that disadvantaged communities are subject to both higher concentrations, which EPA has acknowledged,[296] and face more serious negative health effects from particulate matter than the general population.[297] Given these inequities, less stringent particulate matter standards do have disproportionate negative impacts on disadvantaged communities. Yet EPA declined to acknowledge these facts, or to consider whether more stringent standards would have mitigated the disparities.

EPA received numerous comments advocating for additional health protections in light of the disproportionate impacts of $PM_{2.5}$ exposure on disadvantaged communities. Some commenters asserted that a failure to "evaluate and discuss the implications of its proposal on low income and minority communities" and "establish standards that specifically address the impacts that these communities face" would violate both the Clean Air Act and Executive Order 12898.[298] Others stated that the rule itself violated Executive Order 12898 by "caus[ing] disproportionate and adverse health effects on minority and low-income populations" due to heightened exposure levels and inequitable health care access.[299]

In response, EPA claimed to have taken into account relevant information relating to at-risk populations in revising the $PM_{2.5}$ standards.[300] The agency acknowledged its obligation to set a NAAQS that protects "vulnerable subpopulations" with an adequate margin of safety, and that "minority and low-income populations" are often especially susceptible to adverse health effects from $PM_{2.5}$ exposures.[301] Yet EPA repeated its assertion that because the particulate matter NAAQS is a uniform, national standard, it would not disproportionately harm minority or low-income communities.[302]

EPA dismissed comments contending that the rule would "permit the continuation of disproportionate adverse health effects on minority and low-income populations."[303] The agency insisted that revising the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ would address environmental justice concerns by reducing adverse health risks in areas currently facing the highest

296. *See supra* text accompanying note 290.

297. *See supra* Part II.

298. 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171. Commenters also criticized EPA's lack of outreach to affected communities. *See id.*

299. *Id.* at 175.

300. *See id.* at 171–72; Particulate Matter 2006 Final Rule, *supra* note 290, at 61,219.

301. 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171–72.

302. *See id.*; Particulate Matter 2006 Final Rule, *supra* note 290, at 61,219.

303. 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171–72; Particulate Matter 2006 Final Rule, *supra* note 290, at 61,219.

levels of fine particle concentration.[304] Thus, EPA suggested that any rule that increases constraints on pollution will adequately mitigate disparate impacts on disadvantaged communities. Under this flawed reasoning, no environmental justice inquiry would be necessary for any regulation reducing pollution. In particular, the agency did not address whether more stringent standards would provide additional protections for these at-risk communities.[305] EPA spent less than half a page out of its ninety-page final rule and fewer than two pages of its two-hundred-page Responses to Significant Comments addressing these environmental justice concerns.[306]

B. 2012 Review

In 2012, during the Obama administration, EPA proposed to lower the annual $PM_{2.5}$ standard from 15 μg/m^3 to between 12 and 13 μg/m^3.[307] The agency proposed to retain the existing 35 μg/m^3 24-hour $PM_{2.5}$ standard, stating that the reduced annual standards combined with the existing 24-hour standard would be sufficiently controlling to protect against both long- and short-term exposures.[308]

EPA spent just six pages of its 167-page proposed rule discussing environmental justice-related issues. The agency stated that the revised annual standard would help protect "children, older adults, persons with pre-existing heart and lung disease, and other at-risk populations."[309] Although it did not discuss racial disparities, the agency suggested that low-income populations may face higher $PM_{2.5}$-related risk due to the "higher prevalence of pre-existing diseases; limited access to medical treatment; and increased nutritional deficiencies."[310] The agency recognized that given the large size of the at-risk

304. *See* 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171–72; Particulate Matter 2006 Final Rule, *supra* note 290, at 61,219.

305. *See* 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171–72; Particulate Matter 2006 Final Rule, *supra* note 290, at 61,219. Despite refusing to strengthen the 24-hour PM_{10} standard and fully revoking the annual PM_{10} standard, EPA suggested that the PM_{10} standard would do the same. *See* 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171–72.

306. *See* 2006 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 285, at 171–72; Particulate Matter 2006 Final Rule, *supra* note 290, at 61,219.

307. *See* National Ambient Air Quality Standards for Particulate Matter, 77 Fed. Reg. 38,890, 38,893 (proposed June 29, 2012) (to be codified at 40 C.F.R. pts. 50, 51, 52, 53, 58) [hereinafter Particulate Matter 2012 Proposed Rule].

308. *See id.* Citing scientific uncertainties, EPA proposed retaining the 24-hour PM_{10} standard at 150 μg/m^3 and declined to reconsider its 2006 decision to revoke the annual PM_{10} standard. *Id.* at 38,893, 38,962–63.

309. *Id.* at 38,893. The agency clarified that the term "at-risk" is used to "broadly define the populations with characteristics that increase the risk of pollutant-related health effects," including subpopulations that are "affected by lower concentrations of PM" or "exposed to higher PM concentrations than the general population." *Id.* at 38,910.

310. *Id.* at 38,910–11. In its discussion of spatial averaging, EPA recognized that "the highest concentrations in an area tend to be measured at monitors located in areas where the surrounding populations are more likely to live below the poverty line and to have higher percentage of minorities," but did not discuss this further in its explanation of the proposed $PM_{2.5}$ level. *Id.* at 38,924.

population, the ubiquitous nature of $PM_{2.5}$, and the association of $PM_{2.5}$ with mortality and morbidity, exposures will have a significant public health impact "virtually regardless of the relative risk" and even where the predicted impact on an individual is minor.[311] In a shift from its 2006 review, EPA also recognized that no effects threshold existed below which short- and long-term $PM_{2.5}$ exposures had no health impacts.[312] Yet despite these acknowledgments of the $PM_{2.5}$-related health risks faced by susceptible populations, EPA did not discuss how a more protective standard might better protect these populations.

As in the previous review, EPA included a brief statement of compliance with Executive Order 12898.[313] The agency described its "ongoing commitment to ensure environmental justice for all people" and stated that it had "carefully evaluated the potential impacts on low-income and minority populations."[314] Unlike in the previous review, EPA recognized that it had "identified potential disproportionately high and adverse effects on minority and/or low-income populations from this proposed rule" due to vulnerability of low-income populations to $PM_{2.5}$ exposure.[315] Yet the agency again concluded that the proposed rule "would lead to the establishment of uniform NAAQS for PM."[316] Thus, EPA relied on the same flawed reasoning used in the previous review, suggesting that the uniformity of the standard precludes disproportionate impacts on disadvantaged communities, and ignoring the possibility that a stricter standard would more effectively mitigate these disparities.[317]

Numerous commenters, including the Children's Health Protection Advisory Committee, the American Heart Association, and the American Lung Association, emphasized the need to lower $PM_{2.5}$ standards in order to better protect at-risk groups, including low-income populations.[318] In advocating for a

311. *Id.* at 38,911; Particulate Matter 2013 Final Rule, *supra* note 285, at 3113.

312. *See* Particulate Matter 2012 Proposed Rule, *supra* note 307, at 38,903, 38,918. For non-threshold pollutants, since the data demonstrate that there is no safe exposure level, the accepted standard ultimately reflects a policy judgement. *See* Cary Coglianese & Gary E. Marchant, *The EPA's Risky Reasoning*, REGULATION, Summer 2004, at 16, 17, 22. While factoring in the financial feasibility of a given standard might seem reasonable especially for non-threshold pollutants, the Court has ruled differently, reaffirming that regulatory costs could not be relied on as an intelligible principle in setting standards for criteria pollutants. *See* Anne E. Smith, *Setting Air Quality Standards for $PM_{2.5}$ A Role for Subjective Uncertainty in NAAQS Quantitative Risk Assessments?*, 38 RISK ANALYSIS 2318, 2319 (2018) (citing Whitman v. Am. Trucking Ass'ns, 531 U.S. 457, 473–76 (2001)). Without the ability to factor in cost, EPA resorts to arguing that its current standards are supported by science without any transparency about what other factors may have gone into the rationale. *See* Cary Coglianese & Gary E. Marchant, *Shifting Sands The Limits of Science in Setting Risk Standards*, 152 U. PA. L. REV. 1255, 1297 (2004). Some have argued that EPA's insistence that it relies purely on scientific data to set the NAAQS for $PM_{2.5}$ is primarily to evade responsibility for what is in reality a "social, political and economic choice[]." Coglianese & Marchant, *Risky Reasoning*, *supra*, at 18.

313. *See* Particulate Matter 2012 Proposed Rule, *supra* note 307, at 39,032.

314. *Id.*

315. *Id.*

316. *See id.*; Particulate Matter 2006 Proposed Rule, *supra* note 285, at 2694.

317. *See supra* text accompany notes 294-296.

318. *See* 2012 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 286, at II-2, II-81.

more stringent annual $PM_{2.5}$ level of 11 μg/m3, commenters asserted that "given the strength of the available scientific evidence, the serious nature of the health effects associated with $PM_{2.5}$ exposures, the large size of the at-risk populations, the risks associated with long- and short-term $PM_{2.5}$ exposures, and the important uncertainties inherently present in the evidence, EPA should follow a highly precautionary policy response by selecting an annual standard level that incorporates a large margin of safety."[319]

Although it acknowledged the significant public health impacts at stake, particularly for at-risk populations, EPA rejected these calls to revise its proposal. The agency insisted that it had fully considered information concerning at-risk populations in selecting a standard,[320] noting that the fact that individuals experienced adverse effects due to $PM_{2.5}$ exposures suggested that "more severe responses may reasonably be expected in a more diverse population, specifically, in at-risk populations."[321] Although elsewhere in the final rule the agency recognized that health risks would decrease if it adopted more stringent annual and 24-hour $PM_{2.5}$ standards, it did not directly address whether these at-risk populations would benefit from additional protections.[322] EPA dedicated fewer than six pages of its 203-page final rule and around eight pages of its 295-page Responses to Significant Comments to addressing these environmental justice concerns.[323]

C. 2020 Review

EPA reviewed the particulate matter NAAQS standards again in 2020, during the Trump administration.[324] However, EPA made several changes to the review process that critics warned would compromise its integrity.[325] Then-Administrator Scott Pruitt barred scientists who had received EPA grants from serving on the Clean Air Scientific Advisory Committee (CASAC),[326] while permitting those who had received funding from regulated industries to

319. *Id.* at II-77.

320. *See id.* at II-82.

321. *Id.* at II-22.

322. *See* Particulate Matter 2013 Final Rule, *supra* note 285, at 3157.

323. *See id.* at 3104–05, 3125–27, 3267–68; 2012 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 286, at II-47 to II-52, V-45 to V-46.

324. *See* Review of the National Ambient Air Quality Standards for Particulate Matter, 85 Fed. Reg. 24,094, 24,095 (proposed Apr. 30, 2020) [hereinafter Particulate Matter 2020 Proposed Action].

325. *See, e.g.*, H. Christopher Frey, *A Rush to Judgment The Trump Administration Is Taking Science out of Air Quality Standards*, THE CONVERSATION (Nov. 26, 2018, 6:38 AM), https://theconversation.com/a-rush-to-judgment-the-trump-administration-is-taking-science-out-of-air-quality-standards-106507.

326. *See* Lisa Friedman, *E.P.A. to Disband a Key Scientific Review Panel on Air Pollution*, N.Y. TIMES (Oct. 11, 2018), https://www.nytimes.com/2018/10/11/climate/epa-disbands-pollution-science-panel.html.

participate.[327] Although the Trump administration insisted this policy was intended to prevent conflicts of interest, it effectively prevented many academics from serving on the advisory committee,[328] leaving CASAC staffed with just one researcher and no epidemiologists, statisticians, or risk-assessment modeling experts.[329] The new panel was chaired by Louis Anthony Cox Jr., who had received funding from an oil lobbying firm for his particulate matter research.[330]

EPA sparked further controversy by declining to renew the Particulate Matter Review Panel, a group of twenty particulate matter experts that provides guidance to CASAC,[331] ignoring CASAC's recommendation that the panel be reinstated.[332] The agency also insisted on an expedited review process.[333] Yet despite these drastic changes to the composition of CASAC, the Advisory Committee was not able to achieve consensus on its decision to retain the existing particulate matter standards.[334] One member maintained that the standards did

327. *See* Rachel Frazin, *EPA Announces New Clean Air Advisors After Firing Trump Appointees*, THE HILL (June 17, 2021, 5:34 PM), https://thehill.com/policy/energy-environment/559069-epa-announces-new-clean-air-advisors-after-firing-trump-appointees.

328. *See* Friedman, *supra* note 326.

329. *See id.*; Stuart Parker, *EPA Taps Critic of Trump NAAQS Review Process to Lead CASAC*, INSIDE EPA (June 18, 2021), https://insideepa.com/daily-news/epa-taps-critic-trump-naaqs-review-process-lead-casac; Susanne Rust & Tony Barboza, *Top Advisor to Trump's EPA Is Called Out in Major Journal for His Fringe' Ideas*, L.A. TIMES (Mar. 21, 2019, 11:00 AM), https://www.latimes.com/local/california/la-me-epa-pollution-study-20190321-story.html. The policy banning EPA grant recipients from serving on advisory committees was struck down by a federal district court in February 2020 and abandoned by EPA later that year. *See* Sean Reilly, *EPA Gives Up on Barring Grantees from Science Advisory Panels*, SCIENCE (June 25, 2020), https://www.science.org/content/article/epa-gives-barring-grantees-science-advisory-panels.

330. *See* Jean Chemnick, *Meet 7 Science Advisers Under Trump*, E&E NEWS: CLIMATE WIRE (July 24, 2019, 6:43 AM), https://www.eenews.net/stories/1060780563.

331. Friedman, *supra* note 326. Because CASAC is a small, seven-person panel and the particulate matter NAAQS review requires broad expertise ranging from "air quality, epidemiology, toxicology, medicine, biostatistics, ecology, climate and risk assessment," EPA consistently seeks guidance from the Particulate Matter Review Panel. H. Christopher Frey, *The EPA Disbanded Our Clean Air Science Panel. We Met Anyway – And Found That Particle Pollution Regulations Aren't Protecting Public Health*, THE CONVERSATION (Oct. 29, 2019, 8:58 PM), https://theconversation.com/the-epa-disbanded-our-clean-air-science-panel-we-met-anyway-and-found-that-particle-pollution-regulations-arent-protecting-public-health-125779.

332. *See* Letter from Dr. Louis Anthony Cox, Jr., Chair, Clean Air Sci. Advisory Comm., to Andrew R. Wheeler, Adm'r, EPA (Apr. 11, 2019) (on file with author). Administrator Wheeler instead hired a group of consultants who were available to give CASAC input upon request. *See* News Release, EPA, Administrator Wheeler Announces New CASAC Member, Pool of NAAQS Subject Matter Experts (Sept. 13, 2019), https://www.epa.gov/newsreleases/administrator-wheeler-announces-new-casac-member-pool-naaqs-subject-matter-experts.

333. *See* Memorandum from E. Scott Pruitt, Adm'r, EPA, to Assistant Adm'rs, EPA (May 9, 2018), https://www.epa.gov/sites/production/files/2018-05/documents/image2018-05-09-173219.pdf.

334. *See* Stuart Parker, *Divided CASAC Spars on PM Review but Leans Toward Retaining NAAQS*, INSIDE EPA (Oct. 24, 2019), https://insideepa.com/daily-news/divided-casac-spars-pm-review-leans-toward-retaining-naaqs.

not provide the requisite public health protection, describing the review process as "dysfunctional" and "broken."[335]

Under this contentious review process, EPA proposed to retain all existing standards without revision, asserting that they adequately protected public health.[336] Less than a page of its fifty-one-page proposed rule discussed environmental justice-related issues. EPA recognized that NAAQS protections are intended to protect groups that are particularly vulnerable to $PM_{2.5}$-related health effects, including children, older adults, those with pre-existing conditions, and low-income populations.[337] The agency also acknowledged evidence of "racial and ethnic differences in $PM_{2.5}$ exposures and in $PM_{2.5}$-related health risk."[338] It noted that the 2009 Integrated Science Assessment found "strong evidence" that Black and Latino populations were exposed to above-average $PM_{2.5}$ levels.[339] The assessment also found "consistent evidence across multiple studies demonstrating an increase in risk for nonwhite populations."[340] EPA concluded that at-risk groups comprise a "substantial portion" of the country, and therefore health effects on these at-risk populations are an "important consideration" in setting the $PM_{2.5}$ standards.[341] Yet despite acknowledging the size and vulnerability of these groups, the agency did not consider whether a more stringent standard would better protect them.

EPA again included a brief statement claiming compliance with Executive Order 12898.[342] The agency stated that it had considered effects on at-risk

335. *See id.*; Letter from Dr. Louis Anthony Cox, Jr., Chair, Clean Air Sci. Advisory Comm., to Andrew R. Wheeler, Adm'r, EPA (Dec. 16, 2019) (on file with author). Under the Biden administration, EPA "reset" the Advisory Committee by dismissing the Trump-appointed CASAC members, in an effort to ensure "scientific integrity." News Release, EPA, Administrator Regan Directs EPA to Reset Critical Science-Focused Federal Advisory Committees (Mar. 31, 2021), https://www.epa.gov/newsreleases/administrator-regan-directs-epa-reset-critical-science-focused-federal-advisory. The new advisory committee includes three epidemiologists, one of whom is an expert in health disparities and environmental justice. *See* News Release, EPA, EPA Announces Selections of Charter Members to the Clean Air Scientific Advisory Committee (June 17, 2021), https://www.epa.gov/newsreleases/epa-announces-selections-charter-members-clean-air-scientific-advisory-committee; *Georgia State Environmental Health Expert Selected for Prestigious EPA Committee*, GA. STATE UNIV. (June 20, 2021), https://news.gsu.edu/2021/06/20/georgia-state-environmental-health-expert-selected-for-prestigious-epa-committee/. The Biden administration has also reinstated the Particulate Matter Review Panel. *See* Rachel Frazin, *EPA to Reinstate Air Pollution Panel Disbanded Under Trump*, THE HILL (June 14, 2021, 2:42 PM), https://thehill.com/policy/energy-environment/558340-epa-to-reinstate-air-pollution-panel-disbanded-under-trump?rl=1.

336. Particulate Matter 2020 Proposed Action, *supra* note 324, at 24,095.

337. *See id.* at 24,114. In its final rule, EPA clarified that it used the phrase "at-risk populations" "to describe populations with a quality or characteristic in common (for example, a specific pre-existing illness) that contributes to them having a greater likelihood of experiencing $PM_{2.5}$-related health effects." Particulate Matter 2020 Final Action, *supra* note 285, at 82,703.

338. Particulate Matter 2020 Proposed Action, *supra* note 324, at 24,114.

339. *Id.*

340. *Id.*

341. *Id.*

342. *See id.* at 24,140.

populations and determined that the existing standards provided the requisite protection, including an "adequate margin of safety," for these groups.[343] EPA asserted the rule "does not have disproportionately high and adverse human health or environmental effects on minority, low-income populations and/or indigenous peoples[.]" [344] Although it did not reiterate its suggestion from prior reviews that a uniform standard cannot have disproportionate impacts on disadvantaged communities,[345] EPA yet again failed to account for the higher exposure and increased vulnerability to $PM_{2.5}$-related health effects that disadvantaged communities face. EPA did not discuss whether a more stringent standard would better protect these communities and mitigate $PM_{2.5}$-related health disparities.

As in the 2012 review, numerous commenters asserted that EPA had violated Executive Order 12898. First, commenters criticized EPA for failing to "adequately consider environmental justice (EJ) and equity concerns" given that "low-income communities and communities of color, including the American Indian Community" are disproportionately affected by EPA's decision not to adopt a more stringent standard.[346] Second, commenters claimed that EPA violated Executive Order 12898 by failing to promulgate a standard that protects at-risk groups, with some commenters asserting that it violated the Clean Air Act as well for failing to include a margin of safety for at-risk communities.[347] Others criticized EPA's decision not to prepare a Regulatory Impact Assessment exploring environmental justice concerns and effects of particulate matter on "sensitive groups and minority populations."[348] Separately, others questioned EPA's decision not to conduct a Risk and Exposure Assessment as it had done in past reviews, with one CASAC member stating that an updated Risk and Exposure Assessment could "lead to different policy recommendations on the current annual and 24-hour $PM_{2.5}$ standards."[349]

In addition to criticizing the alleged failure to comply with Executive Order 12898, commenters raised further environmental justice concerns. Some criticized EPA for concluding that the lack of experimental studies accompanying existing epidemiological studies at $PM_{2.5}$ standards below the current NAAQS meant that a more stringent standard lacked adequate scientific support.[350] These commenters noted the difficulties associated with obtaining such experimental studies, including ethical issues with "conducting experimental studies among susceptible/at-risk populations."[351] They asserted

343. *Id.*
344. *Id.*
345. *See supra* text accompanying notes 295-297, 302, 316-317.
346. 2020 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 286, at 41.
347. *See id.*; Particulate Matter 2020 Final Action, *supra* note 285, at 82,713.
348. 2020 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 286, at 41.
349. *Id.* at 28.
350. *See id.* at 5.
351. *Id.*

that EPA was "imposing [a] burden of proof or evidence far beyond what is required by statute."[352]

In response, EPA reaffirmed its reasoning from the past two reviews, stating that the rule "is not expected to have disproportionate negative impacts on minority or low-income populations or on indigenous peoples."[353] EPA insisted that it had considered evidence of $PM_{2.5}$-related health effects on "sensitive populations, including populations that are of low socioeconomic status and nonwhite populations."[354] The agency employed the same flawed reasoning it had used in 2006, stating that its work to ensure compliance with the current standards will lower risks for those facing the highest levels of $PM_{2.5}$ exposure.[355] EPA asserted that "to the extent that the public health burden of PM air pollution is disproportionately affecting minority or low-income populations, reaching attainment with existing standards will effectively reduce that disparity."[356] As indicated above,[357] such reasoning would lead to the absurd conclusion that any environmental regulation, even one that provides minimal health protections, would sufficiently alleviate racial and socioeconomic health disparities because it provides some level of protection. As in the past two reviews, EPA did not address whether a more stringent standard would more effectively mitigate these disparities and protect disadvantaged communities.[358]

Some commenters urged EPA to consider studies linking $PM_{2.5}$ exposure to COVID-19 mortality, asserting that exposure of communities of color to higher $PM_{2.5}$ concentrations causes these communities to have worse COVID-19 health outcomes.[359] In response, EPA again highlighted uncertainties in the evidence, stating that given the unknowns about COVID-19 it will take years to understand the relationship between $PM_{2.5}$ exposure and the virus.[360] The agency stated that its decision to retain existing $PM_{2.5}$ standards was not affected by a provisional consideration of relevant studies, and that in the next review it would consider information related to COVID-19 and particulate matter exposure, including

352. *Id.* at 6.

353. *Id.* at 41. The agency noted that it did not have reason to believe that the existing particulate matter standards would disproportionately harm "the American Indian community," nor would more stringent standards alleviate any disproportionate impact, but suggested that this community would be protected under the national standard. *Id.* at 41–42.

354. *Id.* at 41.

355. *See id.*

356. *Id.*

357. *See supra* text accompanying notes 304-306.

358. EPA also stated that no new Regulatory Impact Analysis was needed because no changes had been made to the existing rule, so no additional costs or benefits beyond those assessed in the previous review had arisen. *See* 2020 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 286, at 42. The agency further explained that a risk assessment was not required by law, and that it had evaluated the risks without issuing a separate risk assessment. *See id.* at 28–29.

359. *See id.* at 36.

360. *See id.* at 37.

studies of at-risk populations.[361] Thus, for a third consecutive review, EPA rejected environmental justice arguments for strengthening $PM_{2.5}$ standards.

EPA has consistently failed to account for the impacts of its decisions on communities of color and low-income communities. In its brief discussions of environmental justice during its rulemakings, the agency insisted that the uniform nature of the NAAQS precludes it from disproportionately affecting particular subpopulations. Yet disadvantaged communities do in fact face disproportionately high concentrations of $PM_{2.5}$ and are especially vulnerable to its adverse health effects. EPA's repeated selection of less stringent standards allows these inequities to persist unchecked. Similarly, the agency has asserted that these less stringent standards will address environmental justice concerns by lowering particulate matter concentrations in the areas with the highest concentrations. By this account, any regulation constraining pollution can be deemed to adequately address environmental justice concerns, even where the permitted level of pollution causes disadvantaged communities to suffer disproportionate, often deadly, health effects. In all three reviews, EPA neglected to consider whether stricter standards would more effectively mitigate these disparities and protect disadvantaged communities.

IV. INSTITUTIONALIZED NONATTAINMENT

A key element and the regulatory centerpiece of the Clean Air Act of 1970 is the designation of nonattainment regions—the regions in the country that do not meet the NAAQS. Congress initially set an ambitious goal requiring every state to meet the primary NAAQS within three years after EPA approved its State Implementation Plan, which is the blueprint indicating how the state would regulate its sources.[362] Congress sought to achieve full attainment by 1975.[363] However, many states with high pollution levels were reluctant to make the economic sacrifices required to adequately reduce emissions and declined to include land use and transportation restrictions in their State Implementation Plans.[364] Faced with resistance from states, EPA sought to delay implementation of the Act.[365] In 1973, the D.C. Circuit held that EPA was required to fulfill the clear intent of Congress in imposing strict deadlines.[366] In 1977, after EPA failed to meet the 1975 goal of full attainment, Congress pushed back the deadline to 1982, and gave states the option to further extend the ozone and carbon monoxide compliance deadline until 1987.[367] However, many states again failed to meet

361. *See id.*
362. *See* RICHARD L. REVESZ ET AL., ENVIRONMENTAL LAW AND POLICY 434 (4th ed. 2019).
363. *See id*.
364. *See id.* at 434–35.
365. *See id.* at 435.
366. *See id.*; Nat. Res. Def. Council, Inc. v. EPA, 475 F.2d 968 (D.C. Cir. 1973).
367. *See* REVESZ ET AL., *supra* note 362, at 435.

the revised deadline.[368] In 1987, EPA proposed further extending the deadline.[369] That same year, the Ninth Circuit ruled that EPA lacked the authority to approve State Implementation Plans that would not bring areas into compliance with the ozone and carbon monoxide NAAQS by the 1987 deadline.[370] Finally, in 1990, Congress intervened again. It amended the Act to create stratified deadlines for nonattainment areas that varied based on the extent to which an area exceeded the NAAQS for a given pollutant.[371] Thus, Congress abandoned its ambitious compliance goals and institutionalized nonattainment. This set the stage for what has become a state of persistent nonattainment in which many areas still fail to meet the NAAQS fifty-one years after enactment of the Clean Air Act.

Subpart A describes the geographical distribution of nonattainment areas over time as well as their typical characteristics. Subpart B examines practices that have led EPA to misclassify areas that exceed the NAAQS and incorrectly deem them to be "in attainment." These practices include a lack of adequate monitors, strategic placement of monitors to avoid detecting high particulate matter concentrations, and limited days of operation, all of which can cause $PM_{2.5}$ hotspots to remain undetected. Subpart C discusses the obstacles to achieving nationwide attainment—primarily a lack of political will on the part of EPA to force states to comply with unpopular implementation plans, but also the significant presence of interstate emissions and the difficulties in regulating mobile sources like motor vehicles.

Nonattainment of the particulate matter NAAQS exposes communities of color and low-income communities to dangerous levels of $PM_{2.5}$ at disproportionately high rates.[372] Yet the persistence of nonattainment has not traditionally been seen as a core environmental justice issue.[373] Although EPA has the authority to consider environmental justice concerns in its review of nonattainment area redesignation, permitting, and sanctions,[374] it has largely neglected to consider environmental justice concerns in the context of nonattainment. For example, EPA's program imposing requirements on

368. *See id.* at 437–438.

369. *See id.* at 438; State Implementation Plans; Approval of Post-1987 Ozone and Carbon Monoxide Plan Revisions for Areas Not Attaining the National Ambient Air Quality Standards; Notice, 52 Fed. Reg. 45,044, 45,045 (Nov. 24, 1987).

370. *See* REVESZ ET AL., *supra* note 362, at 438; Abramowitz v. EPA, 832 F.2d 1071, 1072–73 (9th Cir. 1987).

371. *See* REVESZ ET AL., *supra* note 362, at 438. The amendments also imposed additional requirements on states to ensure progress in achieving attainment. *See id.*

372. *See supra* Subpart II.A.2.

373. Importantly, it is rarely mentioned in the environmental justice literature discussed *supra* in Subpart I.C.

374. *See* Richard J. Lazarus & Stephanie Tai, *Integrating Environmental Justice into EPA Permitting Authority*, 26 ECOLOGY L.Q. 617, 634 (1999) (explaining how environmental justice considerations fall within the purview of EPA's redesignation, permitting, and sanctions processes); *see also* Richard J. Lazarus, Essay, *Fairness in Environmental Law*, 27 ENV'T L. 705, 717–19 (1997) (same).

nonattainment areas seeking to build new sources does not directly address disproportionate impacts on disadvantaged communities.[375] Instead, the agency has regularly suggested that its nonattainment-related rules do not implicate environmental justice considerations, for example, because the "action does not directly affect the level of protection provided for human health or the environment."[376] Alternatively, EPA has relied on claims that "[a]rea designations address environmental justice concerns by ensuring that the public is properly informed about the air quality in an area."[377] This suggestion fails to acknowledge that information alone is of little solace to communities that suffer disproportionately from pollution. Meanwhile, environmental justice groups have yet to develop strategies focused on ending institutionalized nonattainment.[378]

A. Persistence of Nonattainment

This Subpart first describes the geographical distribution of nonattainment areas over time as well as their typical characteristics. It then shows that the persistence of nonattainment is not simply the result of the progressive strengthening of the NAAQS.

As of March 31, 2022, five areas are in nonattainment of the 2012 annual NAAQS for $PM_{2\,5}$, which is 12 $\mu g/m^3$.[379] These nonattainment areas cover a total of fifteen counties with a population of 20,941,659 across the United States.[380] Fifty areas, covering a population of 122,419,071 people, are currently designated as being in nonattainment of the 8-hour ozone NAAQS.[381] High ozone levels can cause lung damage and aggravate underlying health conditions.[382] Including the current nonattainment counties for pollutants other

375. *See* Eileen Gauna, *Major Sources of Criteria Pollutants in Nonattainment Areas Balancing the Goals of Clean Air, Environmental Justice, and Industrial Development*, 3 HASTINGS W.-NW. J. ENV'T L. & POL'Y 379, 387 (1996) ("The [permitting] requirements accommodate environmental interests as well as industrial interests, but as yet do not directly address environmental justice concerns.").

376. Findings of Failure to Submit State Implementation Plan Revisions in Response to the 2016 Oil and Natural Gas Industry Control Techniques Guidelines for the 2008 Ozone National Ambient Air Quality Standards (NAAQS) and for States in the Ozone Transport Region, 85 Fed. Reg. 72,963, 72,965 (Nov. 16, 2020).

377. Reconsideration of the Area Designation for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard for Williamson County, Illinois, 84 Fed. Reg. 26,627, 26,629 (June 7, 2019).

378. *See supra* Subpart I.C.

379. *See PM2.5 (2012) Designated Area/State Information*, EPA, https://www3.epa.gov/airquality/greenbook/kbtc.html (last updated Mar. 31, 2022). Four additional areas are listed as in nonattainment of the 1997 annual $PM_{2.5}$ standards. *See PM-2.5 (1997) Designated Area Design Values*, EPA, https://www3.epa.gov/airquality/greenbook/qdtc.html (last updated Mar. 31, 2022).

380. *See id.*

381. *See 8-Hour Ozone (2015) Designated Area Design Values*, EPA, https://www3.epa.gov/airquality/greenbook/jdtc.html (last updated Mar. 31, 2022).

382. *See Health Effects of Ozone Pollution*, EPA, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution (last visited July 22, 2021).

than $PM_{2.5}$, there are thirty-seven states, districts, and territories that have nonattainment counties.[383] The total number of people living in a nonattainment area for at least one criteria pollutant is 131,418,000.[384] Overall, nonattainment areas tend to be in large urban centers.[385]

The Clean Air Act provides for the revision of the NAAQS at five-year intervals based on the advice of a scientific review committee.[386] As discussed in Part III, EPA has not generally complied with these time limits, as revisions for $PM_{2.5}$ have occurred at longer intervals, in 1997, 2006, 2012, and most recently in 2020.[387] But the strengthening of the ambient standards should not be blamed for the persistent nonattainment. After all, not every area complied with the standards right before they were strengthened.

Many areas that are in nonattainment would have remained so even if EPA had not strengthened the standards. For example, out of the fifty areas currently designated as nonattainment under the 8-hour ozone NAAQS set in 2015, twenty-six, over half, fail to meet the outdated 2008 standard as well.[388] The five nonattainment areas for the annual $PM_{2.5}$ standard still fail to meet the current standard even though it was set in 2012 and was not strengthened in 2020.[389] One of these five areas even fails to meet the less stringent 2006 $PM_{2.5}$ NAAQS.[390]

B. Nonattainment Determinations and the Underestimation of the Problem

Nonattainment areas are not the only regions with particulate matter levels that do not comply with the NAAQS. Many areas are misclassified by EPA as "in attainment" despite actually exceeding the NAAQS.[391] The limited number of monitors and frequency at which they operate prevent EPA from detecting many particulate matter hotspots. This issue is exacerbated by the strategic placement of monitors and efforts by polluters to avoid detection of high particulate matter concentrations. These practices have caused EPA to seriously underestimate the number of people experiencing excessive $PM_{2.5}$

383. *See Current Nonattainment Counties for All Criteria Pollutants*, EPA, https://www3.epa.gov/airquality/greenbook/ancl.html (last updated Mar. 31, 2022).

384. *See Summary Nonattainment Area Population Exposure Report*, EPA, https://www3.epa.gov/airquality/greenbook/popexp html (last updated Mar. 31, 2022).

385. *See* RICHARD L. REVESZ & JACK LIENKE, STRUGGLING FOR AIR: POWER PLANTS AND THE "WAR ON COAL" 84 (2016).

386. *See* 42 U.S.C. § 7409(d).

387. *See supra* Part III.

388. *Compare 8-Hour Ozone (2015) Designated Area Design Values*, *supra* note 381, *with 8-Hour Ozone (2008) Designated Area Design Values*, EPA, https://www3.epa.gov/airquality/greenbook/hdtc.html (last updated Mar. 31, 2022).

389. *See PM-2.5 (2012) Designated Area Design Values*, *supra* note 379.

390. *See id*.

391. *See supra* text accompanying notes 253-262.

concentrations.[392] Misclassification has disproportionate effects on communities of color and low-income communities, which are more likely to be located near $PM_{2.5}$ hotspots like major roadways.[393] Misclassified areas do not receive the same interventions to reduce emission levels, causing these high concentrations of particulate matter, and subsequent racial and economic health disparities, to persist unmitigated.

Particulate matter concentrations that violate standards often go undetected because not enough $PM_{2.5}$ monitors are deployed to adequately measure $PM_{2.5}$ concentrations on a local level.[394] For example, in 2015, 79 percent of counties did not contain a single $PM_{2.5}$ monitor.[395] The dearth of monitoring sites hampers efforts to fully measure $PM_{2.5}$ concentrations, leading officials to underestimate the extent to which people face high pollution levels.[396] One study estimated that, as a result, over 24 million people reside in misclassified areas, where the NAAQS are violated even though the areas are deemed to be in attainment.[397]

Also, because $PM_{2.5}$ concentrations often differ drastically depending on the location within a given area and the time of the day, a multitude of monitors is needed to capture the nuances of $PM_{2.5}$ concentrations.[398] When EPA designates an area as being in nonattainment, it assesses the ambient concentrations of a single, large region, thus failing to properly account for the variation of $PM_{2.5}$ concentrations within that region.[399] EPA may use only a few monitors to measure the entire area, which can provide one reading that may not be representative of the area as a whole.[400] This practice often causes EPA to overlook pollution hotspots, or "microclimates," which tend to occur near major pollution sources like transport hubs and industrial areas.[401] These

392. Another practice that previously allowed areas to avoid nonattainment designations is spatial averaging, where recordings from multiple monitoring sites in an area were averaged, provided they met certain constraints. *See* Particulate Matter 2006 Final Rule, *supra* note 290, at 61,166. This practice allowed for an area to be designated as "in attainment" even though one or more monitors recorded particulate matter levels that exceeded the NAAQS. However, EPA eliminated this practice in 2013, citing concerns about "disproportionately higher exposure concentrations in at-risk populations such as low income communities as well as minority communities." 2012 RESPONSES TO SIGNIFICANT COMMENTS, *supra* note 286, at II-48; Particulate Matter 2013 Final Rule, *supra* note 285, at 3127.

393. *See supra* text accompanying notes 253-262.

394. *See* Sullivan & Krupnick, *supra* note 240, at 2.

395. *Id.* at 5.

396. *See id.* Reliance on inaccurate growth rate projections can also lead officials to miscalculate the level of emissions reductions required for an area to remain in compliance with the Clean Air Act, and therefore underestimate the number of areas that will become nonattainment. *See, e.g.*, OFF. OF INSPECTOR GEN., EPA, 2004-P-00033, EPA AND STATES NOT MAKING SUFFICIENT PROGRESS IN REDUCING OZONE PRECURSOR EMISSIONS IN SOME MAJOR METROPOLITAN AREAS 23 (2004), https://www.epa.gov/sites/production/files/2015-12/documents/20040929-2004-p-00033.pdf.

397. Sullivan & Krupnick, *supra* note 240, at 1.

398. *See* N.Y.C. ENV'T JUSTICE ALL., *supra* note 259, at 9.

399. *See* Ann E. Carlson, *The Clean Air Act's Blind Spot Microclimates and Hotspot Pollution*, 65 UCLA L. REV. 1036, 1043 (2018).

400. *See id* .at 1043–44.

401. *See id.* at 1036.

microclimates "have air quality significantly more unhealthful than the background measurements of ambient air suggest."[402] One study used satellite monitoring to estimate that fifty-four counties contain such microclimates.[403]

The problem is compounded because of the variation of concentrations throughout the day, principally as a result of traffic patterns. So, for example, even if a monitor is placed at a location that has the highest pollution concentration at a particular time of the day, a different location might have a higher concentration at a different time. If there is no monitor at the latter location, the seriousness of the pollution would be overlooked.

Densely populated urban areas experience especially pronounced spatial variation in $PM_{2.5}$ concentrations due to "street canyons" and varying traffic patterns.[404] In the South Bronx and Southside Williamsburg neighborhoods of New York City, for example, air pollution changes dramatically according to time of day.[405] When researchers used mobile monitors to measure $PM_{2.5}$ concentrations per minute, the monitors displayed concentrations that were up to twenty times greater than the numbers listed on nearby government monitors.[406] Despite these extreme variations, New York City is equipped with just thirteen ambient air monitoring sites for a 302-square-mile area; as a result, much remains unknown about the variation of emissions within the city.[407] Similarly, in Los Angeles, only thirty-eight monitoring stations are deployed to measure an entire 11,000-mile area.[408] The monitors are not placed near roadways, and so do not capture readings from these $PM_{2.5}$ hotspots.[409] The placement of monitors has serious public health consequences, given that millions of people live in proximity to major roadways.[410]

Monitors are also concentrated in cities, which could lead to an underappreciation of the number of rural areas that may also be in nonattainment.[411] The Clean Air Act itself was primarily focused on emissions sources like "cars and factories," which tended to be more prevalent in urban areas.[412] Furthermore, many studies on nonattainment areas are limited to urban areas since there is rarely data for rural counties.[413] For example, when Nevada experienced serious wildfire smoke from the west coast fires of 2020, the federal

402. *Id.* at 1046.
403. Sullivan & Krupnick, *supra* note 240, at 2.
404. *See* Jonathan I. Levy & Steven R. Hanna, *Spatial and Temporal Variability in Urban Fine Particulate Matter Concentrations*, 159 ENV'T POLLUTION 2009, 2010 (2011).
405. *See supra* Part II; N.Y.C. ENV'T JUSTICE ALL., *supra* note 259, at 9.
406. N.Y.C. ENV'T JUSTICE ALL., *supra* note 259, at 19.
407. *See id.* at 9.
408. *See* Carlson, *supra* note 399, at 1046.
409. *See id.*
410. *See id.* at 1045.
411. *See* JAMES E. MCCARTHY & KATE C. SHOUSE, CONG. RSCH. SERV., R403092, IMPLEMENTING EPA'S 2015 OZONE AIR QUALITY STANDARDS 28 (2018).
412. *Id.*
413. *See* Bravo et al., *supra* note 181, at 243.

air quality data showed Nevada as having clean skies, while in reality schools were closed and residents were warned to remain indoors due to poor air quality.[414] This discrepancy was attributed to the gap in Nevada's air monitors, which were located in only nine of the state's seventeen counties.

Strategic placement of monitors can also contribute to misclassification. One hypothesis proffered is that localities "teach[] to the test," placing $PM_{2.5}$ monitors in cleaner areas of the monitoring region or working with major polluters in the county to decrease emissions at the time of monitoring.[415] Alternatively, polluters themselves may circumvent NAAQS restrictions by moving downwind from monitors.[416]

EPA may also underestimate $PM_{2.5}$ concentrations due to the large number of monitors that are set to function only at certain intervals in order to reduce expenses.[417] In 2015, for example, 56 percent of monitors operated fewer than 121 days a year, while 23 percent of those operated on fewer than eighty days a year, in order to reduce expenses.[418] One study claimed that polluters, who know in advance the days that $PM_{2.5}$ monitors operate,[419] purposely take advantage of inconsistent monitoring by polluting less on days when monitors operate.[420] Another study found that 1.6 times more particulate pollution occurs on days where monitors were not in operation than on days where monitors were in operation.[421] As a result, areas are classified as in attainment even though particulate matter levels often exceed the NAAQS.[422]

Misclassification has serious environmental justice implications. Approximately half of those living near major roadways are people of color and lower-income residents, and temporary exposure to high levels of $PM_{2.5}$ can have dangerous health effects.[423] Designation of an area as nonattainment triggers a myriad of regulatory interventions that can reduce (although not fully address) high exposures of particulate matter to communities of color.[424] However, areas

414. *See* Sam Metz, *Parts of Now Smoky Rural Nevada Lack Government Air Monitors*, ASSOCIATED PRESS (Sept. 18, 2020), https://apnews.com/article/wildfires-carson-city-air-quality-environment-fires-b79ce80d22f17897413e940649731825.

415. Sullivan & Krupnick, *supra* note 240, at 5.

416. *See id.* at 5–6.

417. EPA saves about $12 million a year through discontinuous monitoring. *See* Eric Yongchen Zou, *Unwatched Pollution The Effect of Intermittent Monitoring on Air Quality*, 111 AM. ECON. REV. 2101, 2105 (2021).

418. *See* Sullivan & Krupnick, *supra* note 240, at 5, 20 fig.1, 21 fig.2.

419. *See id.* at 6.

420. *See id.*

421. *See id.* at 3.

422. *See id.* at 2.

423. *See* Carlson, *supra* note 399, at 1047; *see also* Tegan K. Boehmer et al., *Residential Proximity to Major Highways – United States, 2010*, CTRS. FOR DISEASE CONTROL & PREVENTION (Nov. 22, 2013), https://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a8 htm (discussing the disproportionate number of racial and ethnic minorities who live close to highways and are thus exposed to higher pollution concentrations).

424. *See* REVESZ ET AL., *supra* note 362, at 435–36.

that are misclassified as "in attainment" do not receive these interventions, allowing racial disparities to persist unmitigated. One study estimated that the misclassification of nonattainment areas resulted in 2,726 premature deaths from $PM_{2.5}$ per year, resulting in $24.5 billion in social costs annually.[425]

In summary, the failure to monitor $PM_{2.5}$ concentrations on a localized level and on daily intervals, combined with strategic placement of monitors and efforts by polluters to circumvent monitoring, has led many pollution hotspots to remain undetected. Such practices cause EPA to underestimate pollution levels in many areas, which contributes to the disproportionate burden of air pollution on disadvantaged communities. Misclassification relieves these areas from the obligation to reduce pollution levels and achieve compliance with the NAAQS. The extent of such misclassification may be avoidable, given improvements in technology that enable more extensive and affordable monitoring.[426]

C. Explanations

There are several explanations for the persistence of nonattainment. First, EPA lacks the political will to enforce deadlines and bring states into attainment. Second, pollution from neighboring states can make it difficult for states to achieve attainment. Finally, regulating vehicle emissions, a major pollution source, is challenging and controversial.

1. Political Will

Many states have resisted adopting the stringent measures necessary to attain the NAAQS, and EPA has often lacked the political will to hold these states accountable. In particular, EPA has been "extraordinarily reluctant to take the actions that would even trigger the possibility of sanctions."[427] The agency has often delayed imposing sanctions despite inadequate state plans to achieve attainment, and has failed to reclassify or redesignate areas as being in nonattainment.[428] Put simply, "EPA's practices of apparently just ignoring the requirement to determine whether areas attained and of liberally granting extensions on the basis of ozone transport, has undermined Congress's efforts to introduce accountability and to create incentives for state compliance."[429]

Numerous scholars have discussed EPA's lack of political will to implement the law as Congress legislated. As an example, Jessica Ranucci

425. Sullivan & Krupnick, *supra* note 240, at 16.

426. *See* Adam Babich, *The Unfulfilled Promise of Effective Air Quality and Emissions Monitoring*, 30 GEO. ENV'T L. REV. 569, 574–75 (2018).

427. Douglas R. Williams, *Cooperative Federalism and the Clean Air Act A Defense of Minimum Federal Standards*, 20 ST. LOUIS U. PUB. L. REV. 67, 91 (2001).

428. *See* Thomas O. McGarity, *Missing Milestones A Critical Look at the Clean Air Act's VOC Emissions Reduction Program in Nonattainment Areas*, 18 VA. ENV'T L.J. 41, 48 (1999).

429. Williams, *supra* note 427, at 94.

pointed specifically to EPA's impermissible approval of State Implementation Plans that do not adequately assure the funding necessary to bring about compliance and to the agency's lack of enforcement actions against states for such funding failures.[430] Similarly, Meredith Fowlie noted that EPA's most effective tool is to impose sanctions on a state, but that the agency lacks the appetite to employ this tool, instead turning to slower and more subtle techniques to cajole states into compliance.[431]

This lack of political will has plagued EPA since the early days of the Clean Air Act. Under the 1977 amendments, EPA "refused to impose the statutory sanctions on states that had obviously failed to attain the standards by the statutory deadline" unless the state had demonstrated bad faith.[432] In the 1980s, the agency informally sent the message that State Implementation Plan failures were unlikely to be punished.[433]

EPA's failures in implementing its 1990 "milestone" program exemplify the agency's lack of political will. This program required states to prove that their State Implementation Plans would reduce volatile organic compound emissions by 15 percent between 1990 and 1996 in order to bring nonattainment areas into compliance with the NAAQS. Thomas McGarity listed multiple reasons for the program's failures, which are indicative of why it has been unable to bring institutionalized nonattainment to an end.[434] For example, EPA approved State Implementation Plans even though they were based on unrealistic assumptions about how the NAAQS would be met.[435] And, EPA did not then hold states accountable for noncompliance.[436] In particular, although EPA has the obligation to promulgate a Federal Implementation Plan when it determines that a State Implementation Plan is inadequate, the agency has regularly avoided doing so.[437]

One significant proceeding underscores EPA's unwillingness to force states to meet their obligations. In *Coalition for Clean Air v. EPA*,[438] a case concerning California's South Coast Air Basin, which includes Los Angeles, EPA argued that the passage of the 1990 Clean Air Act Amendments relieved the agency of its obligation to promulgate a Federal Implementation Plan for an area that was consistently in nonattainment for ozone and carbon monoxide.[439] EPA had previously proposed a federal plan but ultimately withdrew it, citing the

430. *See* Jessica Ranucci, Note, *Reviving the Clean Air Act's Requirement That States Adequately Fund and Staff Clean Air Programs*, 40 HARV. ENV'T. L. REV. 351, 355 (2016).
431. *See* FOWLIE ET AL., *supra* note 77, at 8.
432. *Id.* at 48.
433. *See id.* at 49.
434. *See* McGarity, *supra* note 428, at 92–99.
435. *Id.* at 93–95.
436. *Id.* at 97.
437. *See* REVESZ ET AL., *supra* note 362, at 389, 404.
438. Coal. for Clean Air v. S. Cal. Edison Co., 971 F.2d 219 (9th Cir. 1992).
439. *See id.* at 221–23.

"disruptive social and economic consequences of such regulations[.]"[440] In 1988, the appellants, Coalition for Clean Air and the Sierra Club, sued EPA on the grounds that the agency had failed to discharge its obligation to promulgate a Federal Implementation Plan. In seeking to convince Congress to rescind the requirement that EPA issue a Federal Implementation Plan, the EPA administrator complained that such a plan would "devastat[e] the country's largest industrial area," which was widely understood as a reference to the South Coast Air Basin.[441] Following the Ninth Circuit's decision, EPA did promulgate a federal plan for Southern California.[442] But soon after, Congress passed an appropriations rider removing this obligation, citing the 1990 amendments, and EPA rescinded its plan.[443] California eventually submitted a State Implementation Plan, but EPA delayed its approval until 1997.[444] Further skirmishes then ensued when California dragged its feet once again.[445] The saga of this proceeding highlights EPA's unwillingness, partly with congressional acquiescence, to aggressively enforce the provisions of the Clean Air Act requiring attainment of the NAAQS.

Moreover, EPA's many losses in the courts for failing to discharge its duties have not remedied its lack of political will to ensure compliance with the NAAQS. In *South Coast Air Quality Management District v. EPA*,[446] involving a challenge to the agency's 2015 Implementation Plan for the 2008 NAAQS for ozone, the D.C. Circuit held that by revoking the 1997 NAAQS, EPA had arbitrarily waived statutory deadlines while "allow[ing] areas that fail to timely attain to avoid being subject to more stringent emissions controls."[447] In a more recent case, the D.C. Circuit again found that EPA's revocation of the 1997 NAAQS for ozone without adequate backsliding provisions impermissibly waived those statutory attainment deadlines.[448] In yet another recent case, EPA relied on the nature of ozone seasons to justify its decision to extend the deadlines for attaining the ozone NAAQS, but the D.C. Circuit found that there was no indication Congress intended to take into account ozone seasons when setting attainment deadlines. [449]

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440. *Id.* at 222 (quoting Revocation of Gasoline Rationing Regulations, 41 Fed. Reg. 45,565, 45,656 (Oct. 15, 1976)).

441. *Id.* at 223 (quoting 136 Cong. Rec. H2771, H2887 (daily ed. May 23, 1990)).

442. *See* REVESZ ET AL., *supra* note 362, at 402 (citing Defense Supplemental Appropriation, Pub. L. No. 104–6 (1995)).

443. *See id.*

444. *See id.* at 403.

445. *See id.* For further discussion of foot-dragging, see Alan C. Waltner, *Paradise Delayed—The Continuing Saga of the Los Angeles Basin Federal Clean Air Implementation Plan*, 14 UCLA J. ENV'T L. & POL'Y 247 (1996).

446. S. Coast Air Quality Mgmt. Dist. v. EPA, 882 F.3d 1138 (D.C. Cir. 2018).

447. *Id.* at 1147.

448. *See id.* at 1148.

449. *See* Nat. Res. Def. Council v. EPA, 777 F.3d 456, 469 (D.C. Cir. 2014).

EPA has also lost cases challenging its failure to impose mandatory sanctions and fees on noncomplying areas and states. In one such case, EPA's final rule for 8-hour ozone NAAQS attempted to exclude areas in nonattainment under the older NAAQS from certain regulations.[450] The D.C. Circuit held that this attempt to create regulatory flexibility and maximize EPA discretion was impermissible and rejected EPA's argument that enforcing penalties was too impractical.[451]

EPA's attempts to push back deadlines without a mandatory nonattainment reclassification, which would subject the affected area to more stringent regulatory requirements,[452] were similarly unsuccessful in court. In one case, petitioners challenged EPA's approval of a State Implementation Plan designating Atlanta as a serious 1-hour ozone nonattainment area.[453] The Eleventh Circuit struck down the agency's decision to extend the date for compliance without reclassifying the city's attainment status, as the statute required, to severe nonattainment.[454] And, in a 2021 case, the D.C. Circuit struck down portions of EPA's 2015 and 2018 Implementation Rules for ozone NAAQS, finding that EPA had given the states significant flexibility that was unwarranted under the statute.[455]

Despite these numerous losses in the courts, EPA has consistently avoided imposing the deadlines and sanctions necessary to bring states into compliance. The agency's unwillingness to hold states accountable for violating the NAAQS has posed a significant barrier to ending nonattainment and has had serious adverse consequences for disadvantaged communities.

2. Interstate Pollution

In addition to EPA's lack of political will, interstate emissions pose a further challenge to attainment of the NAAQS. The construction of tall stacks in the decade after the Clean Air Act's passage, which EPA's policies encouraged, led to an increase in the amount of pollution that crosses state lines.[456] Tall stacks disperse pollution to neighboring states, enabling upwind states to continue emitting high pollution levels without violating the NAAQS, while making it much more challenging for downwind states to achieve compliance despite having reduced their own emissions.[457] Indeed, it can be difficult for downwind

450. *See* S. Coast Air Quality Mgmt. Dist. v. EPA, 472 F.3d 882, 894 (D.C. Cir. 2006).

451. *See id.* at 894, 903.

452. *See* 42 U.S.C. §§ 7511–14a (setting forth more stringent regulatory requirements in nonattainment areas).

453. *See* S. Org. Comm. for Econ. & Soc. Just. v. EPA, 333 F.3d 1288 (11th Cir. 2003).

454. *See id.* at 1289–90.

455. *See* Sierra Club v. EPA, 21 F.4th 815, 817–18 (D.C. Cir. 2021).

456. *See* Richard L. Revesz, *Federalism and Interstate Environmental Externalities*, 144 U. PA. L. REV. 2341, 2350–58 (1996).

457. *See* REVESZ & LIENKE, *supra* note 385, at 85.

states burdened by this practice to trace interstate pollution back to its original source and hold the polluting state accountable.[458]

In Maryland, for example, up to 70 percent of ozone pollution is emitted by neighboring states.[459] One recent study found that approximately half of air quality-related premature deaths caused by a given state's pollution "occurs outside that state."[460] In 2018, out-of-state emissions resulted in 3,800 premature deaths in New York alone.[461]

As early as 1977, Congress understood that interstate pollution would complicate attainment of the NAAQS and, accordingly, amended the Clean Air Act.[462] The first provision prevents EPA from giving states credit for building tall stacks designed to disperse pollutants when assessing a given state's compliance. This amendment was intended to incentivize states to require their sources to reduce emissions rather than simply dispersing them.[463] However, the provision was largely ineffective due to EPA's sluggish and industry-friendly implementation.[464]

The second provision, the Good Neighbor Provision, prevents sources in a state from "contribut[ing] significantly to nonattainment" in downwind states.[465] Until recently, this provision was also ineffective at addressing interstate pollution, initially because of foot-dragging by EPA. In the first proceeding involving this provision,[466] Jefferson County, Kentucky, petitioned EPA to find that the Gallagher Power Station, in a neighboring town across the border in Indiana, was violating the Good Neighbor Provision by emitting high levels of sulfur dioxide (SO_2) that prevented Jefferson County from attaining the NAAQS. The facts in this case pointed clearly towards a finding of a violation.[467] The

458. *See* REVESZ ET AL., *supra* note 362, at 476.

459. *See* Richard L. Revesz & Jack Lienke, Opinion, *Here's How the EPA Can Help States with Their Smog Problems*, WASH. POST (May 2, 2017), https://www.washingtonpost.com/opinions/heres-how-the-epa-can-help-states-with-their-smog-problems/2017/05/12/f3650c8c-31bc-11e7-9534-00e4656c22aa_story.html; MD. DEP'T OF THE ENV'T, PETITION TO THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY PURSUANT TO SECTION 126 OF THE CLEAN AIR ACT FOR ABATEMENT OF EMISSIONS FROM 36 COAL-FIRED ELECTRIC GENERATING UNITS AT 19 PLANTS IN FIVE STATES THAT SIGNIFICANTLY CONTRIBUTE TO NONATTAINMENT OF, AND INTERFERE WITH MAINTENANCE OF, THE 2008 OZONE NATIONAL AMBIENT AIR QUALITY STANDARD IN THE STATE OF MARYLAND 11 (2016), https://news.maryland.gov/mde/wp-content/uploads/sites/6/2016/11/MD_126_Petition_Final_111616.pdf.

460. Irene C. Dedoussi et al., *Premature Mortality Related to United States Cross-State Air Pollution*, 578 NATURE 261, 261 (2020); *see also* Leslie Kaufman, *New Yorkers Are Dying from Air Pollution Caused by Other States*, BLOOMBERG NEWS (Feb. 12, 2020, 10:00 AM), https://bnanews.bna.com/environment-and-energy/new-yorkers-are-dying-from-air-pollution-caused-by-other-states?context=search&index=0.

461. Kaufman, *supra* note 460.

462. REVESZ & LIENKE, *supra* note 385, at 89–90.

463. *See id.* at 89 (citing Sierra Club v. EPA, 719 F.2d 436, 440–41 (D.C. Cir. 1983)).

464. *See id.* at 90; Revesz, *supra* note 459, at 2354–58.

465. *See* 42 U.S.C. § 7410(a)(2)(D).

466. The petition was brought under *id.* § 7426.

467. *See* REVESZ & LIENKE, *supra* note 385, at 90–93.

Gallagher Power Station had not implemented any pollution controls.[468] In contrast, the power plant in Kentucky had spent $138 million in purchasing scrubbers to reduce its SO_2 emissions.[469] But, despite this large expenditure, as a result of the emissions from the Gallagher plant, Jefferson County was in nonattainment of the NAAQS for SO_2.[470] And up to 47 percent of the pollution in Jefferson County came from the Gallagher plant.[471]

Nonetheless, EPA denied the petition in 1982, finding that Gallagher was not in violation because only 3 percent of the pollution in the parts of Jefferson County that exceeded the NAAQS came from the Gallagher plant.[472] EPA deemed this amount not to be "substantial" and ignored the much higher contribution elsewhere in Jefferson County.[473] The Sixth Circuit upheld EPA's narrow interpretation of the Good Neighbor Provision, setting the stage for EPA's repeated denial of petitions to enforce the Good Neighbor Provision.[474]

EPA began to take the problem of interstate pollution seriously only in 1997, after Congress in 1990 gave EPA the authority to issue a "SIP call" for previously approved State Implementation Plans that failed to lead to the attainment of the NAAQS.[475] But EPA's foot-dragging was replaced by hostility in the D.C. Circuit, which, in two important cases, struck down EPA's efforts in this regard.[476] It was only in 2014 that the Supreme Court upheld EPA's efforts to control interstate pollution under the Good Neighbor Provision in *EPA v. EME Homer City Generation*.[477]

Yet even after this Supreme Court decision, the Trump administration attempted to undermine its own ability to regulate interstate emissions. In one case, EPA issued an updated rule that would have allowed upwind states to continue significant contributions beyond downwind attainment deadlines, which the agency justified by pointing to scientific uncertainty, administrative infeasibility, litigation delays, and a desire to address the problem incrementally.[478] However, the D.C. Circuit struck down the rule.[479] In another case, EPA declined to consider out-of-state yet relevant monitors for determining nonattainment status,[480] but was, once again, rebuffed by the D.C. Circuit.[481]

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468. *Id.* at 92.
469. *Id.* at 91.
470. *Id.*
471. *Id.* at 93.
472. *See id.* at 92.
473. *See id.* (citing Air Pollution Control Dist. of Jefferson Cty. v. EPA, 739 F.2d 1071, 1076 (6th Cir. 1984)).
474. *See id.* at 95.
475. *See* REVESZ ET AL., *supra* note 362, at 478; 42 U.S.C. § 7410(k)(5).
476. *See* REVESZ ET AL., *supra* note 362, at 485–89.
477. EPA v. EME Homer City Generation, 572 U.S. 489 (2014).
478. *See* Wisconsin v. EPA, 938 F.3d 303, 319 (D.C. Cir. 2019).
479. *See id.* at 309.
480. *See* Maryland v. EPA, 958 F.3d 1185, 1193, 1195 (D.C. Cir. 2020).
481. *See id.* at 1201.

In summary, fifteen years of EPA foot-dragging, from 1982 to 1997, were followed by seventeen years of legal uncertainty, from 1997 to 2014, and then by four years, from 2017 to 2021, of Trump administration efforts to avoid implementing the Supreme Court's *EME Homer City Generation* decision. In the meantime, northeastern states were subject to violations of the NAAQS but were powerless to avoid them, and disadvantaged communities suffered as a result.

3. Mobile Sources

Another challenge to ending nonattainment is the contribution of mobile sources. Mobile sources generally include "vehicles and engines of all sizes, from ships and trains to hand-held lawn and garden equipment," and are responsible for more than half of U.S. air pollution.[482] Compared to 1970, there are more drivers on the road, and those drivers are driving longer distances than in prior decades.[483] This pattern can be partially attributed to both population growth and sprawl development that fostered a dependence on car use.[484] But despite significant reductions in individual car emissions thanks to technological improvements, mobile sources still contribute to about half of U.S. air pollution.[485]

EPA sets uniform national standards for the emissions of new vehicles, which generally preempt states from setting alternate standards.[486] California falls within a narrow statutory exception and is permitted to set more stringent standards, which it has regularly done.[487] Beyond the ability to adopt California's standards,[488] states "have limited authority over mobile source emissions."[489] More stringent emissions standards that regulate new vehicles may not provide an immediate solution to high pollution levels, as older cars with higher emissions remain in circulation.[490] Moreover, some regions, like Southern California and the Salt Lake City area, have geographical features that prevent the dispersion of pollution, leading $PM_{2\,5}$ emissions from mobile sources to remain concentrated within the area and hinder efforts to achieve

482. REVESZ ET AL, *supra* note 362, at 513.

483. *See id.*

484. *See* Joy Herr-Cardillo, *Indirect Source Review Is It a Strategy That Could Help Phoenix Finally Clear Its Air?*, 43 ARIZ. STATE L.J. 735, 741 (2011); S. Wesley Woolf, *Mitigating the Air Quality Impacts of Sprawl in Atlanta*, 15 NAT. RES. & ENV'T 232, 232 (2001).

485. REVESZ ET AL, *supra* note 362, at 513.

486. *See id.* at 519–20.

487. *See id.* at 520.

488. *See id.* at 520, 531–32. For example, thirteen states and the District of Columbia have adopted California's standards for greenhouse gas emissions. *See States Adopting California's Clean Cars Standards*, MD. DEP'T OF THE ENV'T, https://mde.maryland.gov/programs/air/mobilesources/pages/states.aspx (last visited July 23, 2021).

489. FOWLIE ET AL., *supra* note 77, at 8.

490. *See* Andrew P. Morriss et al., *Regulating by Litigation The EPA's Regulation of Heavy-Duty Diesel Engines*, 56 ADMIN. L. REV. 403, 424 (2004).

attainment.[491] Although states struggling with mobile source emissions could impose restrictions on vehicle use, they have generally chosen not to due to the political unpopularity of such measures, which directly affect consumers rather than manufacturers.[492] Even programs that do not directly restrict vehicle use, such as those instituting regular inspection of vehicle emission controls, have been poorly received.[493] Furthermore, given the large quantity of vehicles, additional regulations would entail high administrative costs.[494] These challenges have hampered efforts by states to reduce their pollution levels and target mobile source hotspots.[495]

Attainment of the NAAQS has proven elusive since the passage of the Clean Air Act in 1970 and in the wake of its amendments to emission standards. EPA's lack of political will to enforce penalties and promulgate Federal Implementation Plans, the challenges of regulating interstate emissions, and the political unpopularity of restricting vehicular emissions have all posed barriers to ending nonattainment, which have thus far been insurmountable.

CONCLUSION

On June 10, 2021, EPA announced that it will "move expeditiously to reconsider" the existing NAAQS, taking into account environmental justice and COVID-19-related concerns.[496] The agency highlighted the need to protect "the most vulnerable among us," including people of color, who face disproportionate particulate matter-related health risks.[497] Environmental and public health organizations lauded the decision as a key step in addressing the disproportionately high particulate matter exposure that disadvantaged communities face.[498]

The pending proceeding to reconsider the Trump administration's failure to strengthen the NAAQS for particulate matter provides a forum for positive,

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491. *See* Arnold W. Reitze, Jr., *Utah's Fine Particulate Air Pollution Problem*, 2014 UTAH L. REV. ONLAW 113, 118 (2014); Hannah J. Wiseman, *Remedying Regulatory Diseconomies of Scale*, 94 B.U. L. REV. 235, 266 (2014).

492. *See* Reitze, *supra* note 491, at 134; Morriss et al., *supra* note 490, at 412–13 (citing R.F. Sawyer et al., *Mobile Sources Critical Review 1998 NARSTO Assessment*, 34 ATMOSPHERIC ENV'T 2161, 2178 (2000)).

493. *See* Morriss et al., *supra* note 490, at 413.

494. *See id.*

495. *See* FOWLIE ET AL., *supra* note 77, at 8; Reitze, *supra* note 491, at 133.

496. News Release, EPA, EPA to Reexamine Health Standards for Harmful Soot That Previous Administration Left Unchanged (June 10, 2021), https://www.epa.gov/newsreleases/epa-reexamine-health-standards-harmful-soot-previous-administration-left-unchanged. The agency noted that it will accelerate the process by supplementing the 2019 Integrated Science Assessment rather than drafting an entirely new one. *See id.*

497. *Id.*

498. *See* Samantha Hawkins, *Biden EPA to Reexamine Trump Air Quality Standards for Soot*, COURTHOUSE NEWS SERV. (June 10, 2021), https://www.courthousenews.com/biden-epa-to-reexamine-trump-air-quality-standards-for-soot/.

concerted action by groups that, in the past, have often not worked together productively. While the quality of the ambient air has been a longstanding concern for the traditional mainstream environmental groups,[499] as this Article shows,[500] it has not to date been a core environmental justice concern. Similarly, concerns over climate change have devoted inadequate attention to the negative consequences of particulate matter emissions, even though more stringent controls of this pollutant are highly correlated with reductions in greenhouse gases.[501]

In addition to bringing to bear the power and influence of environmental justice groups in the upcoming proceeding, a broader agenda needs to be pursued to end institutionalized nonattainment. This agenda must ensure that placement of air quality monitors does not mask the problem. And it must address the agency pathologies and legal doctrines that have condoned the institutionalization of nonattainment of the NAAQS. The lessons of the COVID-19 pandemic and the Biden administration's genuine interest in issues of justice and equity potentially make this time a propitious one for significant change.

499. *See* Jedediah Purdy, *The Long Environmental Justice Movement*, 44 ECOLOGY L.Q. 809, 849–50 (2018).

500. *See supra* Part I.

501. *See* David J. Hayes & Richard L. Revesz, *The Other Public Health Crisis*, THE HILL (Oct. 23, 2020, 3:30 PM), https://thehill.com/opinion/energy-environment/522458-the-other-public-health-crisis.