Richmond Public Interest Law Review

Volume 27 | Issue 3 Article 6

7-8-2024

# From Community Science to Community Justice: Protecting Data Usability in Community Air Quality Monitoring Networks

Marley Manjarrez

# FROM COMMUNITY SCIENCE TO COMMUNITY JUSTICE: PROTECTING DATA USABILITY IN COMMUNITY AIR QUALITY MONITORING NETWORKS

*Marley Manjarrez*[*]

[*] Marley Majarrez is a third-year law student at the University of Richmond School of Law. Before law school, Marley worked in non-profit food justice programming at both the non-governmental organization ("NGO") and community scale. Throughout law school, Marley had the opportunity to contribute to the work of many organizations critical to the Richmond community. This includes the City of Richmond's Office of Sustainability, Central Virginia Legal Aid Society and VCU Health's Medical-Legal Partnership, and the Chesapeake Bay Foundation. Passionate about environmental and food justice, after graduating Marley hopes to continue to participate in the democratization of policy development in the non-profit and local government sectors.

## ABSTRACT

*Community science holds significant promise for empowering communities to address air quality disparities and advocate for policy change. However, the usability and legal defensibility of community-collected data pose significant challenges. This article argues that with the help of low-cost tools such as air quality monitors, community members can take an active role in combating the disproportionate distribution of air pollutants hidden by our current regulatory scheme. By examining the regulatory frameworks under the Clean Air Act and opportunities for procedural justice at federal, state, and local levels, the article identifies pathways for incorporating community-collected data into air quality regulation and environmental justice initiatives. It emphasizes the need for collaboration between community scientists, regulatory agencies, and local governments to develop and implement quality assurance protocols that ensure the credibility and effectiveness of community-led air quality monitoring efforts. Through proactive engagement and adherence to quality assurance standards, community science can emerge as a powerful tool for advancing environmental justice and promoting healthier, more equitable communities.*


## INTRODUCTION

On a cloudy October evening I arrived at a park in Richmond's Woodland Heights neighborhood. At our meeting point, the Community Science Catalyst for the Science Museum of Virginia, handed a mobile air quality monitor to me and my fellow volunteers. We then strolled through winding streets talking about community projects and how the city has changed over the years. We visited the Fonticello Food Forest, a community gardening project, and learned about efforts the neighborhood is taking to improve their park.1 Learning about community development projects was not a planned part of the evening's event, however, spontaneous opportunities to learn about your city are inherent in the community science process.

We met that evening as part of the Science Museum's RVAir Initiative.[2] This program hosts regular walks in different Richmond neighborhoods.[3] Participants wear mobile air quality monitors while walking through city parks and streets.[4] They learn about the local air quality and how it can differ

[1] *See Fonticello Food Forest*, https://www.fonticellofoodforest.com/ (last visited Oct. 5, 2023).
[2] *See generally RVAir*, SCI. MUSEUM OF VA., https://smv.org/learn/rvair/ (last visited Oct. 5, 2023).
[3] *See id.*
[4] *Id.*

neighborhood by neighborhood or even block by block.

On our walk we learned that citizen science is "the practice of public participation and collaboration in scientific research to increase scientific knowledge."[5] It is typically led by scientists and researchers.[6] By contrast, community science is a collaboration. Community members "leverage scientific research" with the goal of "advanc[ing] community priorities and benefit[ing] from knowledge and advancements of science and engineering."[7] The RVAir Initiative is a collaboration between the Science Museum and Richmond residents to explore the city's air quality and ensure it meets community needs.[8] Community science projects like these serve many purposes. In addition to providing a new way to engage with others, documenting air quality variances by neighborhood fills gaps left open by our current regulatory system.

Under the current cooperative federalism structure of the Clean Air Act (CAA), the Environmental Protection Agency (EPA) identifies which air pollutants need to be monitored and the acceptable levels for each pollutant in our air.[9] States then create implementation plans to meet the National Ambient Air Quality Standards (NAAQS).[10] Both the federal and state governments monitor whether the plans are meeting their goals through the same mechanism: air quality monitors placed miles apart.[11] The monitors take the average pollution levels of large geographic areas and this information becomes the basis for future permitting and policy decisions.[12] What these monitors fail to capture are the differences in air quality from one street to the next–the "hyper-local" variances in air quality.[13] Because that data is missing, the monitors make disparate exposure to air pollution invisible. Legal scholar, Ann Carlson, labeled these data gaps the "Blind Spots" of the CAA.[14] In hopes of continuing that conversation, this article first explores how to increase the legal usability of community-collected data

[5] Devin Jefferson, Address to RVAir Meetup Participants, Cmty. Sci. Catalyst., Sci. Museum of Va. (Oct. 10, 2022).

[6] *Id.*

[7] *Id.*

[8] *See RVAir*, *supra* note 2.

[9] *Clean Air Act (CAA) Compliance Monitoring*, EPA, https://www.epa.gov/compliance/clean-air-act-caa-compliance-monitoring (last visited Oct. 8, 2023).

[10] *Summary of the Clean Air Act*, EPA, https://www.epa.gov/laws-regulations/summary-clean-air-act (last updated Sept. 6, 2023).

[11] *See AirData Air Quality Monitors*, EPA, https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=5f239fd3e72f424f98ef3d5def547eb5&extent=-146.2334,13.1913,-46.3896,56.5319 (last visited Oct. 25, 2022).

[12] *See* Ann E. Carlson, *The Clean Air Act's Blind Spot: Microclimates and Hotspot Pollution*, 65 UCLA L. REV. 1036, 1067-68 (2018).

[13] *Id.* at 1040-42.

[14] *Id.* at 1036.

as well as the potential role community science can play in filling the CAA's Blind Spots.

There are many sources of air pollution, such as traffic, industrial factories, agriculture, and construction.[15] The proximity to these sources of air pollution is not equally shared by all communities. Primarily non-white communities are more likely to be located near pollution sources and therefore exposed to more pollutants on a daily basis.[16] A 2021 report demonstrates that primarily white communities experience lower-than-average exposure to pollutants and primarily non-white communities experience higher-than-average exposure levels.[17] Historically, real estate practices like redlining and racial covenants confined non-white communities to specific neighborhoods.[18] These neighborhoods experienced disinvestment from local and state governing bodies, or were intentionally destabilized.[19] In Richmond, the highway running through Jackson Ward serves as a monument to racist actions by government officials against the Black community.[20] The highway has lasting consequences on the air quality, and in turn, the health of community members.[21]

While the EPA acknowledges the existence of the air quality disparity, it is unclear what accountability and remediation should look like under our current regulatory model. The data used to set and revise NAAQS is missing the hyper-local data variances (the "Blind Spots").[22] Filling the Blind Spots could provide clarity and context to the causes and extent of disparate exposure. However, without adequate quality assurance measures, none of the data is usable for enforcement or policy creation.

A Quality Assurance Project Plan (QAPP) is an essential component to overcoming the regulatory hurdles that inhibit the use of community data. Without a QAPP, data carefully collected over many years is unusable both

[15] Christopher W. Tessum et al., *Pm2.5 Polluters Disproportionately and Systemically Affect People of Color in the United States*, SCI. ADVANCES, Apr. 28, 2021, at 1, https://www.science.org/doi/epdf/10.1126/sciadv.abf4491.

[16] *See generally id.*

[17] *See id.*

[18] *See* Daniel Cusick, *Past Racist "Redlining" Practices Increased Climate Burden on Minority Neighborhoods*, E&E NEWS (Jan. 21, 2020), https://www.scientificamerican.com/article/past-racist-redlining-practices-increased-climate-burden-on-minority-neighborhoods/.

[19] *See, e.g.*, Lylla Younes et al., *Poison in the Air*, PROPUBLICA (Nov. 2, 2021), https://www.propublica.org/article/toxmap-poison-in-the-air.

[20] *See* Samantha Willis, *The "Gibraltar of Jackson Ward"*, VPM (Mar. 31, 2022), https://www.vpm.org/news/2022-03-31/the-gibraltar-of-jackson-ward.

[21] *See Living Near Highways and Air Pollution*, AM. LUNG ASS'N, https://www.lung.org/clean-air/outdoors/who-is-at-risk/highways (last updated Nov. 2, 2023).

[22] *See* Carlson, *supra* note 12, at 1060.

in court to hold polluters accountable, and in regulatory decision-making.[23] A QAPP requires a high degree of commitment and knowledge early in a community science planning process.[24] It is needed before one even purchases an air quality monitor. This requirement can present a challenge to community-led groups. However, many regulatory agencies, including the EPA, provide guides, videos, and templates to assist the QAPP process.[25]

The full potential of what change is possible through community-collected and quality-assured data is ripe for exploration. While the CAA creates many Blind Spots for obtaining needed data, it also creates openings. No specific provisions prohibit the use of reliable data based on the collection source. Additionally, the current rhetoric at the EPA suggests new prioritization of information from community-led research.[26] Now more than ever, initiatives like RVAir have funding opportunities and regulatory recognition, assuming the first step a community takes is to create a QAPP.[27]

This article argues that with the help of low-cost tools such as air quality monitors, community members can take an active role in charting and combating the disproportionate distribution of air pollutants hidden by our current regulatory scheme. However, without adequate quality assurance protections, data is presumptively inaccurate and thus not usable for policy creation. Within our existing legal framework, quality assurance is an essential component of effective environmental democratization, especially when challenging the distributive injustice of air pollution. Part I of this article discusses the unequal distribution of pollution and the resulting human harm. It looks at how our current regulatory system maintains this disparate impact. Part II explores the role community science can play in self-advocacy. Part III reviews the essential role of quality assurance in community-based reform. Part IV advances procedural entry points for reliable air quality data at the federal, state, and local level.

---

[23] *See, e.g.*, Miss. Comm'n. on Env't. Quality v. Env't Prot. Agency, 790 F.3d 138, 155-56 (D.C. Cir. 2015).

[24] *See Quality Assurance Handbook and Toolkit for Participatory Science Projects*, EPA, https://www.epa.gov/participatory-science/quality-assurance-handbook-and-toolkit-participatory-science-projects#video (last updated June 6, 2023).

[25] *See id.*

[26] *See* ENV'T PROT. AGENCY, GUIDANCE ON CONSIDERING ENVIRONMENTAL JUSTICE DURING THE DEVELOPMENT OF AN ACTION (2015).

[27] *Frequently Asked Questions: Quality Assurance Project Plans*, EPA, https://www.epa.gov/participatory-science/frequently-asked-questions-quality-assurance-project-plans (last updated June 6, 2023); *see generally RVAir*, *supra* note 2.

## I. ENVIRONMENTAL INJUSTICE UNDER THE CLEAN AIR ACT

Our current methods of regulating air quality do not adequately protect the health and welfare of United States residents. The CAA is the primary statutory tool for federal control over air quality.[28] Originally passed in 1963, and greatly expanded in 1970, the CAA enables the EPA to set NAAQS.[29] The EPA defines ambient air as the "portion of the atmosphere, external to buildings, to which the general public has access."[30] This includes all air someone can breathe when they are outside. However, since establishing NAAQS, uniform adherence to these standards is not within reach and many cannot walk outside without breathing harmful pollutants.[31]

### *A. Regulating Air Quality Through the Clean Air Act*

The CAA provides the EPA with a tool to regulate ambient air. It "authorizes EPA to establish National Ambient Air Quality Standards (NAAQS)" that limit the permissible volume of identified pollutants in the ambient air.[32] The CAA tasks the EPA with identifying which pollutants must be regulated through NAAQS.[33] Pollutants requiring regulation are, among other things, any that "endanger public health and welfare."[34] The EPA creates the regulations considering "the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects . . . which may be expected from the presence of such pollutant in the ambient air."[35] To date, the EPA has identified carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide as being harmful to human health and in need of regulation.[36]

Enforcement of the NAAQS operates through a cooperative federalism

---

[28] *Evolution of the Clean Air Act,* EPA, https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20legal%20authority%20for%20federal,Clean%20Air%20Act%20(CAA) (last updated Nov. 21, 2023).

[29] *Id.*; *see Summary of the Clean Air Act, supra* note 10.

[30] 40 C.F.R. § 50.1 (2016).

[31] *See Ambient (Outdoor) Air Pollution*, WORLD HEALTH ORG. (Dec. 19, 2022), https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health*; see generally Nonattainment Areas for the Criteria Pollutants*, EPA, https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=8fbf9bde204944eeb422eb3ae9fde765 (last visited Oct. 8, 2023).

[32] *Summary of the Clean Air Act, supra* note 10.

[33] 42 U.S.C. § 7408(a)(1); *see id.*

[34] 42 U.S.C. § 7408(a)(1)(A).

[35] *Id.* § 7408(a)(2).

[36] *See NAAQS Table*, EPA, https://www.epa.gov/criteria-air-pollutants/naaqs-table (last updated Mar. 15, 2023).

model.[37] The CAA delegates each state to draft a State Implementation Plan ("SIP") for "implementation, maintenance, and enforcement" of the NAAQS.[38] In a SIP, a state demonstrates how it will maintain air quality in order to remain in attainment, or come into attainment, with the NAAQS.[39] SIPs establish attainment areas—areas that meet the NAAQS for a specific criteria pollutant—and non-attainment areas., which do not meet those standards.[40] State and federal governments monitor attainment status with air quality monitors throughout the country.[41] The collected air quality data is also online, available for public access.[42] Individuals can go online and look up the air quality for their town, but the data cannot provide more nuanced results, like the quality of the air a person is breathing when they walk to the bus in the morning.

The NAAQS are insufficient for capturing hyper-local air pollution. Measurements determining NAAQS attainment are based on averages taken from large geographic areas.[43] For example, the city of Richmond is monitored by two sensors miles apart.[44] Unfortunately, air quality can differ block by block.[45] With data retrieved by averages from widely spaced monitors, regulators may not have access to data that would corroborate "complaints of residents who can smell the chemicals and regularly experience a respiratory problem."[46] Additionally, this missing hyper-local data can lead to "systematic underreporting errors in emissions measurements."[47] The disproportionate exposure levels of air pollution experienced by non-white communities may never show up on these monitors because air quality can vary so greatly from one street to the next. The direct air quality impacts of bisecting a community with a highway, for example, are invisible under our current regulatory scheme.[48]

---

[37] *The Evolution of Cooperative Federalism*, TUL. UNIV. L. SCH. (Apr. 15, 2021), https://online.law.tulane.edu/blog/the-evolution-of-cooperative-federalism (describing cooperative federalism as a governing model that "requires state and national governments to share power and collaborate on overlapping functions."); *see also* Carlson, *supra* note 12, at 1067.

[38] 42 U.S.C. § 7410(a)(1).

[39] *See id.* at § 7410(a)(2)(C).

[40] *See id.*

[41] *See AirData Basic Information*, EPA, https://www.epa.gov/outdoor-air-quality-data/air-data-basic-information (last updated Dec. 8, 2023).

[42] *See id.*

[43] *See* Carlson, *supra* note 12, at 1060.

[44] *See AirData Air Quality Monitors*, *supra* note 11.

[45] Carlson, *supra* note 12, at 1040-41.

[46] *Id*. at 1047-48.

[47] *Id*. at 1059.

[48] *Id*. at 1060-61.

### *B. Impacts of Pollution Exposure*

The EPA estimates that in 2021, roughly 102 million people in the United States lived in counties that did not meet the air quality standards established by NAAQS.[49] Additionally, a ProPublica study aggregating EPA data from 2014 to 2018 found "1,000 toxic hot spots across the country."[50] Approximately 250,000 people live in these hotspots and are potentially, in their own neighborhoods, exposed to toxic air pollutants that create a cancer risk beyond what EPA deems acceptable.[51] In the words of a former EPA scientist, the "EPA allows a hell of a lot of pollution to occur that the public does not think is occurring."[52] Furthermore, with shifting political administrations and changing standards, the future of air quality is uncertain. For the first time in decades, the United States reversed the trend of achieving cleaner air each year, when in 2019 the country saw a 5.5% increase in particulate matter pollution.[53]

Air pollution can be an invisible and abstract threat; however, the impacts of air pollution have very tangible and devastating consequences. A 2019 study found a "significant link" between people who are regularly exposed to air pollution and the increased risk of experiencing a miscarriage."[54] Heavy exposure to air pollutants has also been linked to worsening heart disease—by "narrowing of blood vessels" and steady thickening of artery walls—and an increased risk for stroke.[55]

One specific pollutant, PM 2.5, defined as "tiny particles or droplets in the air that are two and one-half microns or less in width," is particularly harmful when inhaled. An increased PM 2.5 exposure of five micrograms per cubic meter is equivalent to just over one-quarter of the decreased lung capacity caused by smoking and can be four times greater than the impact of secondhand smoke.[56] PM 2.5 is also associated with a 7.3% increase in the mortality rate of Medicare enrollees.[57] The health impacts of air pollution are

---

[49] *Air Quality - National Summary*, EPA, https://web.archive.org/web/20221019190814/https://www.epa.gov/air-trends/air-quality-national-summary (last updated June 1, 2022).

[50] Al Shaw & Lylla Younes, *The Most Detailed Map of Cancer-Causing Industrial Pollution in the U.S.*, PROPUBLICA, https://projects.propublica.org/toxmap/ (last updated Aug. 28, 2023).

[51] Younes et al., *supra* note 19.

[52] *Id*.

[53] Nadja Popovich, *America's Air Quality Worsens, Ending Years of Gains, Study Says*, N.Y. TIMES (Oct. 24, 2019), https://www.nytimes.com/interactive/2019/10/24/climate/air-pollution-increase.html.

[54] Amy Qin, *Air Pollution Is Linked to Miscarriages in China, Study Finds*, N.Y. TIMES, (Oct. 14, 2019), https://www.nytimes.com/2019/10/14/world/asia/china-air-pollution-miscarriages-study.html.

[55] Deborah Blum, *Air Pollution as a Heart Threat*, N.Y. TIMES: WELL BLOG (Nov. 15, 2013), https://archive.nytimes.com/well.blogs.nytimes.com/2013/11/15/an-airborne-heart-threat/; Nicholas Bakalar, *Air Pollution Raises Stroke Risk,* N.Y. TIMES: WELL BLOG (Mar. 24, 2015), https://archive.nytimes.com/well.blogs.nytimes.com/2015/03/24/air-pollution-raises-stroke-risk/.

[56] Bakalar, *supra* note 55.

[57] Carlson, *supra* note 12, at 1053.

severe and worthy of concern. However, not all communities share the same degree of risk.

### *C. The Unequal Distribution of Air Pollution*

Non-white communities experience greater exposure to air pollution than white communities. Census tracts identified as mostly white have forty percent less cancer-causing air pollution than those that are not.[58] Additionally, census tracts with primarily Black residents experience double the toxic air pollution as primarily white communities.[59] A 2021 report demonstrates that People of Color (POC) experience PM 2.5 exposure at a higher-than-average rate, while the exposure of white people is lower than average.[60] Regardless of household income, POC communities are "disproportionately exposed by the majority of [pollution] sources."[61] The same study found that this trend is also not industry specific. Due to their proximity to all sources of pollution, POC communities experience higher PM 2.5 exposure regardless of whether the source is an industrial factory, agriculture, transportation, or construction.[62]

Proximity to major roadways has a dramatic impact on the levels of pollution exposure. Families that live within 500 meters of a major road are exposed to more pollutants than those outside of that zone.[63] This is especially true during rush hour.[64] Proximity to roadways has such a drastic impact on air quality that, on average, those who live downwind from Memphis highways breathe air worse than Southern California—the area the EPA has recognized as having the worst air quality in the country.[65] Proximity to highways is also a distributive justice concern. Latinx, Black, and Asian/Pacific Islander communities are more likely to live near freeways than primarily white communities.[66] In many cases, this trend did not occur by accident.[67] For example, Richmond's historic Jackson Ward neighborhood, a thriving Black community, was intentionally bisected by Interstate 95 in the 1950s.[68] This did not just destabilize a community by cutting it in half, it also attacked the community's health through increased pollution exposure.

---

58 Younes, *supra* note 19.
59 *Id.*
60 Tessum et al., *supra* note 15 at 1.
61 *Id.*
62 *Id.*
63 Carlson, *supra* note 12, at 1056-57.
64 *Id.* at 1045.
65 *Id.* at 1047.
66 *Id.*
67 Younes, *supra* note 19.
68 Willis, *supra* note 20.

### *D. Air Pollution in the Environmental Justice Framework*

The increased air pollution exposure experienced by non-white communities contradicts the EPA's stated environmental justice goals. Environmental justice is the "simultaneous pursuit of both social justice and environmental protection"[69] It acknowledges that many communities were excluded from policy and decision-making when distributing environmental protections and harms.[70] In the words of Navajo President Joe Shirley Jr., "environmentalists are good at identifying problems but poor at identifying feasible solutions . . . Most often they don't try to work with us[,] but against us."[71] The exclusion of many communities leads to suboptimal policy creation and ultimately environmental racism.[72] Environmental racism is "any policy, practice or directive that differentially affects or disadvantages (whether intended or unintended) individuals, groups, or communities because of their race or color."[73] Air pollution policies, intentional or otherwise, ensure clean air for primarily white communities and shift costs to communities of color.[74]

The environmental justice framework looks at both distributive and procedural justice. When looking at distributive justice, it considers "to what extent justice in this context is distributive."[75] Distributive justice addresses the distribution of harmful pollutants, or the lack thereof. When looking at the distributive justice or injustice of air pollution, we have to ask whether all communities are exposed to the same levels of air pollution, or whether there are "disproportionate public health and environmental risks borne by people of color."[76] From the previously discussed data, it is evident that there are disproportionate public health and environmental risks borne by People of Color from the unequal exposure to harmful air pollutants.[77]

An environmental justice framework also asks "whether and to what extent justice amounts to procedural protection (e.g., increased transparency and participation)."[78] Distributive justice is "intimately interlinked" with procedural justice.[79] Procedural justice requires that communities are

---

[69] Brigham Daniels et al., *Just Environmentalism*, 37 YALE L. & POL'Y REV. 1, 11 (2018).

[70] *Id.* at 20-21.

[71] *Id.* at 48.

[72] *Id.* at 51.

[73] ROBERT D. BULLARD, THE QUEST FOR ENVIRONMENTAL JUSTICE: HUMAN RIGHTS AND THE POLITICS OF POLLUTION, 32 (2005).

[74] *See id.*

[75] Daniels et al., *supra* note 69, at 13.

[76] Robert R. Kuehn, *A Taxonomy of Environmental Justice*, 30 ENV'T L. REP. 10681, 10684 (2000).

[77] Tessum, *supra* note 15, at 3.

[78] Daniels et al., *supra* note 69, at 13.

[79] *Id*. at 46.

involved in making environmental decisions that impact them, especially vulnerable communities.[80] This means the community has a voice in identifying the location of pollution sources, and determining environmental reform policies and remediation tactics.[81] Without procedural justice, primary stakeholders are excluded from decision-making, and subsequent inefficiencies or unintended consequences can lead to community distrust in policymakers, or even substantial community harm. Distributive justice and procedural justice work together because "redistribution without empowerment can be short-lived, and empowerment without redistribution can be an insult."[82] In the United States, the Blind Spots that hide the unequal distribution of air pollution advance distributive injustice. Failing to include those most impacted in regulatory reform advances procedural injustice.

The EPA has defined environmental justice goals. In 1990, the agency established an Office of Environmental Equity, now the Office of Environmental Justice.[83] The agency defines environmental justice as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[84] The EPA has also recognized that air pollution has environmental justice implications. In discussing the fact that communities with high concentrations of air pollutants tend to be majority POC populations, EPA's Director of Environmental Justice under the Biden Administration said, "these places didn't happen by accident… [t]hese places were created."[85]

On its face, a representative of the federal government stating "these places didn't happen by accident" feels like accountability, or at least acknowledgment.[86] However, the next question becomes, how does the disparity in air pollution exposure still exist when our primary regulatory agency is aware of the problem? This is certainly a complex question with massive arrows pointing at procedural injustice; however, our current method of regulating air quality is also a contributing factor. With insight into hyper-local air quality missing, and the government's apparent unwillingness to take necessary steps toward rectification, some have turned to community science to fill the Blind Spots left by the government.

---

[80] *See* Kuehn, *supra* note 76, at 10688.

[81] Daniels et al., *supra* note 69, at 71.

[82] *Id.* at 46.

[83] *See generally Environmental Justice*, EPA, https://www.epa.gov/environmentaljustice (last updated Nov. 15, 2023).

[84] *Id.*

[85] Younes, *supra* note 19.

[86] *Id.*

## II. SELF-ADVOCACY THROUGH COMMUNITY SCIENCE

### *A. Community Science as a Launching Point for Change*

Community science is scientific research grounded in community member collaboration. Community members "conduct and leverage scientific research and technological innovation to advance community priorities."[87] In this research method, the community, not remote policymakers, examine and weigh "ethical considerations and trade-offs" and "help construct solutions for [sic] in order to ensure relevance and equity."[88] Community science at its best can ensure environmental policies are created by and "empower the public" as well as achieve "firm compliance with higher environmental standards."[89] Community science is procedural justice through science. It can be used to fill gaps in NAAQS data and other existing air quality control measures.

Filling data Blind Spots is a launching point for meaningful change. First, it can make disparity visible. Second, it can introduce accountability politics. Publicizing the discrepancy between the public statements of industries or government entities and their actual behavior may create political pressure.[90] This opens the door for many potential areas of impact such as public criticism, consumer purchasing habits and investment viability.[91] Third, better data can peak the interest of resourced advocates like non-governmental organizations (NGOs) or universities.[92] Finally, filling Blind Spots can potentially mobilize politicians.[93] For air quality regulation, data retrieved through community science can shift the power from regulators to community researchers by giving the community grounded talking points, and the ability to "contest official accounts of environmental quality."[94]

### *B. Existing Community Science Efforts*

Community-collected data is not new. The state of Wisconsin leveraged the passion of local advocates and created a water-monitoring program in

---

[87] Community Science Initiative, *Introduction to Community Science*, ASS'N. OF SCI. & TECH. CTRS., https://communityscience.astc.org/overview/ (last visited Oct. 9, 2023).

[88] *Id.*

[89] Christine Overdevest & Brian Mayer, *Harnessing the Power of Information through Community Monitoring: Insights from Social Science*, 86 TEX. L. REV. 1493, 1498 (2008).

[90] *See id.*

[91] *See id.* at 1502.

[92] *See id.*

[93] *Id.*

[94] *Id.* at 1497.

collaboration with local communities.[95] In this program, water-monitoring volunteers "were likely to participate in 75% more local political activities related to the environment."[96] Additionally, community researchers that regularly participated "knew more than twice as many people in the local community who they felt understood local water-quality issues" than those who rarely or ever participated.[97] Through this collaboration, the state and community members found multiple levels of success because the partnership allowed for more thorough data collection, lead to stronger community cohesion, and increased understanding of the water quality generally.[98]

While the Wisconsin community data project was initiated by the state, many activist communities are collecting data independent of the government. Communities have or are currently using community science to self-advocate to local decision makers for improved air quality. Air Alliance Houston (AAH) is a community advocacy organization with a mission to "reduce the public health impacts from air pollution through research, education, and advocacy."[99] The organization built a community-based air monitoring network that uses a combination of "anchor monitors and more widely distributed PurpleAir sensors" in five Harris County Communities.[100] AAH's strategic focus includes building healthy communities and advocating for policies that decrease reliance on car travel, leverage electrification technologies, and support health equity."[101] Community science is central to AAH's strategy for increased education and outcomes in Houston communities.

Community science has even led to policy creation and support from local regulatory agencies. In 2008 the Los Angeles Collaborative for Environmental Health and Justice initiated a "ground-truthing" campaign where residents collected community data on environmental hazards.[102] Through informational workshops, community researchers were taught to locate and compare "emissions sources against government databases and

---

[95] *See* Overdevest & Mayer, *supra* note 89, at 1503.

[96] *Id.*

[97] *Id.* at 1503-04.

[98] *Id.*

[99] *Air Alliance Houston Strategic Plan Summary 2020-2024*, AIR ALL. HOUS., https://airalliancehouston.org/wp-content/uploads/2023/11/Strategic-Plan-Summary.pdf (last visited Nov. 21, 2023).

[100] Jennifer Hijazi, *Community Air Monitoring Is an 'Inevitable' Issue for Industry*, BLOOMBERG L. (Dec. 8, 2021), https://www.bloomberglaw.com/bloomberglawnews/environment-and-energy/XBGOEIBK000000?bna_news_filter=environment-and-energy#jcite.; *see* PURPLEAIR, https://www2.purpleair.com/ (last visited Nov. 21, 2023) (low-cost air quality sensors).

[101] *Air Alliance Houston Strategic Plan Summary 2020-2024*, *supra* note 99.

[102] ANA ISABEL BAPTISTA ET. AL., LOCAL POLICIES FOR ENVIRONMENTAL JUSTICE: A NATIONAL SCAN 24-25 (Tishman Env't and Design Ctr. ed., 2019).

then map[ped] where pollution sources and sensitive uses were missing from the data."[103] The data retrieved from this campaign informed a report that demonstrated the extent of the undocumented pollution and community conditions. The city of Los Angeles used recommendations from this report in a 2016 "Clean Up Green Up" campaign.[104] The changes included new laws imposing additional citywide code requirements.[105]

While community science may seem like a powerful antidote for procedural, and even distributive, injustice, the utility of community science is not universally appreciated.[106] Community science as a mechanism for improving environmental conditions sits squarely in the environmental justice framework. Critics of environmental justice do not find value in providing government funding to environmentally-minded community groups for education and outreach.[107] Some regulated agencies have gone far enough to suggest that "increased public participation is not appropriate" and draw concerns about research from non-experts.[108] One of the primary concerns with non-expert research is data quality.[109] Data quality, or proving data reliability, is also one of the primary barriers to policy change originating from community air monitoring data.[110]

## III. UNDERSTANDING AND OVERCOMING THE QUALITY ASSURANCE HURDLE

Monitoring air quality is different than generating usable data. Air quality monitors can give a sense of security or safety. Perhaps if the monitors show the air is polluted, officials will use these findings to keep you safe.[111]

---

[103] *Id.* at 24-25.

[104] Olivier F. Theard, *New LA Ordinances "Clean Up, Green Up" Industry in Residential "Toxic Hotspot" Neighborhoods*, LEXOLOGY (May 23, 2016), https://www.lexology.com/library/detail.aspx?g=2a3891cb-83da-4591-bfbc-cc4aee6163ce*; see* Cal. Green Zones, *Los Angeles: Clean Up Green Up*, Cal. ENV'T JUST. ALL., https://calgreenzones.org/los-angeles-clean-up-green-up/ (last visited Nov. 21, 2023) (LA's Clean Up Green Up campaign seeks to "minimize the overconcentration of environmental hazards in overburdened neighborhoods, reduce pollution, and help businesses clean up and green up their operations while still retaining and creating more jobs in the neighborhood.").

[105] Theard, *supra* note 104.

[106] *See* Younes, *supra* note 19.

[107] Kuehn, *supra* note 76, at 10693.

[108] *Id.*

[109] *See* Lisa Song & Lylla Younes, *Air Monitors Alone Won't Save Communities From Toxic Industrial Air Pollution*, PROPUBLICA (May 18, 2022), https://www.propublica.org/article/air-monitors-alone-wont-save-communities-from-toxic-industrial-air-pollution.

[110] *Id.*

[111] *Id.*

However, air quality monitors can "serve as false promises."[112] If today you purchased and carefully installed an air quality monitor, the information you collect will not be usable for holding polluters legally accountable or making policy resilient to legal challenges.[113] This data is not usable because there are no preemptive measures proving data quality. Without quality assurance measures, communities may invest years into data collection to later find that regulators do not view the information as credible, and the data is not resistant to legal challenges presented to prove inaction or violation.

### *A. Quality Assurance Casualties*

Precedent demonstrates the difficult legal challenges facing data collected without adequate quality assurance measures.[114] This is true whether communities or government entities collect data, as exemplified by an enforcement attempt by state officials in Calvert City, Kentucky.[115] Between 2005 and 2007, state regulators installed five monitors in Calvert City.[116] This project contained "way more air monitoring than what's required by any EPA program."[117] However, when seeking enforcement from a nearby vinyl plant, the EPA found "the state had never created a quality-assurance plan for the monitors, detailing the procedures to ensure that the collected data was reliable and accurate."[118] The EPA found that the lack of quality assurance measures "may affect the potential legal defensibility of the prior data collected."[119] After arriving at that conclusion, the EPA pursued no enforcement action against the vinyl plant.[120]

A foundational case in evidentiary requirements, *Daubert v. Merrell Dow Pharmaceutical*, established guidelines for data usability in courts.[121] Interestingly, the United States Supreme Court in *Daubert* did not "inherently disqualify" community-collected data.[122] However, it did set data quality parameters.[123] *Daubert* held that scientific expert testimony must be rooted in valid scientific methods supported by "duly qualified experts."[124] Within the context of air quality monitoring, the *Daubert* standard considers both the

---

[112] *Id.*
[113] *Id.*
[114] *See, e.g., Miss. Comm'n on Env't Quality*, 790 F.3d at 155-56.
[115] Song & Younes, *supra* note 109.
[116] *Id.*
[117] *Id.*
[118] *Id.*
[119] *Id.*
[120] *Id.*
[121] *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).
[122] George Wyeth et al., *The Impact of Citizen Environmental Science in the United States*, 49 ENV'T L. REP. 10237, 10245 (2019).
[123] *Id.*
[124] *Id.*; *Daubert*, 509 U.S. at 579.

scope of the data collection and the planned use for the findings.[125] The quality of both the protocols and the monitors will require validation through expert testimony.[126] However, under *Daubert*, if a project follows "approved scientific protocols in performing data collection" it has a significantly greater probability of legal resilience.[127]

In *Mississippi Commission on Environmental Quality v. Environmental Protection Agency*, the importance of data quality assurance was further underscored. In that case, the plaintiff argued that the EPA must consider privately collected air quality data when determining whether an area is in attainment of the NAAQS.[128] The Court disagreed, holding the EPA had no obligation to "base its designations on data it reasonably considers to be unsound."[129] Furthermore, the data was reasonably unsound because it "lacked quality assurance data needed to verify and audit."[130] *Mississippi Commission on Environmental Quality* established that any community-collected data must meet the admissibility requirements of expert testimony established in Federal Rule of Evidence 702."[131] Calvert City, *Daubert*, and *Mississippi Commission on Environmental Quality* demonstrate the challenges to using community-collected data. Without demonstrated reliability, time and resources can be spent without a legal return. Quality assurance is necessary for enforcement based on community data.[132] However, recognizing the utility of quality assurance gives little insight into how communities can ensure data quality.

### *B. Creating a Quality Assurance Project Plan*

According to federal agency employees, "data quality [is] a significant barrier" to the ability to use community science data.[133] One avenue of tackling this barrier is utilizing the federal quality assurance regulations on data collection. Under the CAA, the EPA has promulgated rules regulating air quality monitoring and quality assurance requirements.[134] Although these requirements were written to regulate state agencies (rather than community groups), they can be adapted and applied to community groups. It is also important to note that state agency data collected in accordance with these

125 Wyeth, *supra* note 122, at 10245.
126 *Id.*
127 *Id.*
128 *Miss. Comm'n on Env't Quality*, 790 F.3d at 155-56.
129 *Id.* at 154.
130 *Id.*
131 *Id.* at 155.
132 *Id.;* Song & Younes, *supra* note 109; *Daubert*, 509 U.S. at 579.
133 Wyeth, *supra* note 122, at 10245.
134 Ambient Air Quality Surveillance, 40 C.F.R. App. A(f) (2.1.2) to pt. 58 (2006).

regulations is admissible for legal challenges and policy creation.[135] Adhering to these guidelines increases the likelihood that community data is usable.

Under EPA guidelines for "network design criteria for ambient air quality monitoring," the agency requires air quality monitoring networks to specify: monitoring objectives and spatial scales, general monitoring requirements, and design criteria for state or local air monitoring stations.[136] This information must be generated before implementation, in the form of a Quality Assurance Project Plan (QAPP).[137] A QAPP is a formal document detailing the quality system used to ensure that the results of work performed will satisfy the stated objectives.[138] The monitoring network must explain how it "intends to control measurement uncertainty to an appropriate level in order to achieve the data quality objectives."[139] Once written, the QAPP must be reviewed and approved by a regulatory agency before monitoring begins.[140] Throughout the process, researchers are responsible for strictly adhering to the QAPP and documenting findings in accordance with EPA requirements.[141]

The utility of a QAPP is understandable. If the goals of collecting air quality data are to implement policy reform or hold pollution sources accountable, it is crucial that the data is reliable. However, from the language provided in the regulation, QAPPs may seem inaccessible or even impossible to those new to scientific research.

Interestingly, the EPA has resources to walk community researchers through the process. The EPA offers an online "Air Sensor Toolbox" that encourages community-collected data.[142] In this toolbox, community scientists can find webinars on using Low-Cost Air Quality Sensors, a video series on "Sensor Measurements, Data Quality, and Interpretation" and an "Air Sensor Guidebook."[143] Furthermore, the EPA funded the *Five Air Sensor Models Across Seven U.S. Sites* study and has made the report publicly available.[144] The report assists project planners in narrowing down

---

135 *Clean Air Act*, *supra* note 9.

136 Ambient Air Quality Surveillance, *supra* note 134.

137 *Id.*

138 *Id.*

139 *Id.*

140 *Id.*

141 *Id.*

142 *Air Sensor Toolbox*, EPA, https://www.epa.gov/air-sensor-toolbox (last visited Nov. 21, 2023).

143 *Id.*

144 Karoline K. (Johnson) Barkjohn et al., *Long-Term Performance of Five Air Sensor Models Across Seven U.S. Sites*, EPA, https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=349961&Lab=CEMM (last visited Oct. 26, 2022).

device choices while proactively ensuring the options have been evaluated by the EPA. This collection of resources helps in determining the monitor type and considering data quality as it is specifically related to air pollution; however, it is just the starting point for QAPP resources generally.

The EPA offers a webpage containing the "Quality Assurance Handbook and Toolkit for Participatory Science."[145] The toolkit includes a handbook with accompanying community QAPP examples and templates.[146] It has several flyers breaking down essential components of quality assurance and provides access to a "Make Your Data Count Video Series."[147] Local regulatory agencies also offer user-friendly and comprehensive quality assurance support. South Coast Air Quality Management District created the publicly available report: *Community in Action: A Comprehensive Guidebook on Air Quality Sensors*.[148] This is a guidebook on community-driven air quality monitoring that includes information on planning and deployment, such as "what to monitor, where to monitor, which sensors to use" and "how to use and maintain sensors [and] what factors to consider when taking measurements."[149] The guidebook also provides information on the "interpretation, communication, and use" of data.[150] While writing a QAPP may present an intimidating hurdle to those new to air quality and data collection, there are many publicly accessible resources to help advocates throughout the process.

## IV. PROCEDURAL POINTS OF ENTRY FOR QUALITY-ASSURED DATA

The regulatory structure under the Clean Air Act allows for air pollutants to disproportionately impact certain communities. Using tools such as community science, locals are empowered to self-advocate once they meet the data reliability requirements. With abundant guides on making QAPPs accessible, it may feel like the problem has been solved. However, lost time and resources are also a barrier to procedural justice. If a researcher spends years collecting unusable data, she may not have the capacity to start over. It is therefore crucial for a community scientist to ensure they have a quality

[145] *Quality Assurance Handbook and Toolkit for Participatory Science Projects, supra* note 24.

[146] *Id.*

[147] *Id.*

[148] *An Overview of Community in Action: A Comprehensive Educational Toolkit on Air Quality Sensors*, SOUTH COAST AIR QUALITY MGMT. DIST. (Sept. 2021), https://www.aqmd.gov/docs/default-source/aq-spec/star-grant/overview-of-the-sensor-educational-toolkit.pdf?sfvrsn=8.

[149] *Id.*

[150] *Id.*

assurance plan before they even install their low-cost monitor. It is crucial because, along with data Blind Spots, our current regulatory system has openings for using community collected data.

### *A. Engaging Procedural Justice at the Federal Level*

Our current regulatory system creates several points of entry for procedural justice in the air quality regulation setting. At the federal level, no regulation prevents community-collected air quality from being considered when establishing NAAQS.[151] Under the CAA, the EPA must publish and "from time to time" revise a list with each criteria air pollutant.[152] The list must "accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare which may be expected from the presence of such pollutant in the ambient air, in varying quantities."[153] The EPA can consult with a standing committee "comprised of technically qualified individuals representative of state and local governments, industry, and the academic community" to "assist in the development of information on pollution control techniques."[154]

Additionally, when establishing NAAQS, the EPA must appoint an "independent scientific review committee" that is "composed of seven members including at least one member of the National Academy of Sciences, one physician, and one person representing state air pollution control agencies."[155] The committee will, among other things, "recommend to the Administrator any new national ambient air quality standards and revisions of existing criteria and standards."[156]

The statutory text indicates that non-EPA data and experts can be considered when identifying criteria pollutants and when establishing the NAAQS for each pollutant.[157] While the text carefully uses terms such as "technically qualified individuals," recent EPA statements, such as the 2015 *Guidance on Considering Environmental Justice During the Development of an Action,* suggest a broader understanding of "qualified."[158] At the very least, they seem to broaden whose input is essential to rulemaking.[159] Though such statements do not specifically address NAAQS promulgation,

[151] *See generally* 42 U.S.C. § 7401.
[152] 42 U.S.C. § 7408(a)(1).
[153] 42 U.S.C. § 7408(a)(2).
[154] 42 U.S.C. § 7408(b)(2).
[155] 42 U.S.C. § 7409(d)(2)(A).
[156] 42 U.S.C. § 7409(d)(2)(B).
[157] *See generally* 42 U.S.C. 7408-7409.
[158] *See* 42 U.S.C. 7408(b)(2); ENV'T PROT. AGENCY, *supra* note 26, at 2, 25 (indicating that rule-writers, including at the "Early Guidance" step, are in a position to support and assist in the development of regulatory actions).
[159] ENV'T PROT. AGENCY, *supra* note 26, at 2.

provisions under the CAA create opportunities for the applicability of community collected data.

The EPA's *Guidance on Considering Environmental Justice During the Development of an Action* outlines steps the agency should take when creating regulatory measures.[160] The document prompts rule writers to ask themselves, "how did [or will] the public participation process provide transparency and meaningful participation for minority populations, low-income populations, tribes, and indigenous peoples?"[161] Additionally, the document outlines different decision makers' roles and their independent responsibilities of "achiev[ing] meaningful involvement" and "consider[ing] environmental justice concerns during the development of the action."[162] In developing regulatory actions, the EPA should inquire whether the action involves "a topic that is likely to be of particular interest to or have a particular impact upon minority populations, low-income populations, or indigenous populations, or tribes?"[163] The EPA also provides a 120-page document entitled *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis*.[164]

These documents suggest that the participation of impacted communities is not just helpful in promulgating regulations, it is essential and expected.[165] With the opportunities that the CAA creates for "local representatives" and "latest scientific knowledge," and the EPA's claimed adherence to procedural justice, the CAA offers a "powerful statutory basis" for the applicability of community-collected data to establish national air quality regulations.[166] Under the CAA, the EPA is required to review and revise the NAAQS "to ensure their adequacy in light of new information and changing circumstances."[167] By using the data from community air quality experts, the EPA may "promulgate more protective NAAQS" because they would be able to systematically consider "the sensitivities of those members in environmental justice communities based on preexisting physical conditions or environmental stresses from other pollution sources."[168]

---

[160] *Id.* at 19.

[161] *Id.* at ii.

[162] *Id.* at 19-20.

[163] *Id.* at 22.

[164] EPA, TECHNICAL GUIDANCE FOR ASSESSING ENVIRONMENTAL JUSTICE IN REGULATORY ANALYSIS (2015).

[165] *Id.*

[166] 42 U.S.C. § 7408(a)(2), (b)(2); Richard J. Lazarus & Stephanie Tai, *Integrating Environmental Justice Into EPA Permitting Authority*, 26 ECOLOGY L.Q. 617, 631-32 (1999).

[167] Lazarus & Tai, *supra* note 166, at 632.

[168] *Id.*

*B. Engaging Procedural Justice at the State and Local Level*

Reliable hyper-local air quality data also opens procedural doors at the state and local levels. First, similar to the federal level, community data can be useful for regulation setting through SIPs.[169] When drafting implementation plans to reach or maintain NAAQS attainment, states must consider how to offset new pollution sources to ensure "an equal or greater reduction . . . in the actual emissions of such air pollutant."[170] Community data can provide deeper insight into which communities to prioritize for reductions through offsets. Second, reliable hyper-local air quality data can provide the necessary findings for grants and other funding streams with environmental justice requirements.

The Justice40 Initiative and the Inflation Reduction Act highlight the impact of the current federal prioritization of environmental justice on state funding opportunities.[171] The Justice40 initiative directs that forty percent of the "overall benefits" of certain federal investments from covered programs should flow to "disadvantaged communities."[172] According to the federal government's Climate and Economic Justice Screening Tool, a community is disadvantaged if they are "at or above the 90th percentile" for "PM 2.5 in the air."[173] Community data can be a useful tool in identifying such communities. Justice40 requirements extend to grants from several federal agencies including the EPA, Department of Energy (DOE), Department of Transportation (DOT), and the Federal Emergency Management Agency (FEMA).[174]

Additionally, the Inflation Reduction Act, passed in August 2022, creates block grants for "community-led projects in disadvantaged communities and address[es] disproportionate environmental and public health harms related to pollution and climate change."[175] The Act also specifically includes funding for "air quality sensors in disadvantaged communities" and "new and upgraded multipollutant monitoring sites."[176] Reliable community-collected data is a procedural justice measure that can bring light to

[169] *Id.* at 632-33.

[170] 42 U.S.C. § 7503(c)(1).

[171] *Justice40,* EXEC. OFF. OF THE PRESIDENT, https://www.whitehouse.gov/environmentaljustice/justice40/ (last visited Nov. 21, 2023).

[172] *Id.*

[173] *Methodology*, COUNCIL ON ENVIRONMENTAL QUALITY, https://screeningtool.geoplatform.gov/en/methodology#3/33.47/-97.5 (last visited Oct. 8, 2023).

[174] *Justice40*, *supra* note 171.

[175] *Fact Sheet: Inflation Reduction Act Advances Environmental Justice*, EXEC. OFF. OF THE PRESIDENT (Aug. 17, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/17/fact-sheet-inflation-reduction-act-advances-environmental-justice/.

[176] *Id.*

vulnerable communities experiencing disproportionate exposure to air pollution and provide a basis for federal funding streams to state and local research and remediation efforts.

## CONCLUSION

In a presentation on *Mapping for Environmental Justice*, a member of the Virginia Environmental Justice Collaborative, defined strong and weak communities.[177] Weak communities are categorized by political dominance, disempowerment and impaired ability for advocacy.[178] Conversely, strong communities include local participation, ownership, community empowerment, strategic networks, and healthier individuals.[179] Community science shifts weaker communities towards stronger communities by advancing principles of environmental justice. This article positions procedural justice as a mechanism for addressing distributive injustice in air quality monitoring efforts. It argues that our current regulatory system's inability to capture hyper-local air quality data perpetuates ignorance of the disproportionate distribution of air pollution in POC communities. This article offers that community science is a tool to fill these data gaps so long as the data is usable. Quality Assurance Project Plans are an essential component for molding community science into community justice.

While this article addresses one barrier to procedural justice—quality assurance—many others exist that disrupt the ability of "non-experts" to participate in the systems that govern them. Additionally, within the realm of quality assurance, simply knowing that quality requirements and resources exist does not overcome the obstacles of limited capacity and resources. It is important to note that although community science demands community ownership, governing agencies, especially local governments, are also part of the broader community.

Local governments have a role in resourcing community-led efforts, especially for air quality monitoring. This can mean collaborating with community members to build out a monitoring network, helping to establish QAPPs, or providing connections to funding streams. It could also necessitate multi-departmental engagement. This can look like ensuring that representatives from sustainability, health, parks, education, transportation, and other departments are aware of community efforts, how they intersect with current government objectives, and how each department can be helpful

[177] Monica Esparza, Virginia Environmental Justice Collaborative, Presentation at the University of Richmond School of Law: Mapping for Environmental Justice (Oct. 18, 2022).

[178] *Id.*

[179] *Id.*

to achieving the community goals. Regardless of which parties are involved, quality assurance is an essential early step of community science if the goal is legally-resilient reform.

*This page intentionally left blank.*