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# UNEQUAL EXPOSURE: ADDRESSING ENVIRONMENTAL RACISM THROUGH LOCAL AIR MONITORING



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# INTRODUCTION

Air pollution poses a major threat to health and climate in the United States, and communities across the country have begun to address it at a local level. Racial and ethnic minorities and low-income populations are often the most affected because they are more likely than white individuals to live near environmental hazards such as landfills, incinerators, and diesel bus depots, factories, congested roadways, and shipping routes. These conditions expose them to higher levels of PM2.5 and nitrogen dioxide, which contribute to worsened healthcare outcomes (Jbaily et al., 2022). Headlines such as “How air pollution is disproportionately impacting minority communities in San Diego” and “Asthma alley: why minorities bear burden of pollution inequity caused by white people” illustrate that air pollution remains a nationwide environmental justice issue. Therefore, creating policy solutions is essential to ensure equitable access to healthy air and reduce unequal exposure to pollution.



**“NO MATTER  
THE COLOR OF  
THEIR SKIN,  
EVERYONE HAS A  
RIGHT TO  
BREATHE CLEAN  
AIR, AND THAT  
RIGHT IS A CIVIL  
RIGHT FOR ALL”**

# PROBLEM STATEMENT

This policy brief will specifically look at New York, as the New York State Department of Environmental Conservation (DEC) is conducting a Community Air Monitoring Initiative (2022–2023) in 10 selected Disadvantaged Communities to identify high pollution burdens. Higher levels of air pollution disproportionately affect communities of color and low-income populations in the U.S. These populations are often identified as Black, Asian, and Hispanic or Latino communities. Such populations often live in closer proximity to urban areas, factories, congested roadways, or shipping routes with heavily polluted air. As a result, racial and ethnic minorities and low-income populations face higher average PM<sub>2.5</sub> and nitrogen dioxide exposure from pollution-related causes, thus contributing to worsened healthcare outcomes (Jbaily et al., 2022).

# SCOPE OF THE PROBLEM

Segregation and racism remain deeply entrenched factors shaping who lives where and how industrial-level developments are positioned across communities. This is largely attributable to the legacy of racist housing policies that left low-income individuals and people of color disproportionately exposed to environmental burdens (Vermeer, 2021). This brief uses New York as its primary case study because it reflects the broader national problem while also offering timely state and municipal policy efforts to minimize pollution in affected communities.

A key concept throughout this brief is environmental racism, defined as any policy, practice, or directive that differentially affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color (Bullard, 1993). Environmental racism plays a critical role in understanding the inequitable and disproportionate health impacts borne by racial, ethnic, and marginalized communities.

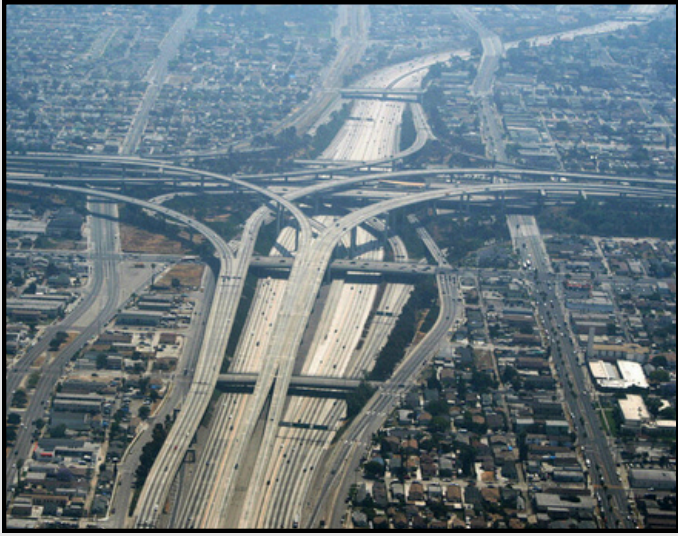
# POLICY CONTEXT

Research shows that segregated, lower-income, and marginalized communities face unequal exposure to air pollution and other environmental hazards, including secondhand smoke and noise. One study finds that low socioeconomic status (SES) and non-white populations tend to own fewer cars, drive less, and commute by walking or transit (Pratt et al., 2015). Although these behaviors reduce emissions, these populations still experience elevated levels of traffic-related air pollution because they typically reside near urban centers. This pattern reveals how environmental racism shapes health and housing outcomes: communities contributing the least to pollution often bear the greatest burdens.

In the United States, air quality is regulated primarily by the Clean Air Act and enforced by the Environmental Protection Agency (EPA), which sets national standards and oversees state implementation. In recent years, these injustices have gained increased attention on policy agendas due to growing environmental justice concerns, enduring patterns of segregation, and the pressing need to address longstanding health disparities. While policymakers have enacted state-level initiatives aligned with the EPA's goal of providing equal protection from environmental health risks, limited resources, uneven implementation, and recent federal rollbacks have hindered progress and effectiveness.



# STAKEHOLDER ANALYSIS



The primary stakeholders are racial and ethnic minorities. One of the major contributors to these disparities stems from redlining and systemic racism, which has resulted in marginalized and lower SES communities being located near factories, congested roadways, or shipping routes with heavily polluted air. As a result, these communities face disproportionately high levels of exposure to pollution and associated health risks.

Additional stakeholders include the U.S. Environmental Protection Agency and industry actors in transportation and manufacturing, particularly within urban planning contexts. These groups influence regulation, funding allocation, and broader economic interests that may prioritize economic growth over environmental and health protections. Community-based organizations and local health departments also play a role by translating data into advocacy, connecting residents to resources, and holding governments and industries accountable.



Altogether, this brief evaluates municipal and state frameworks, recognizing that air pollution interventions often begin at smaller scales. Incremental, community-based change can create lasting improvements over time.

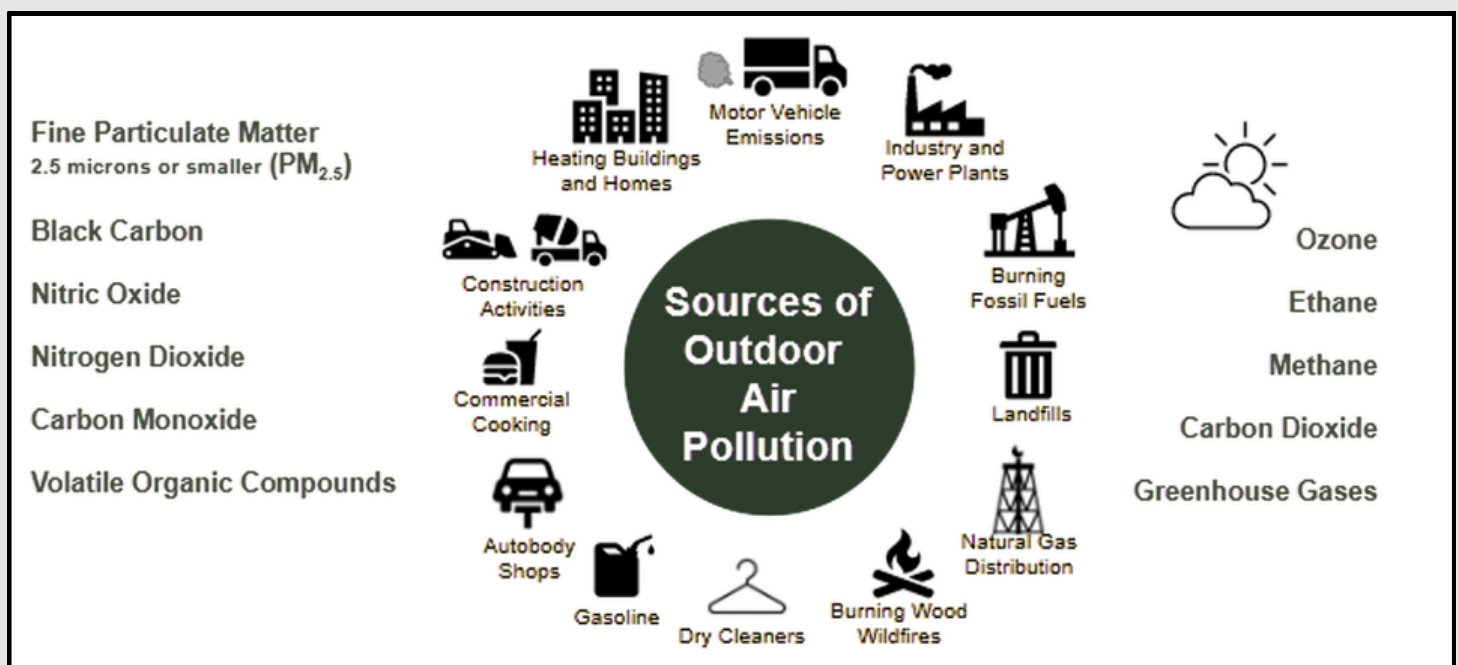
# RATIONALE

Air pollution disparities rooted in environmental racism require government intervention because market failures, particularly negative externalities, leave vulnerable communities bearing disproportionate health burdens. Although the current presidential administration has rolled back several pollution safeguards, state and local initiatives that address population-specific needs remain central to environmental policymaking.

For example, community-based air quality monitoring (CBAQM) informs climate and energy policy by identifying pollution hotspots and using commercially available, lower-cost air quality sensors (Bradbury & Cross, 2023). Similarly, programs such as the Enterprise Green Communities Criteria have shown effectiveness when incorporated into state regulatory requirements (Wang, 2025), particularly in urban areas like New York. Such efforts provide a framework for building healthier, more efficient living environments for vulnerable populations.

Two policy alternatives emerge at the forefront of discussion: CBAQM and green spaces. These options represent interventions focused on data collection and long-term environmental improvement. The following sections evaluate each according to three criteria: pollution reduction effectiveness, equity in health outcomes, and cost. A final recommendation follows, along with a framework for implementation.

The graphic below identifies the primary sources of outdoor air pollution and highlights the wide range of activities that contribute to harmful exposure. Many of these sources can be detected and monitored through CBAQM efforts.



# POLICY ALTERNATIVE I

## GREEN SPACES



The working definition of green spaces used in this brief is “publicly accessible areas with natural vegetation, such as grass, plants or trees [and may include] built environment features, such as urban parks, as well as less managed areas, including woodland and nature reserves” (Lachowycz & Jones, 2013). Green spaces are important because they help reduce air pollution exposure by limiting harmful exposures, including vehicle emissions, noise, and heat, while also supporting healthy behaviors such as social interaction and physical activity (Takenaka et al., 2025). This makes them especially valuable in environmental justice and health policy, since racial and ethnic minorities are more likely to live in neighborhoods with elevated pollution and reduced access to green space. To implement this policy, local governments, NGOs, and developers contribute to the creation of green infrastructure. Governments can set minimum green space requirements for lots or streets, while NGOs can provide tree-planting services to residents (Murray, 2018). Specific actions include parks, street trees, community gardens, and community-centered initiatives such as gardening and running programs. Community gardens have proven particularly successful, as evidenced by the Community Garden Movement, which has produced more than 550 GreenThumb gardens with thousands of volunteer gardeners throughout New York City, generating environmental, economic, and social benefits to surrounding neighborhoods (New York City Department of Parks & Recreation, n.d.).

**Limitations:** While green spaces offer many co-benefits, they also face implementation challenges. Long-term community engagement is difficult to sustain without dedicated funding and staffing. Green infrastructure also does not directly regulate emissions or hold polluters accountable, meaning its pollution reduction benefits depend heavily on broader policy alignment. Additionally, green space development may encounter resistance from developers or municipal actors who view it as incompatible with economic growth objectives.

# POLICY ALTERNATIVE II

## COMMUNITY-BASED AIR QUALITY MONITORING (CBAQM)

Community-Based Air Quality Monitoring (CBAQM) informs climate and energy policy actions by identifying pollution hotspots using commercially available lower-cost air quality sensors (Bradbury & Cross, 2023). Actions under this initiative include installing affordable, easy-to-use sensors to track local air quality, identify high-risk areas and pollution hotspots, and develop data-driven solutions to reduce pollution (Community Monitoring, n.d.). By focusing on community-based interventions and initiatives, CBAQM creates opportunities for community input and greater transparency and accountability in decision-making processes.



“Transparency alone isn’t enough. Communities need tools and support to analyze and use the data, especially when monitoring is meant to inform decisions, not just document problems.” — **Randi Walker**, Chief, Air Toxics Section, Division of Air, New York State Department of Environmental Conservation

Community members play a critical role in maintaining the longevity of this policy alternative, but staffing, funding, and training are needed within state and local governments to lay the foundation for implementation. New York has already moved in this direction through community air monitoring efforts that use sensors and mobile monitoring to better identify local pollution sources and broader patterns. A 2026 report by the American Lung Association describes how community air monitoring has helped local governments identify pollution hotspots and inform targeted pollution reduction efforts, demonstrating its potential to improve policy responsiveness (American Lung Association, 2026).

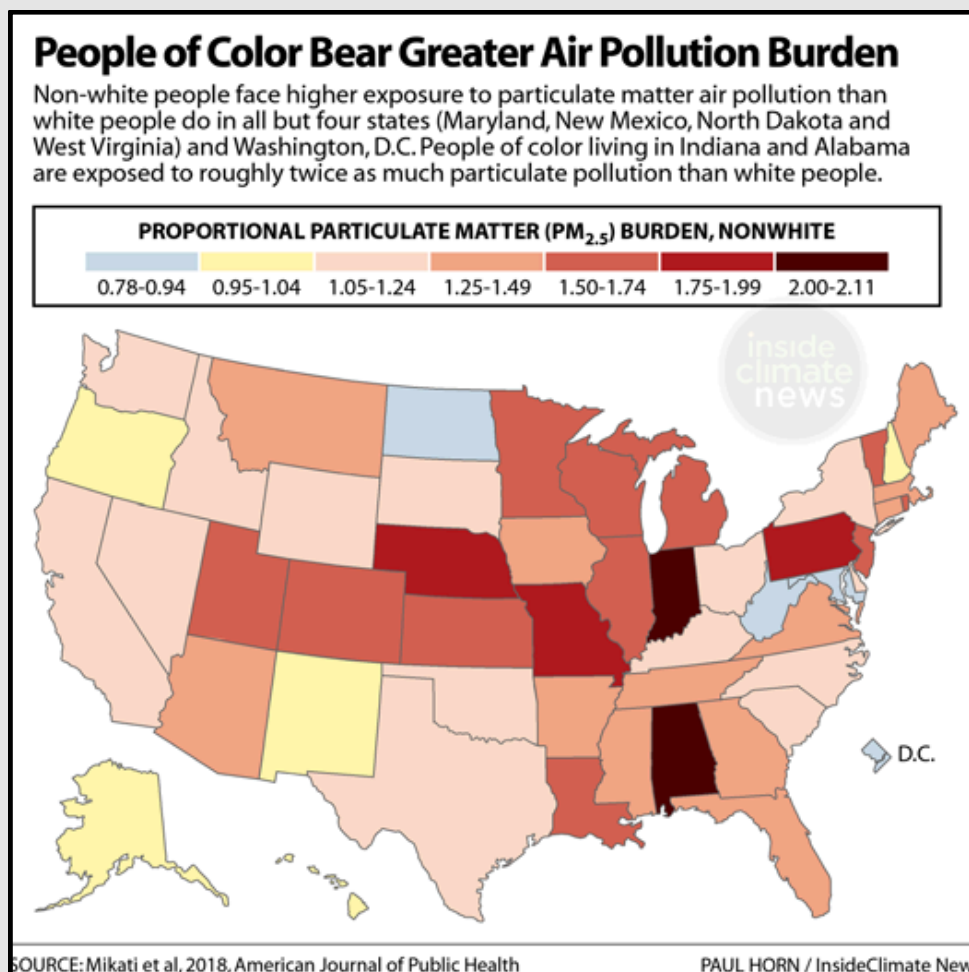
**Limitations:** CBAQM does not directly reduce pollution; it identifies where pollution exists and supports community and policymaker action. Its effectiveness depends on political will and regulatory support. Without requirements for policymakers to respond to collected data, monitoring may remain informational rather than reducing harmful exposure. Local monitoring may also be less suitable for formal enforcement at the state or federal level and depends on consistent staffing. In addition, stakeholders with economic interests in the status quo may resist transparency or challenge sensor findings.

# POLICY ALTERNATIVE III

## MAINTAIN THE STATUS QUO

If maintaining the status quo, little to no action would be taken to improve air quality or health-related outcomes. Residents in lower-income areas would continue to suffer at disproportionate rates compared to their counterparts, while government officials, NGOs, and community partners would remain limited in their ability to mitigate harmful effects. Without innovation, funding, or new programming, the long-standing patterns of redlining, unequal access to housing and economic opportunity, and environmental racism would continue to perpetuate a cycle of systemic harm, deepen health disparities, and fail to address the inequities that drive them.

The figure below shows the disproportionate impact of air pollution. In some states, non-white residents experience roughly twice the pollution burden of white residents. This graphic helps contextualize and visualize how widespread this burden is, and it suggests that, without policy change, the status quo may worsen the disparities currently represented.



# CRITERIA FOR ANALYSIS

Having examined three policy alternatives: green spaces, CBAQM, and the status quo, the following criteria provide a structured framework for evaluating their relative effectiveness, equity outcomes, and costs. Each criterion was selected to align with the central goals of environmental justice policy, namely reducing pollution burdens, improving equity, and assessing its overall feasibility.

1. **Pollution Reduction Effectiveness:** Assess the effectiveness of each alternative in reducing PM<sub>2.5</sub> and nitrogen dioxide exposure by drawing on existing evidence from cities and programs that have already implemented these strategies. Overall, this could be conducted by using outdoor sampling, specialized monitors, and statistical models to visualize reduction percentages. This applies to Green Spaces, Community-Based Air Quality Monitoring (CBAQM), and the Status Quo.
2. **Equity in Pollution and Health Models:** Measure whether the policy alternatives reduce racial, ethnic, and lower-income related disparities in pollution and health outcomes. In doing so, this criterion would analyze evidence from prior implementations and comparable case studies showing whether similar interventions improved health outcomes (i.e., elevated rates of asthma or cardiovascular problems). This applies to Green Spaces, Community-Based Air Quality Monitoring (CBAQM), and the Status Quo.
3. **Cost:** While the initial costs of green spaces and community-based air quality monitoring can be high, the longer-term benefits may outweigh the initial burden. However, cost manifests in more than monetary value. It also includes the burden on communities and whether they have the capacity to sustain such interventions over time. Cost can be evaluated using qualitative and quantitative evidence from existing programs, including implementation expenses, staffing needs, maintenance, and projected long-term savings. This applies to Green Spaces, Community-Based Air Quality Monitoring (CBAQM), and the Status Quo.

# EVALUATION OF ALTERNATIVES

Policy Alternative	Pollution Reduction Effectiveness	Equity in Pollution and Health Models	Cost
Green Spaces	Medium - while this can help mitigate harmful air quality, its effectiveness is not high because it doesn't address the root cause of the issue, but rather a proximate cause.	Medium to high - by creating green spaces, particularly near communities most burdened by pollution, this would begin to bridge the disparity in access while simultaneously improving air quality.	Medium - although this would have a higher initial cost to hire contractors, plant greenery, and provide community resources, these would be minimized over time and would not be overly difficult to
Community-Based Air Quality Monitoring (CBAQM)	Medium - while many examples show its effectiveness, this does not address the root causes of the issue and instead serves as an important step toward creating more informed policy and infrastructure.	High - creating such monitors would increase overall equity because it identifies the causes of pollution, thereby informing communities and decision-makers about the areas that need to be targeted.	Medium to high - hinging on targeted intervention and maintenance. The upfront cost may be high, along with the training required for ongoing monitoring. However, long-term savings may outweigh these concerns.
Maintain the Status Quo	Low - this would not promote helpful interventions or resources for communities most impacted by the problem. These communities would continue to be disproportionately affected.	Low - without change, there is no improvement in equity or meaningful engagement with communities.	Low - no new cost is incurred, but the lack of action also means no substantive benefit.

This table assesses each alternative against each criterion. Both green spaces and CBAQM offer medium to high rankings, suggesting that targeted interventions would likely begin to address pollution-related outcomes, particularly when paired with dedicated programs and oversight personnel. The Status Quo, by contrast, offers no pathway to improvement and perpetuates existing disparities. Although green spaces provide important co-benefits, CBAQM's capacity to generate actionable, localized data makes it a more direct tool for equitable policymaking.

# RECOMMENDATION

Based on this analysis, the recommended policy is Community-Based Air Quality Monitoring. Studies demonstrate that CBAQM reveals localized pollution patterns that traditional networks cannot capture. This information is especially important for communities near busy highways, industrial sites, and wildfire-prone regions. As a result, many communities are strengthening their ability to measure and respond to air pollution through collaborative partnerships that integrate low-cost sensors, mobile monitoring, and other research instruments that translate data into actionable measures and protections.

Implementation of CBAQM would be a step in the right direction. In doing so, it would establish a system that is capable of producing measurable outputs and guide communities in data-driven decision-making processes. Consequently, rates of PM<sub>2.5</sub> and nitrogen dioxide exposure and, more broadly, air pollution would be significantly reduced (Community Monitoring, n.d.). This is also one of the most cost-efficient policies to implement because the systems themselves are affordable and easy to use. Furthermore, CBAQM, by comparison, provides more immediate and measurable information regarding pollution patterns. Unlike green spaces, CBAQM identifies pollution hotspots that can better equip policymakers with the data needed to develop targeted interventions.

## Implementation Logistics

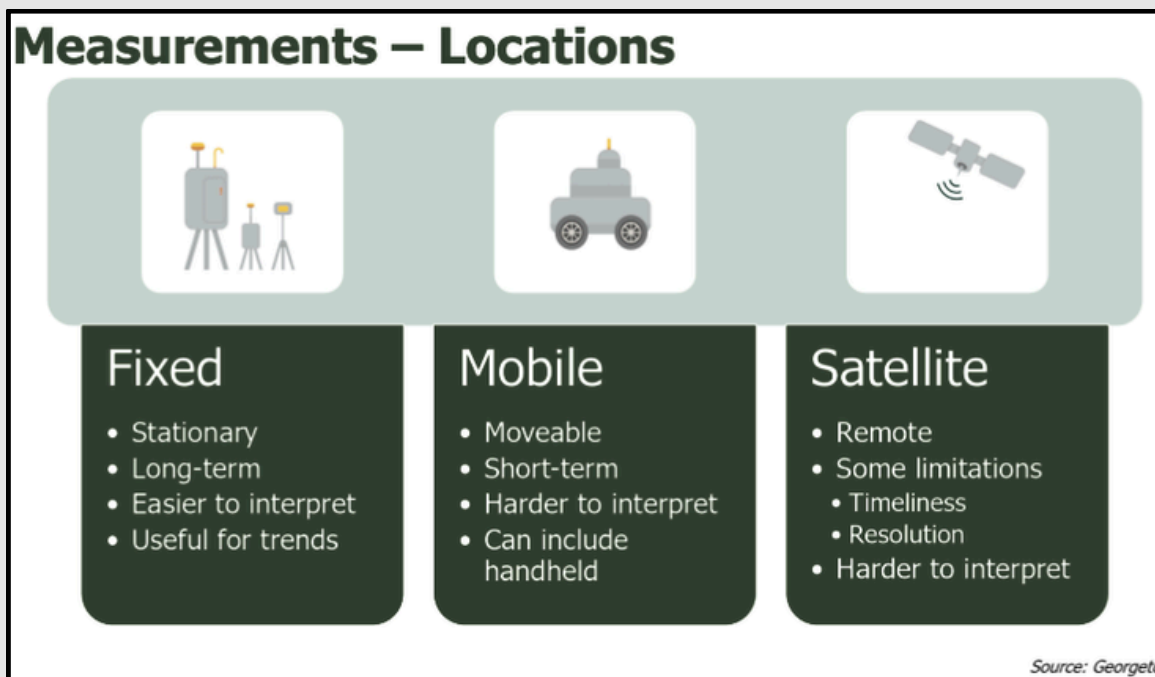
Effective implementation requires attention to the following considerations:

1. **Oversight:** Programs should be jointly administered by state environmental agencies (i.e., the New York DEC) and local health departments, with community organizations providing ongoing accountability.
2. **Funding:** Start-up costs for sensors and training can be supported through federal environmental justice grants (i.e., EPA's Environmental Justice Collaborative Problem-Solving grants) and state networks. Long-term sustainability should be built into the overall program design through a dedicated budget and public-private partnerships.
3. **Data-to-Policy Action:** Legislation or regulatory guidance should require that identified pollution hotspots trigger review processes. Policymakers should be required to respond when thresholds are exceeded, with clear timelines for evaluating conditions and implementing actionable measures. This is largely in part because the success of this policy is contingent on policymakers acting on collected data.
4. **Accountability Mechanisms:** Tools directed to improve community engagement and transparency by displaying real-time data, along with regular community meetings to share findings, can help ensure that data collection translates into tangible community protections and interventions.

# FEASIBILITY

The feasibility of this politically is strong, with various cities across the country adopting similar programs and reporting a measurable change in both pollution rates and pollution-related decision-making. The largest barriers involve consistent monitoring and tracking, along with actionable change to create concrete, lasting benefits for affected communities. Nevertheless, CBAQM introduces opportunities for collaborative relationships between governments and overburdened communities through public forums such as technical workshops, where communities and air quality monitoring personnel work together to interpret results, develop findings, and identify solutions (Bradbury & Cross, 2023). More tangibly, the Georgetown Climate Center outlines a replicable CBAQM implementation process that includes the following steps:

1. Establishing the roles and responsibilities of each of the organizations collaborating on the project.
2. Developing the detailed plans for the project, including agreeing on the purpose for the monitoring, selecting and siting equipment, and deciding how the data will be used and shared.
3. Staffing the project, including identifying personnel roles that need to be filled.
4. Estimating costs and managing the project budget.
5. Implementing the project, including planning for operating needs and maintenance.
6. Assessing options and choosing among potential uses and follow-up actions based on the data produced by the monitoring project.



Additionally, the implementation of these programs can take different forms, which can be tailored to the specific needs of each impacted community, as defined by the U.S. EPA. In doing so, this allows for flexibility in design while maintaining a common framework for evaluation. The table located to the left illustrates the variations.

# CONCLUSION

Segregation and racism remain deeply entrenched forces shaping where people live and how industrial development unfolds across American communities, patterns rooted in the legacy of racist housing policies that have left low-income individuals and people of color disproportionately exposed to environmental burdens (Vermeer, 2021). However, policy changes can be implemented to reduce such burdens. Small, incremental, community-based interventions can measurably reduce rates of PM2.5 and nitrogen dioxide exposure and improve pollution conditions more broadly. These changes do not require a large-scale overhaul, but they do require sustained commitment from state and municipal policymakers, community organizations, and residents.

Community-Based Air Quality Monitoring does not fully mitigate the effects of pollution; rather, it is an initiative that depends on sustained effort, strong accountability mechanisms, and actionable solutions to be effective. When implemented within this framework, CBAQM can be one of the most cost-effective and equitable tools available, centering community knowledge, transparency, and the groundwork needed to create lasting impacts on environmental justice initiatives. These changes do not require a large-scale overhaul, but they do require sustained commitment from state and municipal policymakers, community organizations, and residents.



“PROTECTING THE PLANET IS ALSO ABOUT PROTECTING THE PEOPLE ON IT.”  
– ELSA MENGISTU, YOUTH CLIMATE ACTIVIST, OPERATIONS DIRECTOR AT ZERO HOUR



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