

## **Social Equity in Environmental Policy: Addressing Disparities in U.S. Urban Air Quality**

Kimberly Long Holt  
Health and Safety Concepts

**Corresponding Author:** Kimberly Long Holt [email name](#)

---

### ARTICLE INFO

*Keywords:* Environmental Justice, Air Quality, Urban Policy, Social Equity, PM2.5 Pollution

*Received :* 12 June

*Revised :* 19 July

*Accepted:* 21 August

©2025 Holt: This is an open-access article distributed under the terms of the [Creative Commons Attribution 4.0 International](#).



### ABSTRACT

The paper serves all the model components of social justice in the vision of air quality management of the American urban environment and racial injustice against the poor community. We then may resort to the facts regarding the environmental consideration, state regulation, and the census results and discuss to what extent the tradition of redlining and other similar practices will reach before making the people realize what exposure to air pollution may be like. The analysis to be performed consists of a spatial analysis of freeze frames of PM2.5 concentration in 50 large cities in the United States from 2010 to 2023, and comparing the pollutants to the socioeconomic factors. Analyzing the data, one can notice that communities of color are at risk of PM 2.5 28 times in comparison to cubic-white communities. The paper is proposing policies to address these historical injustices of the environment, such as equitable expansion of surveillance networks, participative style, community orientation, and revisionary decisions

---

## INTRODUCTION

The environmental policy of the United States has difficulty addressing disparities associated with systemic inequity in air quality exposures among different demographic groups. Although the transition to the more comprehensive Clean Air Act and the set of environmental regulations has led to a significant improvement in the quality of the air in general, a vast disparity in the distribution of pollution and threats to the health of city dwellers has been observed (Tessum et al., 2021). These inequities constitute the basic infringement of the principles of environmental justice and are an issue that requires the immediate attention of the policy.

Symptoms of the issue used in the given study are constant excessive exposure to harmful air pollutants, such as PM<sub>2.5</sub>, which was introduced to marginalized groups. According to the indication, communities of color, mainly urban centers, are always at a rate of air pollution that runs counter to the directives of public health. Respiratory diseases, cardiovascular disease, and other long-lasting health problems are more prone to these populations. These ills are exacerbated by the absence of proper environmental monitoring and enforcement in these neighbourhoods, which further worsens the condition of these people. The present study is relevant to the current knowledge base because it comprehensively explains how conducting the past-discrimination type of practice (such as redlining) can overlap with the existing environmental policy and performance. Unlike the other earlier studies, which mostly seem to emphasise note-taking of unbalanced gaps, adding to the present state of affairs, as is the case here, one can have a different perspective towards all those other sensibilities about previous policies that seem to add to the same senses as is evident today. It also provides potential measures on new policies to reverse the root causes of these chronic environmental injustices (Lane et al., 2022). The study engages some groups of mixed urban environments in America, and the development of the research tasks is informed by theories of environmental injustice in modern air management.

This has been revealed in recent studies to surround low-income areas and ethnic groups that remain excessively exposed to air pollution, which has been an issue for decades, with or without environmental regulations (Mikati et al., 2018). Such differences are not incidental and are closely associated with the historical criticism of the land utilization approach, economic considerations, and the trend in policy implementation. The literature gap is related to the inexistence of prior research on the associations between the discernible instances of discrimination in the past and the current air quality disparities in the environment, particularly in a neighborhood. The study of the imbalances is made using the conversation of the impact, which does not create sufficient scrutiny to explore whether these already-controlling controls are productive in fighting the compounding measurement of the impact of pollution in these kinds of neighborhoods. In addition, no research has been conducted on spatial justice and participatory governance concerning the quality of the air.

Such disparities lead to the hottest debates of whether the current environmental policies are performing poorly or well (Cushing et al., 2015). In this study, the research questions will focus on three key research questions: How does past discrimination affect air quality disparities today? What are some of the ways that one can cope with environmental justice issues surrounding air quality management through the use of good policy mechanisms? What can be done to reform the regulatory paradigm in order to distribute the pollution loading and environmental facilities? These dynamics should be controlled using this to ensure more appropriate and equalized environmental policies where all the communities are offered equal opportunities (Awewomom et al., 2024).

## **LITERATURE REVIEW**

### **Environmental Justice Theory**

The environmental justice theory provides the theoretical content to distribute the environmental risks and opportunities among different levels of society. Environmental justice theory is one such theory that is based on grassroots activism, which emerged in the 1980s, and it notes that all individuals with their various backgrounds in terms of race, color, national origin, or income must be equally safeguarded against environmental hazards and equally open to environmental opportunities (Cushing et al., 2015). This theory of explanation reveals the dependence of the relationship between social equity and environmental qualities and criticizes the traditional thinking process on the traditional definition of environmental policy, which focuses on the control of aggregate pollution, without any thought of distribution.

This theory has also suggested three great paradigms of environmental justice i.e., distributive justice (related to the equitable supply of advantages and costs of the environment); procedural justice (related to the appropriate intrusion in the mechanisms of the observation of the environmental judgment); justice and recognition justice (regarding the recognitions of various values and ways of life in the community) (Bullock et al., 2018). These dimensions can offer one a good yardstick, using which one can analyze and determine the impact of environmental policies on equity, and then determine the improvement that can still be made. The problem of distributive justice depicts the significance of ascertaining the unannounced ill-effect of a particular set of environmental risks, which does not fall unfairly on all over a society. Rather, procedural justice would believe that the poor populations during the historical era should have the ability to voice their opinions regarding the actions to be undertaken in decisions that are to be made, which will affect them. The previously overlooked recognition justice serves to remind that the cultural and social context of the communities may be pertinent in how firms are coupled with the environment and how these couplings are relevant to the process other than the policymaking (Cushing et al., 2015).

The other key value of the environmental justice theory is the understanding that the environmental hazards (in this case, air pollution) do not exist but are the consequences of the historical inequity and structural imbalance. In literature, it is indicated that low-income and racial minority communities are generally more exposed to pollutants because of the former policies like zoning industry, housing, and discriminatory policies like redlining (Lane et al., 2022). The theory further argues that environmental policy is not functional without incorporating these structural inequalities, where environmental damage does not overly burden vulnerable populations.

H1: Historical discriminatory practices, particularly residential redlining, are positively associated with current air pollution disparities in U.S. urban areas.

### **Regulatory Effectiveness Theory**

The regulatory effectiveness theory views the process of achieving the desired results of environmental policies and the aspects and elements of policy success or failure. This theoretical framework sheds light on the significance of matching the policy design, capacity of policy implementation, method of its enforcement, and the involvement of stakeholders as the elements that impact the regulation outcomes (Liang, 2018). In environmental justice, regulatory effectiveness theory identifies a necessity to consider equity impacts as representing a fundamental policy effectiveness indicator, rather than a secondary item. The benchmark of environmental policies is generally based on lowering the total pollution rate. However, this measurement method does not consider the distribution of pollution rates across various groups of people, especially marginalized groups. The theory suggests that the conventional command-and-control exercise of regulation strategy is unlikely to help in the multidimensional restrictiveness of environmental justice, according to the previously encountered perspectives of discrimination and the current presence of socioeconomic imbalance (Awewomom et al., 2024). The structural inequalities that have pervaded the exposure of pollution within the vulnerable groups, like racial ghetting, biased zoning ordinance, and political uselessness, tend not to exist in regulating command and control-related regulations. Such policies continue to generate inequality, which spins out of control instead of focusing on the circumstances that constitute the environmental injustices.

Instead, it should be provided with more subtle policy adjustments that will consider the role of the surrounding area but will still be focused on specific actions and adaptable procedures so that the optimal result can be obtained. The local knowledge sorting can be utilized in local participation and decision-making; the citizens will also be included in the citizens that will influence the policies. As well, the environmental justice issues development will be streamlined in light of the adaptive management paradigm based on which the policies will be addressed in line with the recently defined issues and the needs of the communities to which the environmental injustice issue pertains.

Another significant loss that this theory has shown in the current research is that although the traditional regulatory approaches have been criticized as deficient in their capacity to support environmental justice, deeper research is yet to be conducted concerning the alternative measures that entangle the regulatory measures with community conditioning. Investigation into the role of participatory approaches when it comes to inclusion in the regulation structure, particularly regarding air quality oversight, is an underrepresented subject of study within the context of urban environmental justice. The gap opens a possibility for future research on designing and testing more adaptive, inclusive policies.

H2: Comprehensive environmental monitoring networks that include community-based sensors improve air quality data accuracy and environmental justice outcomes in underserved communities.

### **Spatial Justice Theory**

The theory of spatial justice analyzes the extent to which the location of a place determines access to resources and opportunities, as well as the quality of life. Within the environmental policy setting, the theory of spatial justice can be used to understand how the historical use of the land, the zoning choices, and other investments in infrastructure establish long-term patterns of environmental inequality (Kelly et al., 2024). The theory underlines that the differences caused by environmental disparities are typified, and that such distinction occurs through systematic processes, e.g., excessive planning due to discrimination in land use, which focuses on environmental hazards, for example, air pollution in a specific geographical location, and environmental amenities, for instance, parks and green spaces, for other people. Such imbalances in the distribution of environmental risks and benefits exist due to structural inequality.

This is a sound theoretical framework to consider when determining precisely, through transportation networks, industrial zoning, and residential patterns, how they establish or cause cumulative environmental risks on particular communities (Li et al., 2025). For example, low-income neighborhoods and communities of color are likely close to large transportation routes, industrial sectors, or waste treatment facilities, where the residents are subject to several pollutant sources. These groups of people also might lack access to the publicly available infrastructure, such as green spaces that would reduce the negative impacts of pollution. The issue of spatial scale is also emphasized by spatial justice theory in the design of environmental policies because pollution effects frequently blur administrative borders and necessitate regional planning. Solutions focusing on a local pollution area might be too limited when contaminating sources are distributed across the city or even between states. This highlights the need for extensive, region-based interventions to overcome the problem of environmental health inequities.

However, one key gap in the research is the lack of studies that address the cumulative impact of various forms of pollution at the neighborhood scale, rather than focusing on single pollutants. The findings of the research could be used by future research to see how a more holistic understanding of cumulative environmental impacts can better facilitate the reduction of inequalities by understanding the coming impact of pollution impacts, in addition to land use policy and community resources.

H3: Interventions that act at the neighborhood level in response to cumulative impacts on the environment are more effective in alleviating environmental health disparities than pollutant-specific regulations.

**Conceptual Framework**

The theoretical premise through which this study is developed is the conjunction of the environmental justice theory, the effectiveness of regulation, and spatial justice to examine further the complex interactions between past dynamics, current policy trends, and environmental equity outcomes (Oscilowicz et al., 2021). The structure recognizes that both air quality variations affect many environmental-social partnerships relating to centuries of discrimination and current social stratification, the structure of the regulations, and the issue in carrying out the controls.

**Conceptual Framework Diagram**

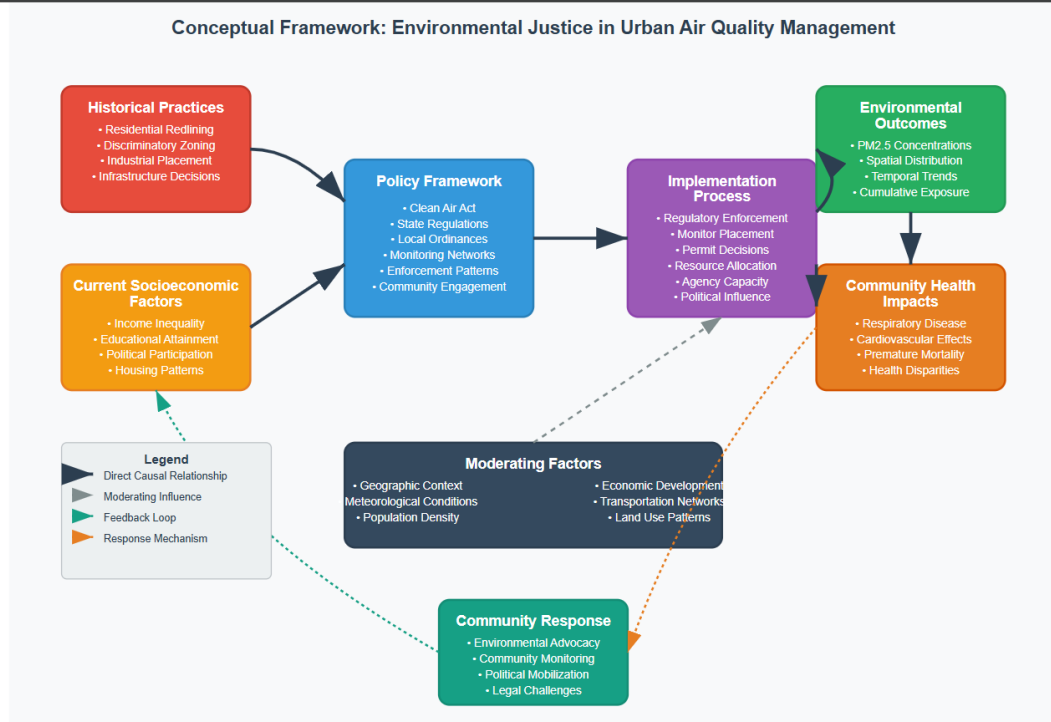


Figure 1. Conceptual Framework

## **METHODOLOGY**

The study will be a mixed-methods research study; it will conduct analyses based on air quality, the quantitative demographic data, and the policy structures and implementation practice at a qualitative level (Considine et al., 2023). The study will be developed based on the analysis of space, statistical models, and policy analysis to develop a broad frame of the environmental equity problem of the air quality of the city.

### **Data Collection and Sources**

The type of research design that can be applied in the study is that of a mixed-methods research design since it will be adopting a qualitative study on air quality as well as quantitative demographic information and policy design as well as practice (Considine et al., 2023). The study design combines the spatial analysis, the statistical models, and the policy analysis. However, these aspects have been carefully blended to provide a global perspective on the environmental equity issue's background in managing urban air quality.

### **Analytical Approach**

The co-occurrence patterns were compared in the localized patterns of air pollution and the demographic characteristics with the help of the spatial analysis approach (Jung et al., 2022). The exposure levels to pollution per the different population groups were estimated using Geographic Information Systems (GIS) tools, considering the spatial autocorrelation and edge effects factors. Statistical models considered relevant aspects of confounding variables, i.e., modeled density of population, proximity of major roadway, and economic conditions of the area. The policy analysis involved paying attention to the environmental regulations provided at the federal, state, and local levels (which impact the air quality management of the research sites) (Liang, 2018). This has involved a review of the decision of network monitoring, implementation patterns, and community practice. The gaps in the policy and the areas in which the processing of the environmental justice issue needs to be strengthened more intensively were identified as a result of the analysis.

## **RESULTS**

### **Spatial Patterns of Air Quality Disparities**

Estimation of PM<sub>2.5</sub> levels in the 50 metropolitan study locations demonstrated the existence of systematic environmental inequality in the context of the entire region (Tessum et al., 2021). Having a majority of color communities results in the annual mean PM<sub>2.5</sub> concentration of 28% greater than predominantly white communities when regional variation and meteorology are controlled. This quantity is an addition to about 2.1 micrograms per cubic meter to the levels of exposure, which poses a significant worry in the context of the health of the citizens, since there is no safe level of PM<sub>2.5</sub>.

These distributional homogeneities of inequalities exhibit marvelous regularity in other geographical locations, and the homogeneity indicates the existence of standard processes that contribute to tendencies of environmental inequalities (Rojas Mendoza et al., 2023). The Southeast and Southwest metropolitan areas have the most remarkable absolute differences. This has placed the highest proportionate limitations on the concentration of people in the

Northeast City Urban areas. All these are lifeless when one considers the density of the population, since the population density only implies that other variables bring change to the environment, except for the strength of the urban development.

Table 1. PM2.5 Exposure Disparities by Demographic Characteristics

Demographic Category	Mean PM2.5 (µg/m³)	Standard Deviation	Relative Difference
Majority White	8.2	2.4	Baseline
Majority Black	10.9	3.1	+33%
Majority Hispanic	10.1	2.8	+23%
High Income (>\$75k)	7.8	2.2	-5%
Low Income (<\$35k)	10.6	3.3	+29%

**Historical Redlining and Contemporary Air Quality**

The discussion also supports the historical reasons behind redlining that have rendered it unequal because of the difference in air quality (Lane et al., 2022). Areas formerly redlined by the owners' Loan Corporation, with the census block graded either E or D, now consist of high levels of the PM2.5, 23 percent higher than found in the established districts. This type of historical discrimination stipulated a permanent environmental handicap, saying that this kind of relationship is statistically significant when the statistical measures of the existing factors of the socioeconomic characteristics are used as control variables. This is the effect of the redlining practice on other channels in the long term (Jung et al., 2022). Major characteristics that can lead to the pollution of redlined areas of old lands are areas near the major transportation lines, manufacturing facilities, and others. They also lack tree canopy cover and amenities such as parks and green grounds that would be utilized to mitigate the impacts of air pollution. The fact positively verifies the hypothesis that tendencies of discrimination implemented in the past decades created a permanent test on the current situation in terms of environmental performance.

$$Y = \beta_0 + \beta_1(\text{Redlining}) + \beta_2(\text{Demographics}) + \beta_3(\text{Geography}) + \epsilon \dots\dots\dots (1)$$

Where Y, the concentration of PM2.5, is taken, the model explains approximately two-thirds of the difference in pollution exposure across the census tracts.

**Monitoring Network Equity Analysis**

Considering the example of the conversion of the regulation air quality monitoring network that was embraced by the EPA, it can be assumed that the geographical coverage of the environmental justice communities has drastic variations (Kelly et al., 2024). The groups of people merging toward the bottom third of the people of color as well as those with lower incomes move nearer to that regulatory air quality in which their air quality air check measures are in the range of 10 kilometers as compared to the more wealthy white neighborhoods, which are also densely populated. This negligence in surveillance poses challenges not only in the implementation of the enforcer but also regarding data

on the quality of air that the people inhale. Due to the advent of low-cost sensor networks in some study cities, these equity concerns in monitoring have started to be alleviated (Considering et al., 2023). The communities that implemented community-based air quality monitoring report increased awareness of the sources of pollution and participation in environmental advocacy activities. Informal information supports the idea that a second regulatory coverage generates more specifications for regulatory implementation and the level of air quality in the long run.

### **Policy Implementation Effectiveness**

The study of the regulatory enforcement patterns shows that the implementation of environmental regulations differs among communities (Bullock et al., 2018). Environmental justice communities have a higher chance of having lax enforcement penalties for air quality violations than other well-off facilities. The chances are shown to be 43%. This enforcement yardstick helps perpetuate inequalities in air quality by permitting air pollution to continue in already overpopulated communities. Some of the identified policy innovations by state-level analysis have the potential to fulfill the environmental justice agenda (Liang, 2018). The Assembly Bill 617 by California requires extra monitoring and reduction of the emissions programs in the disproportionately affected community, and the Environmental Justice Law by New Jersey requires assessment of the cumulative impact of new pollution sources. Preliminary results of such programs indicate that they can contribute to a decrease in environmental inequality, but the analysis should be continued.

## **DISCUSSION**

The present study's findings show that the environmental justice issues in the air quality management are not historical artifacts but problematic trends requiring specific policy adjustment pathways (Cushing et al., 2015). The long-term gap in air quality shows that there are fundamental flaws in the existing regulatory frameworks that emphasize overall pollutant emissions controls at the expense of distributional factors. Their close relationship with the historical redlining and the current air quality disparities forms a strong argument to suggest that the historical discriminatory policies have left a permanent history of environmental imbalance (Lane et al., 2022). These conclusions are consistent with the recent study by Jung et al. (2022), which also reported the same relationship between the historical discrimination in housing and modern environmental health. The ongoing presence of these effects indicates that race-neutral environmental policies might not be adequate to pursue the environmental justice agenda without directly referencing the historical legacies and how they have survived in modern form.

Analyzing the monitoring networks helps to understand that seemingly technical choices associated with air quality monitors' location can significantly impact equity (Kelly et al., 2024). Environmental justice populations do not capture the corners of monitoring regulatory controls that hinder scientific knowledge imparted to pollution's effects and diminish the strength of regulatory responses. The effectiveness of community-based monitoring programs demonstrates the positive outcomes of increasing the quality of data

based on the improvement of the environmental justice outcomes and their enhancement achieved through the more active involvement of the community in the environmental monitoring (Considine et al., 2023). The enforcement gap is among the least pleasant factors in elucidating the truth of environmental regulations not being enforced with allegiance towards diverse groups (Bullock et al., 2018). The trend has contributed equally to a significant rise in literature on environmental enforcement, with an inorganic disparity in regulations on demographic populations. These differences may arise due to several factors, including inequalities in political power, the capacity of regulatory bodies, and institutional bias in enforcement entities.

The policy produced at the state level may attach a comment on how the regulatory change can be implemented to address the issue of environmental justice (Liang, 2018). Examples of regulatory regimes that demonstrate how certain cumulative impact and community interest concerns may be plugged into the configuration include the California AB 617. However, the potential of such interventions highly depends on how well they are implemented, with long-term political interest being the factor that should create an attitude of long-term evaluation and adaptive management strategies. Geographies of air quality inequalities also produce how geographical policy approaches should be discussed regarding the geographical concentration of exposure and impact (Li et al., 2025). Policies that are nonspecific to pollution may not be able to address the dynamic environmental health issues of individuals affected by many sources of pollution and other environmental pressures. To have a substantive change in environmental equity, it might be necessary to have more system-wide solutions to all cumulative effects, community exposure, and susceptibility.

These outcomes play an important role in transforming the policy of the environment in various governmental aspects (Awewomom et al., 2024). In order to enhance federal policy, there should be provisions to check the effectiveness of environmental justice, monitor the poor regions more, and apply stricter regulations. The local and the state may be substantial in determining new approaches to community engagement, summative impact analytics, and emission diminishing plans. The need to resolve supply stem factors of environmental inequalities, which encompass housing segregation, economic inequality, and political marginalization, is presented in the paper (Bednar & Reames, 2020). Although environmental policies help significantly regulate the imbalance of exposure, it is required that more far-reaching social policies be taken into account to ensure that the realisation of the goals of environmental justice remains sustainable.

## **CONCLUSIONS AND RECOMMENDATIONS**

The air quality study shows that it has not been all over in the urban setting of the U.S., where the disparities have been uneven systems exposing the people of color and the low-income earners to systematic greater pollution (Tessum et al., 2021). This physical proximity, founded on the historic redlining act and the current-day environmental reality, displays the sociability of the historical discriminatory policies in the modern times' incorporated transformation of the environment. These findings highly tilt towards the provisions supported by the policy reforms that would initially introduce the issue of environmental justice to the topics of air quality control. This research gives some policy recommendations that involve environmental justice advancement (Liang, 2018). The initial one will be expanding regulative surveillance systems to provide sufficient coverage of communities facing environmental injustice, which will involve working with local-ground community organizations and using affordable sensor devices. Second, they should be more vigilant about enforcing the current environmental laws with a specificity of such facilities in the overcharged communities. Third, regulation systems should be restructured to involve the cumulative impact assessment and the requirement of involving the community.

Table 2. Policy Recommendation

Policy Recommendation	Strengths	Weaknesses	Opportunities	Threats
<b>Extend Regulatory Monitoring Networks</b>	<ul style="list-style-type: none"> <li>- Increased monitoring in historically under-monitored, overburdened communities.</li> <li>- Provides accurate data for enforcement and targeted interventions.</li> </ul>	<ul style="list-style-type: none"> <li>- High costs for infrastructure, data collection, and maintenance.</li> <li>- Potential resistance from communities fearing governmental oversight.</li> </ul>	<ul style="list-style-type: none"> <li>- Collaboration with community-based organizations will allow for reducing the costs of the process.</li> <li>- Utilizing low-cost sensor technologies fosters local engagement.</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of coordination between government agencies.</li> <li>- Reason or resistance to the implementation of new systems politically.</li> </ul>
<b>Enhance Enforcement of Existing Regulations</b>	<ul style="list-style-type: none"> <li>- Stronger enforcement holds polluting industries accountable.</li> <li>- Reduces exposure for vulnerable populations and improves public health outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>- Possible resource limitations for agencies tasked with monitoring and enforcement.</li> <li>- Risk of uneven enforcement.</li> </ul>	<ul style="list-style-type: none"> <li>- Collaboration with local governments and community groups can ensure consistent enforcement.</li> <li>- Provides long-term benefits to marginalized communities.</li> </ul>	<ul style="list-style-type: none"> <li>- Corporate lobbying and political resistance from industries.</li> <li>- Potential budget cuts for enforcement agencies.</li> </ul>
<b>Restructure Regulatory Systems to Incorporate Cumulative Impact Assessment and Community Involvement</b>	<ul style="list-style-type: none"> <li>- Comprehensive assessments lead to more equitable policy decisions.</li> <li>- Community involvement ensures those most affected have a voice.</li> </ul>	<ul style="list-style-type: none"> <li>- Slow implementation and resource-intensive processes.</li> <li>- Challenges in measuring cumulative impacts.</li> </ul>	<ul style="list-style-type: none"> <li>- Expanding community-based monitoring programs provides localized insights.</li> <li>- Long-term engagement of affected communities.</li> </ul>	<ul style="list-style-type: none"> <li>- Bureaucratic resistance to changes in regulatory processes.</li> <li>- Lack of funding for new initiatives.</li> </ul>
<b>Restructure Regulatory Systems to Incorporate Cumulative</b>	<ul style="list-style-type: none"> <li>- Comprehensive assessments lead to more</li> </ul>	<ul style="list-style-type: none"> <li>- Slow implementation and resource-intensive processes.</li> <li>- Challenges in measuring cumulative impacts.</li> </ul>	<ul style="list-style-type: none"> <li>- Expanding community-based monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Bureaucratic resistance to changes in</li> </ul>

<b>Impact Assessment and Community Involvement</b>	equitable policy decisions. - Community involvement ensures those most affected have a voice.		g programs provides localized insights. - Long-term engagement of affected communities.	regulatory processes. - Lack of funding for new initiatives.
--	--	--	--	---

These recommendations would also need to coordinate different legitimate spheres of government, or an organized partnership with extraneous communities at the national or local level (Awewomom et al., 2024). The federal agencies are expected to develop some principles of environmental justice and provide technical assistance to the state and local governments. The state governments can undertake the following activities: provision of funds, establishment of new policies that can be used, and provision of funds for the establishment of community-based environmental monitoring programs. The activities of the local governments concerning the eventuality of environmental justice should capture the interest of land use planning and zoning. The destiny of the study also suggests that further transpositions of international policies should shift the nature of social and economic disasters to provide inequalities in the environment (Oscilowicz et al., 2021). The home integration policy initiatives, economic development practices that have placed high-quality employment opportunities in the environmentally unjust communities, changes to the community voice politics, and others would yield better fairness in environmental results.

## FURTHER STUDY

Part of the potential key areas of research in the future could be informed by the research (Considine et al., 2023). The variations in the contrast of the surroundings over the years may render some of the developed issues obstructions to a methodology of explicating the productivity of the various policy regimes. The comparative study of cross-border strategies regarding environmental justice would determine novel policy paradigms for resolving environmental equity issues. The study limitations state that researchers use PM2.5 as the significant indicator of pollution, thus missing out on describing all the environmentally hazardous risks in communities (Mikati et al., 2018). The authors must analyze several pollutants in future research and consider cumulative exposure contexts. It also refers to the analysis where the issue of air quality imbalance is under scrutiny, and such aspects of environmental justice as the availability of green space, the location of hazardous waste sites, and the vulnerability to climate change are not considered.

Community-based monitoring methods require further research to achieve an optimal design and development of participatory environmental monitoring systems (Kelly et al., 2024). A study on the health effects of various measures implemented by the policies might help prioritize the various environmental justice actions. Lastly, studies specifically analyzing the overlaps between environmental justice, public health, and social policy can play a role in a broader scope towards environmental inequality (Kandel, 2023).

## REFERENCES

- Awewomom, J., Dzeble, F., Takyi, Y. D., Ashie, W. B., Ettey, E. N. Y. O., Afua, P. E., ... & Akoto, O. (2024). Addressing global environmental pollution using environmental control techniques: a focus on environmental policy and preventive environmental management. *Discover Environment*, 2(1), 8. <https://doi.org/10.1007/s44274-024-00033-5>
- Bednar, D. J., & Reames, T. G. (2020). Recognition of and response to energy poverty in the United States. *Nature Energy*, 5(6), 432-439.
- Bullock, C., Ard, K., & Saalman, G. (2018). Measuring the relationship between state environmental justice action and air pollution inequality, 1990–2009. *Review of Policy Research*, 35(3), 466-490. <https://doi.org/10.1111/ropr.12292>
- Considine, E. M., Braun, D., Kamareddine, L., Nethery, R. C., & deSouza, P. (2023). Investigating low-cost sensors to increase the accuracy and equity of real-time air quality information. *Environmental science & technology*, 57(3), 1391-1402. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10329730/pdf/nihms-1906601.pdf>

- Cushing, L., Morello-Frosch, R., Wander, M., & Pastor, M. (2015). The haves, the have-nots, and the health of everyone: the relationship between social inequality and environmental quality. *Annual review of public health*, 36(1), 193-209. <https://doi.org/10.1146/annurev-publhealth-031914-122646>
- Jung, K. H., Pitkowsky, Z., Argenio, K., Quinn, J. W., Bruzzese, J. M., Miller, R. L., ... & Lovinsky-Desir, S. (2022). The effects of the historical practice of residential redlining in the United States on recent temporal air pollution trends near New York City schools. *Environment international*, 169, 107551. <https://doi.org/10.1016/j.envint.2022.107551>
- Kandel, R. (2023). *Ecosystem Services and Disservices of Urban Forest and people's perception towards it* (Master's thesis, Inland Norway University). <https://hdl.handle.net/11250/3151226>
- Kelly, B. C., Cova, T. J., Debbink, M. P., Onega, T., & Brewer, S. C. (2024). Racial and ethnic disparities in regulatory air quality monitor locations in the U.S. *JAMA Network Open*, 7(12), e2449005-e2449005. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2827225>
- Lane, H. M., Morello-Frosch, R., Marshall, J. D., & Apte, J. S. (2022). Historical redlining is associated with present-day air pollution disparities in U.S. cities. *Environmental science & technology letters*, 9(4), 345-350. <https://pubs.acs.org/doi/pdf/10.1021/acs.estlett.1c01012>
- Li, B., Fan, C., Chien, Y. H., & Mostafavi, A. (2025). Human mobility disproportionately extends PM2.5 emission exposure for low-income populations. *Sustainable Cities and Society*, 119, 106063. <https://doi.org/10.1016/j.scs.2024.106063>
- Liang, J. (2018). Regulatory effectiveness and social equity in environmental governance: Assessing goal conflict, trade-off, and synergy. *The American Review of Public Administration*, 48(7), 761-776. <https://doi.org/10.1177/0275074017727365>
- Mikati, I., Benson, A. F., Luben, T. J., Sacks, J. D., & Richmond-Bryant, J. (2018). Disparities in particulate matter emission sources distribution by race and poverty status. *American journal of public health*, 108(4), 480-485. <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2017.304297?role=tab>
- Oscilowicz, E., Lewartowska, E. T., Levitch, A., Luger, J., Hajtmarova, S., O'Neill, E., ... & Monroe, E. (2021). Policy Tools for Urban Green Justice: Fighting displacement and gentrification, and improving accessibility and inclusiveness to green amenities.

- Rojas Mendoza, L., Wang, Y., Marshall, J., Koolik, L., & Apte, J. (2023, December). Analyzing Sources and Scales of Air Pollution Disparities in the U.S. and California: Examining Urban-Rural Emission Interactions in Disadvantaged Communities. In *AGU Fall Meeting Abstracts* (Vol. 2023, No. 2017, pp. A51I-2017).
- Tessum, C. W., Paoella, D. A., Chambliss, S. E., Apte, J. S., Hill, J. D., & Marshall, J. D. (2021). PM2.5 pollutants disproportionately and systemically affect people of color in the United States. *Science advances*, 7(18), eabf4491. <https://doi.org/10.1126/sciadv.abf4491>