

A Resource Database of Cumulative Impacts Permitting Policies: Emerging Opportunities to Protect Environmental Justice Communities from Additional Burden

Ana Isabel Baptista, Yukyan Lam, Anna Yulsman, Madeleine Killough, and Charlotte Sophia Bez

ABSTRACT

The environmental justice (EJ) movement has called attention to the failure of government policies to address cumulative impacts (CI), the multiple and compounding social and environmental stressors that disproportionately affect low-income communities and communities of color. In recent years, driven by the organizing of EJ groups, there has been a proliferation, not only of CI mapping tools, but also of policy proposals to address CI in permitting, particularly at the state level. For the purpose of informing these efforts, we developed a database of state policies that codify a CI requirement in permitting decisions. Through web searches, consultation of existing databases, and direct knowledge, we collected state policies up through September 2024. Data were summarized on their purpose, scope of application, community definitions, and methodologies. The database includes information from eight states that have codified CI considerations in permitting decisions and 11 states with bills that have not passed. Our analysis reveals the design choices that arise in CI lawmaking and rulemaking, which may influence the efficacy of protections. A critical decision point is the strength of the legal mandate to deny permits, but we also documented multiple ways in which even a strong mandate can be diluted. We found many policy features offering opportunities to cater to local context, even while existing policies can serve as models. Moreover, we observed rulemaking to be a critical and not merely “technical” counterpart of legislation, needed not just for making implementation possible, but also for knowing the ultimate strength of the policy.

Keywords: environmental justice, environmental racism, environmental permitting, environmental policy, cumulative impacts

INTRODUCTION

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Cumulative impacts (CI) are the co-occurrence of multiple environmental pollution burdens alongside socioeconomic stressors that can heighten the impact of those burdens. As a key environmental justice (EJ) issue, CI is the lived reality affecting communities of color and low-income communities across the United States.¹

¹A wealth of scientific research is testament to this lived experience, revealing how disparities in health and well-being observed along racial/ethnic and socio-economic lines are inextricably linked to CI and inequitable pollution burdens. Rachel Morello-Frosch et al., “Understanding The Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy,” *Health Affairs* 30, no. 5 (May 2011): 879–87, <https://doi.org/10.1377/hlthaff.2011.0153>.

A key barrier to addressing CI is that environmental regulations largely focus on single pollutants or sources of pollution. Permitting and standard-setting insufficiently account for mutually exacerbating effects of co-occurring burdens and vulnerabilities.^{2,3,4} This includes risk assessment methodologies that, even while seeking to address more exposed or susceptible subpopulations or account for multiple exposure pathways, are limited by their inability to account for nonchemical stressors, their focus on singular direct health outcomes, and an assumed lack of bias in the toxicological and other studies that undergird risk assessments.⁵

The crisis of CI has prompted decades-long EJ organizing efforts. These efforts gained traction in the 2000s into the 2010s, with reports like the 2004 National Environmental Justice Advisory Council report, which defined CI and highlighted the need to consider combined effects when evaluating projects and policies.⁶

However, early CI responses largely focused on forming advisory committees to study the problem and developing quantitative methodologies to assess CI.⁷ While such responses contributed to recognizing CI as a problem, they fell short of providing tangible protections, as they did not provide a mandate to prevent additional sources of pollution from being sited in already overburdened communities. In this early period, which included the 2013 launch of the first official state CI mapping tool (CalEnviroScreen),⁸ no laws required that CI assessments be determinative in decisions to renew or site sources of pollution. California's Senate Bill 673, passed in 2015, was a step in this direction, requiring the Department of Toxic Substances Control (DTSC) to

“consider for inclusion” indicators of CI in permitting decisions for hazardous waste facilities.⁹ However, DTSC's rulemaking remains ongoing.

In 2020, following a 12-year advocacy effort led by local EJ groups, New Jersey (NJ) became the first jurisdiction to codify a requirement that permits be denied on the basis of the outcome of a CI assessment.¹⁰ The state's landmark EJ law brought a new wave, not only of CI assessment and mapping tools, but also of policies requiring CI to be addressed in permitting. This policymaking push has largely occurred at the state level, propelled by grassroots advocacy.

The history of our work on CI mirrors this trajectory of CI efforts. In 2019, the Tishman Center initially created a broad compilation of federal and state laws, policies, mapping tools, agency guidance, and gray literature on CI.¹¹ The positive feedback we received from EJ advocates and researchers on this work, alongside the momentum for state CI policies, motivated us to hone a version 2.0 of the database focused on state CI policies codifying a CI requirement in permitting decisions.¹² By analyzing CI permitting policies, this article and database seek to be a resource to EJ advocates as they come to decision points in policy design.

METHODOLOGY

Data collection

The 2.0 database used the initial database, whose data collection methodology is described in its accompanying report,¹³ as a starting point. From April 2024 through September 2024, new entries were sourced from Google (using search term, “cumulative impacts”), news archives, legislative archives,^{14,15} existing databases,^{16,17} webinars and other public events, and direct knowledge.

²WHEJAC, “Final Recommendations: Justice40, Climate and Economic Justice Screening Tool, and Executive Order 12898 Revisions” (White House Environmental Justice Advisory Council (WHEJAC), May 21, 2021), <https://www.epa.gov/sites/default/files/2021-05/documents/whiteh2.pdf>.

³National Environmental Justice Advisory Council (NEJAC), “Recommendations for Integrating Environmental Justice into the EPA's Research Enterprise” (U.S. Environmental Protection Agency, June 30, 2014), <https://www.epa.gov/environmentaljustice/recommendationsintegrating-environmental-justice-epas-research-enterprise>.

⁴National Environmental Justice Advisory Council (NEJAC), “Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts” (U.S. Environmental Protection Agency, December 2004), <https://www.epa.gov/sites/default/files/201502/documents/nejac-cum-risk-rpt-122104.pdf>.

⁵Clifford Villa et al., *Environmental Justice: Law, Policy & Regulation*, Third edition (Durham, North Carolina: Carolina Academic Press, 2020), <https://cap-press.com/books/isbn/9781531012380/Environmental-Justice-Third-Edition>.

⁶National Environmental Justice Advisory Council (NEJAC), “Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts.”

⁷Charles Lee, “Another Game Changer in the Making? Lessons from States Advancing Environmental Justice Through Mapping and Cumulative Impact Strategies,” *Environmental Law Reporter* 51 (August 2021), <https://www.elr.info/sites/default/files/article/2021/07/51.10676.pdf>.

⁸“CalEnviroScreen,” California Office of Environmental Health Hazard Assessment, accessed January 21, 2025, <https://oehha.ca.gov/calenviroscreen>.

⁹Cal. Health & Safety Code § 25200.21 & 25200.23 (2015).

¹⁰N.J. Rev. Stat. § 13:1D (2020); see “They Said It Couldn't Be Done: A Case Study of New Jersey's Landmark Environmental Justice Law (S.232)” by Nicky Sheats, Ana I. Baptista, Maria Lopez-Nunez, and Melissa Miles in this forthcoming special issue.

¹¹Ana Baptista et al., “Understanding the Evolution of Cumulative Impacts Definitions and Policies in the U.S.” (Tishman Environment and Design Center, August 2022), https://static1.squarespace.com/static/5d14dab43967cc000179f3d2/t/630637a79481bf24cac9f19e/1661351847644/CumulativeImpacts_REPORT_FINAL_Aug2022.pdf.

¹²For the exact version of the version 2.0 database used for the analysis in this article, please see Supplemental Information Table 1. Version 2.0 of the database is also updated continuously, and the most up-to-date version can be found on the Tishman Center website at <http://tishmancenter.org> or upon request to the authors.

¹³Baptista et al., “Understanding the Evolution of Cumulative Impacts Definitions and Policies in the U.S.,” 4.

¹⁴These include: “LegiScan,” LegiScan, accessed January 28, 2025, <https://legiscan.com/>.

¹⁵“Federal & State Legislation Tracker-Bill Track 50,” BillTrack50, accessed January 28, 2025, <https://www.billtrack50.com/info/>.

¹⁶“Bill Tracking,” National Caucus of Environmental Legislators, accessed January 28, 2025, <http://nceleenviro.org/bill-tracking/>.

¹⁷“Environmental Justice State by State Directory,” Environmental Justice State by State, accessed January 28, 2025, <https://ejstatebystate.org/directory>.

For policies, we sought to include all enacted state laws, rules, and regulations that implement a CI requirement in the environmental permitting context.¹⁸ For proposed laws, we sought to include those that were active, though some that were not (e.g., bills that had died in legislative session) were included in the database.¹⁹ As an additional resource and to contextualize this policymaking, we also included state-adopted tools in those jurisdictions that map and calculate CI.²⁰

Data were extracted for each policy and tool and organized into the database as shown in Table 1. Column headings were refined as we determined the types of information most relevant to EJ advocates.

Data analysis

Qualitative thematic analysis. Once the database entries were compiled, we used an iterative process to identify patterns and themes and further refine the categories used in the database. An initial review of the database surfaced a list of key issues to analyze, which was then supplemented by ideas generated in a participatory analysis workshop conducted with additional Tishman Center staff. The workshop consisted of individual prework to review extracted policy language and then an open discussion to collectively surface the most salient policy features, commonalities, and distinctions. The research team then went back to the database entries to conduct a more thorough analysis of identified issues, which included patterns in community definitions, potential policy loopholes or weaknesses, and the relationship (or lack thereof) between CI policies and CI mapping tools within the same jurisdiction. We observed that a number of state policies employed a similar approach to define communities, sometimes called “EJ communities” or a similar term, where the CI permitting requirement would be triggered, and this prompted the additional quantitative analysis described below.

Quantitative analysis of “EJ community” definition coverage. A subset of 11 states was analyzed to determine the extent of coverage given their definition of an EJ community (see Supplementary Table S2).²¹ These states

were chosen because their policies employed a similar construction of an EJ community definition, namely applying thresholds—expressed as fixed percentages or relative to state averages—to one or more sociodemographic indicators, and then combining the indicators with an “and” or “or” construction.²²

The thresholds, indicators, and geographic unit specified in the policy were applied to the 2018–2022 5-year estimates from the American Community Survey (ACS)²³ for consistency.²⁴ All policies utilized census tracts (CTs) or census block groups (CBGs), and thus we calculated the percentage of CTs or CBGs in the state that would be considered an EJ community.²⁵ We also calculated the corresponding percentage of the state’s population living in EJ communities, using population counts obtained from the 2018–2022 ACS.²⁶ Individual indicators were also

the term “EJ community” in this article to include any of these terms that refer to geographic areas that are defined by the policy for purposes of determining policy application.

²²We did not analyze the other eight states’ policies either because their definitions utilized a more complex construction or invoked an external indicator that was itself a composite index or because they lacked a definition altogether. States with more complex definitions could have been analyzed for their coverage and compared with the eleven analyzed states, but this was beyond our scope here.

²³Accessed via data.census.gov between November 10, 2024 and December 14, 2024.

²⁴Policies did not always or fully designate the data source to be used for application of the community definition, so for simplicity and consistency the team opted to use the 2018–2022 ACS dataset for every state. The exact coverage in a given jurisdiction may therefore deviate slightly from our estimates if a different data source is used.

²⁵Rhode Island’s law specified that a variety of spatial units could be used to define EJ communities, including “neighborhood, community, census tract, or other geographically bounded region[s],” however for comparability of analyses across states, we used CTs to analyze Rhode Island’s EJ community definition. S.2535, 2024 Gen. Assemb., Jan. Sess. (R.I. 2024). Massachusetts uses a “neighborhood” definition which is defined as a census block group as defined by the United States Census Bureau, excluding people who live in college dormitories and people who are under formally authorized, supervised care or custody, including federal, state or county prisons. In our calculations we did not exclude those populations living in dormitories and under custody or imprisonment, as we have used the readily available CBG indicators in the ACS that does not exclude those populations. 310 Mass. Code Regs. 7.02(14) (2024).

²⁶Two states’ definitions include whether a community is located within federally recognized American Indian lands. These areas are identified separately from standard CTs or CBGs and are therefore not incorporated into the primary quantitative analysis. Additionally, state-specific imputation reveals marginal contributions of American Indian lands to the aggregative number of spatial units under analysis. In Minnesota, federally recognized American Indian reservations cover a total of 3,270 square miles, which, when compared to the average CBG size of 0.33 square miles, translates to approximately 9,908 imputed CBGs. This accounts for 3.8% of the state’s total 259,777 CBGs. In Michigan, federally recognized American Indian reservations encompass a total of 75,728 acres or approximately 118.3 square miles. Given an average CBG size of 0.2 square miles, this translates to an estimated 591.6 imputed CBGs, accounting for 0.20% of the state’s total 288,754 CBGs. Both cases underscore the relatively small possible impact of the indicator on the overall results.

¹⁸Policies were not included if their content related to CI did not address permitting (i.e., we did not include broad climate laws that only required CI to be considered in a non-permitting context, such as resource allocation).

¹⁹In such cases, we tended to include inactive policies such as failed bills if (1) in the jurisdiction, there was no other relevant *active* proposed policy or a successfully enacted policy and (2) the inactive policy was sufficiently developed such that its inclusion could be informative to users of the resource database looking for guidance and examples of policy design.

²⁰Tools that solely belong to third parties, such as academic institutions, were considered beyond the scope of inclusion in our database.

²¹The eleven states were Arizona, Colorado, Delaware, Georgia, Massachusetts, Michigan, Minnesota, New Jersey, Rhode Island, Vermont, and Wisconsin. Amongst these eleven states, their policies used variable terms, such as “EJ area,” “EJ population,” “overburdened community,” “EJ focus area,” and the like. For brevity, we use

TABLE 1. DATA FOR CUMULATIVE IMPACT LAWS, RULES, AND TOOLS

<i>Column title</i>	<i>Description</i>
State	State name
Type	Passed law, proposed law, rule/regulation, or tool
Issuing agency/body	Issuing agency/body for a rule or regulation, or in the case of tools, the agency/body responsible for its maintenance. (This column is N/A for laws.)
Date passed or proposed (laws); or adopted (regs/rules)	The date legislation was passed or proposed or the date a regulation or rule was adopted.
Tool latest version date (initial version)	Date for the latest version of the tool, as well as a date for the first version.
Purpose & scope of application	Describes what the law, rule, or tool covers. Policies may be broader, but only the portion that pertains to a CI permitting requirement is described in detail.
Applicable facilities	As these policies pertain to permitting, many typically describe a set of facility types for which the policy would be applicable. This section describes those applicable facility types. This column is N/A for tools.
Definition of EJ/overburdened community	As these policies pertain to permitting, many define a subset of communities in or near which a permit application would trigger the CI requirement. Such communities are variably termed “environmental justice communities,” “overburdened communities,” “EJ areas,” “disadvantaged communities,” etc. This section describes those community definitions, including geographic unit, list of indicators, and thresholds used. Where the policy provides for communities to self-designate, this information is also included. In the case of tools, some also offer designations of areas as EJ, overburdened, disadvantaged, disproportionately impacted, etc. These definitions are included for completeness of tool description; however, a policy from the same jurisdiction may not necessarily invoke the tool’s definitions.
Definition of “cumulative impacts” (qualitative)	A qualitative definition of CI, if provided.
Methodology (quantitative) for calculating “cumulative impacts”	The quantitative methodology for calculating CI, if provided. This includes the methodology for analyzing any indicators used (e.g., calculating an index score or some other method of analysis), and any quantitative points of comparison or thresholds used for determining the existence of CI.
Indicators used in CI calculation	The indicators used in the methodology for assessing CI. Lays out the criteria assessed during the CI analysis, typically a combination of socioeconomic indicators, environmental indicators, and others.
Threshold for determining existence of cumulative impacts	The point at which a community is considered affected by cumulative impacts. As related to a policy, this threshold typically determines a course of action. A tool may also define a threshold for determining the existence of cumulative impacts, but by itself the tool typically does not mandate a course of action. Threshold information is also contained in the description of CI calculation methodology, but is isolated here for ease of reference.

analyzed, and their thresholds were compared with state averages to understand how they contributed to a more limited or expansive community definition.²⁷

Analysis and visualizations were conducted in R and Python. The scripts, specific ACS tables used, and additional methodological details are available upon request.

RESULTS

Eight states (California, Colorado, Connecticut, Massachusetts, Minnesota, New Jersey, New York, and Vermont) have codified a requirement for CI to be considered in permitting. However, as of the end of 2024, only two (NJ and

MA) have implemented regulations for their policy.²⁸ We found an additional 11 states (Arizona, DC, Delaware, Georgia, Illinois, Maryland, Michigan, Pennsylvania, Rhode Island, Washington, and Wisconsin) with proposed CI permitting bills that had not passed but had advanced

²⁷To calculate the state averages, we divided the total number of the indicator’s population by total state population.

²⁸In the case of NJ, the law containing the CI permitting requirement was passed in 2020, and the implementing rule was adopted in 2023. In the case of MA, the regulation included in the database responds to MA’s “Act Creating a Next generation roadmap Massachusetts Climate Policy,” which requires the Department of Environmental Protection to propose regulations to include cumulative impact analysis for defined categories of air quality permits. Regulations in MA are considered part of the state’s body of administrative law, and the CI regulation includes both the policy and the methodology. “Learn about the Code of Massachusetts Regulations,” Mass.gov, March 29, 2023, <https://www.mass.gov/info-details/learn-about-the-code-of-massachusetts-regulations>.

sufficiently so as to offer interesting content to potential database users. To help contextualize the policymaking in these 19 states, we included in the database any state tools for mapping or calculating CI. The database's inventory is captured in Table 2.

Displayed chronologically (see Fig. 1), the proliferation of proposed and passed policies that have followed after NJ's law in 2020 is evident, with many successive policies adopting the three-part structure of the NJ law and some even borrowing language (see subsections below). Another observation is that while the first state to have a CI tool, California, achieved this as early as 2013, it still lacks an enforceable CI permitting policy, as the implementing regulations for the CI component of SB 673 are pending.²⁹ Conversely, most states that have passed or made notable progress toward proposing CI permitting legislation have done so without having an official state CI tool. Although our intention was to include any official CI tools to help contextualize the policymaking, even when a state has both, the policy does not necessarily reference the tool.³⁰

Purpose and scope of CI policies

We found that CI policies generally follow a three-part structure. The first part entails the identification of the communities informing where the CI permitting requirement will apply (which some policies and we here refer to as "EJ communities" for brevity).³¹ The second part is a requirement for a CI analysis to be conducted when certain kinds of facilities apply for permits in or near those EJ communities. The third part is the course of action pertaining to the permit that is triggered depending on the outcome of the CI analysis. The legislation also typically contains procedural provisions on timelines, notice requirements, and public participation.³²

Usually, the legislation itself does not contain the CI methodology; rather, this is left for agency rulemaking. Terminology varies by legislation, but the essence is that the specified CI methodology answers the question of whether issuing the permit will cause or contribute to CI in the EJ community and therefore triggers a course of action (such as denying or conditioning the permit).³³ Out of all the policies in the database, DC's and WA's include a methodology within their proposed laws, NJ has already adopted a rule with the methodology for its law, and MA is a special case where both the policy and methodology are contained in an agency regulation considered part of the state's administrative law³⁴; the policies from the other 15 states are examples where methodology would have to be determined in rulemaking.

In its provisions specifying the course of action to be taken regarding the permit, the passed and proposed laws vary in strength, sometimes using weaker, discretionary language and other times providing for exceptions or loopholes. A necessary, but not sufficient, condition of a strong policy is language that obligates the decision maker to deny permits, at least of a certain type and under certain conditions, as evidenced by terminology like "must" or "shall." Such policies were found in DC, GA, IL, MN, NJ, NY, and WA. This is in contrast to policies using discretionary language—e.g., "may" or "can" or "potentially" deny—as seen in the passed and proposed policies of AZ, CO, CT, DE, MA, MD, PA, RI, and WI.³⁵

In some cases, even policies using "must" or "shall" can be weakened by provisions allowing the approval to happen if there is a plan to mitigate harm, that is, applying conditions to permit approval. For example, DC's bill provides that if the CI statement shows that the proposed

²⁹See "SB 673 Permit Criteria-Community Protection," California Department of Toxic Substances Control, October 28, 2024, <https://dtsc.ca.gov/sb-673-permit-criteria-community-protection/>.

³⁰In fact, this tended to be the case with a few exceptions: WA's proposed law does refer to its state tool to define EJ communities, and NJ's tool was created explicitly by the law to provide a methodology for assessing CI. CA's law does not refer to CalEnviroScreen, though ongoing rule-making by the DTSC suggests that CalEnviroScreen will play some role in the implementing regulation. See, for example, California Department of Toxic Substances Control and California Environmental Protection Agency, "SB 673 Cumulative Impacts and Community Vulnerability Draft Regulatory Framework," May 2021, https://dtsc.ca.gov/wp-content/uploads/sites/31/2021/07/2021MAY-DRAFT-CI-Regulatory-Framework_Accessible.pdf.

³¹CI permitting policy can, but does not necessarily have to, make use of an EJ definition (that is based on socioeconomic indicators) and/or a CI assessment tool or framework. However, an EJ community definition can exist in a place that may or may not have a CI permitting policy.

³²These public participation components come into play with respect to all three parts of the process. We did not analyze them extensively, but some mechanisms include public comment periods, the designation of community advisors, and provisions around language accessibility.

³³For example, in Minnesota, the course of action is triggered "if the cumulative impacts analysis determines that issuing the permit, in combination with the environmental stressors present in the environmental justice area and considering the socioeconomic impact of the facility on the residents of the environmental justice area, would have a substantial adverse impact on the environment or health of the environmental justice area and its residents." Minn. Stat. § 116.065 (2023). In New Jersey, the course of action is triggered "upon finding that approval of the permit would, together with other environmental or public health stressors affecting the overburdened community, cause or contribute to adverse cumulative environmental or public health stressors in the overburdened community that are higher than those borne by other communities within the state, county, or other geographic unit of analysis." N.J. Rev. Stat. § 13:1D (2020).

³⁴Regulations in the MA's administrative law (known as the Code of Massachusetts Regulations) are passed and enforced by the executive branch in MA, not the legislative branch, the latter of which passes MA's General Laws (MGL). They do not go through the legislative process. However, the CMR relies on the MGL as its legal authority.

³⁵Vermont's and California's passed CI laws are even more open-ended, in that they lay out certain covered agencies and facilities, respectively, and broadly state that the relevant agencies have to make decisions about CI and permitting, but they do not codify how decisions on the approval or denial of permits will be made. Associated rule-makings may define this further.

TABLE 2. CONTENT COVERED IN CUMULATIVE IMPACTS 2.0 DATABASE

<i>State</i>	<i>Content in database</i>	<i>State</i>	<i>Content in database</i>
Arizona	Proposed law	Michigan	Proposed law, tool
California	Passed law, tool	Minnesota	Passed law
Colorado	Passed law, tool	New Jersey	Passed law, rule, tool
Connecticut	Passed law	New York	Passed law, methodology
Delaware	Proposed law	Pennsylvania	Proposed law, tool
District of Columbia	Proposed law	Rhode Island	Proposed law
Georgia	Proposed law	Vermont	Passed law
Illinois	Proposed law	Washington	Proposed law, tool
Maryland	Proposed law, tool	Wisconsin	Proposed law
Massachusetts	Regulation	Notes: For MA, the regulation is part of the state’s administrative law. For NJ, the tool is not its own entry, as it is embedded in the rule. NY is a special case, where a CI-type methodology exists due to a separate law.	

project will cause disproportionate impact, the permit shall be disapproved, unless the applicant proposes mitigating measures or substitutes an alternative to avoid such impact.³⁶

We also found provisions related to compelling public interest and community benefit agreements (CBAs), sometimes used to change the decision outcome. For example, NJ’s law and the legislation proposed in MI, GA, and WA contain a “compelling public interest” exception, allowing states to approve permits that would otherwise be denied. Note, however, that the extent of these exceptions can be limited. For example, in NJ, the compelling public interest must accrue to the EJ community itself, and final rulemaking has excluded economic benefits from being considered a compelling public interest. WA includes similar limitations embedded in the bill itself, and GA’s proposed legislation copies NJ’s law nearly verbatim. Laws passed in MN and CT also provide for CBAs. In MN, the CBA serves as a loophole, as a permit that would otherwise be obligatorily denied can be approved if the facility owner or operator enters into a CBA. In CT, whose law does not require permit denials, CBAs function differently—they are a prerequisite in the process before a decision can be made on the permit, with applicants being required to consult with municipal officials on the need for a CBA and being required to reach one in certain circumstances.³⁷

Permits and facilities

The CI policies in the database cover various permit types, including those for new facilities, expansions of existing facilities, and renewals. In some cases, policies may offer different legal requirements based on the type of permit. For example, in NJ, permits for new facilities are mandatorily denied based on the CI analysis, whereas those for expansions and renewals may apply

conditions that will mitigate harm. In NY, permits for new facilities are denied if the project will cause or contribute more than a de minimis amount of pollution to a disproportionate pollution burden on a disadvantaged community. However, permit renewals or modifications are denied if the project would significantly increase the existing disproportionate pollution burden on a disadvantaged community.

The CI policies analyzed usually have a corresponding universe of facility types to be covered. Common facility types include major sources of air pollution,³⁸ generators that exceed a certain capacity, incinerators, sewage treatment plants, scrap metal facilities, and waste transfer stations. Each policy may have a particular focus reflecting historic sources of harm in the state’s EJ communities.³⁹ This tailoring was a key part of the list of covered facilities in NJ’s law. We observed what seemed like tailoring in examples from other states, such as animal-feeding operations in Michigan, underground injection control wells in Pennsylvania,

³⁸Some states use the Clean Air Act’s “major source” definition and in some cases will also include additional facility types. The Clean Air Act defines a major source as any stationary facility (or group of facilities within a contiguous area and under common control) that could emit at least 10 tons per year of any hazardous air pollutant, or at least 25 tons per year of any combination of hazardous air pollutants, if operating at maximum capacity for 24 hours a day, 365 days a year. “Clean Air Act,” Pub. L. No. 84–159, § 12, 7412 42 U.S.C. (2013), <https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchap1-partA-sec7412.htm>.

³⁹Relatedly, we are aware of two contributions in this forthcoming special issue that delve into the link between historic sources of harm and current policies. In “They Said It Couldn’t Be Done: A Case Study of New Jersey’s Landmark Environmental Justice Law (S.232),” the authors acknowledge how economic pressures are rooted in historical patterns of racial discrimination in housing, employment, etc. In “Putting the Justice in Environmental Justice Screening Tools: A case study on centering community voices and needs in Southwest Detroit,” the authors recommend the inclusion of data from oral histories, particularly linking environmental injustices to a history of systemic racism (e.g. redlining) and disinvestment via ArcGIS StoryMaps.

³⁶B25–0564, 25th Council, 2023 Leg. Sess. (D.C. 2023).

³⁷Conn. Gen. Stat. § 23–202 (2023).

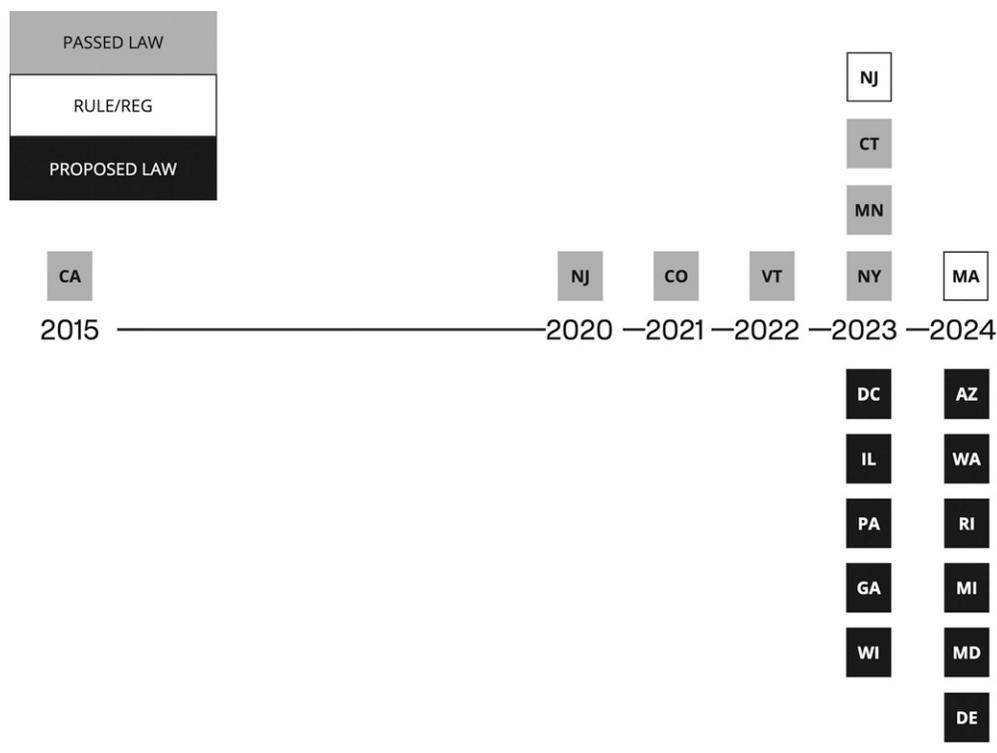


FIG. 1. Timeline of CI proposed laws, passed laws, and regulations.

and asphalt or concrete plants in DC.^{40,41,42} At times, the law bypasses specifying a list of facilities and instead uses broader terms such as “state action.”⁴³ While this approach can be more inclusive—encompassing any project initiated—it also introduces a potential loophole if facilities maneuver outside the scope of the definition of an “action.”

EJ community definition

For most policies, the identification of EJ communities is crucial to informing where CI permitting requirements apply. Eleven states have an EJ community definition

based on socioeconomic indicators, listed in their passed or proposed policy (see Supplementary Table S2). All definitions include one to five indicators, with household income and People of Color (POC)⁴⁴ population being the most common. Indicators vary in their application and thresholds. CBGs and CTs are the spatial units used for eight and three states, respectively.⁴⁵

Policies set indicator thresholds in terms of a state average or as a fixed number.⁴⁶ For thresholds set as fixed percentages, we examined these against state averages. NJ and GA are examples of states intentionally setting at least one fixed threshold at or close to state averages, while most set their thresholds above state averages, meaning that their approach to defining EJ communities is less inclusive. Another important aspect

⁴⁰Kyle Davidson, “Report Calls for Stricter Regulations on Animal Feeding Operations to Protect Water Quality,” Michigan Advance, April 1, 2024, <https://michiganadvance.com/2024/04/01/report-calls-for-stricter-regulations-on-animal-feeding-operations-to-protect-water-quality/>.

⁴¹“Environmental and Health Groups Call on Pennsylvania to Require Minimum Setbacks from Fracking Wells to Protect Pennsylvanians,” Clean Air Council, October 22, 2024, <https://cleanair.org/no-drill-zones-rulemaking/>.

⁴²Jacob Fenston, “Environmental Justice Bill Targets Polluting Industries In Ivy City, Brentwood, And Elsewhere,” DCist, July 31, 2018, <https://dcist.com/story/23/11/09/environmental-justice-bill-polluting-industries-dc/>.

⁴³For instance, in CO the law covers “state actions,” which are defined as “rule-making proceedings held pursuant to section 24–4–103; licensing proceedings, including the issuance and renewal of permits, held pursuant to section 24–4–104; and adjudicatory hearings held pursuant to section 24–4–05.” Colo. Rev. Stat. § 24–4–109 (2021).

⁴⁴We use the term People of Color throughout the manuscript to refer to populations that have a race/ethnicity other than “white alone.” Note, however, that some states use the terminology, “minority” population, to refer to the same concept.

⁴⁵As mentioned in the Methods, Rhode Island lists multiple options for spatial scales that can be used to define EJ communities. For consistency and comparability across states, CTs were used for this analysis.

⁴⁶For example, both Delaware and Wisconsin’s definitions used an indicator of percent population with limited English proficiency. However, Delaware’s policy specifies that the proportion of residents in the CBG with limited English proficiency must be greater than 75% of the state average, while Wisconsin’s law sets a fixed threshold of 40% of households or more in a given CBG (Table 2 in Supplemental Information).

determining the definition's inclusivity is whether a conjunctive or disjunctive approach is used in analyzing multiple indicators (see Fig. 2). Most policies use a purely disjunctive approach, and a community meeting the threshold for any one (or more) of the indicators thus qualifies as an EJ community. A conjunctive approach—requiring *all* indicator thresholds to be met—was less common, as was a mixed approach that would require a specific indicator to be met along with one of several possible other indicators (e.g., the community must meet the income criterion plus either the race/ethnicity *or* linguistic isolation criteria).

Based on the full EJ community definition adopted in each state, we calculated the percentage of the population and spatial units meeting the definition. The population proportion covered under each EJ community definition varies significantly across states (see Table 3). DE and WI cover the highest and lowest proportions, 78.40% and 5.54%, respectively.

As expected, the extent of coverage appears greatly influenced by the policy's design. For instance, the two states with the lowest coverage—WI and MI—are the only ones using a conjunctive approach. As another example, while VT uses fixed percentage thresholds, it appears to fine-tune them according to the state's demographics. VT's thresholds include a minimum of 6% for POC populations and a minimum of 1% for limited English proficiency populations, reflecting the state averages of 7.48% and 0.62%, respectively. Consequently, its population coverage is relatively high (59.80%). WI, having the lowest coverage, employs thresholds significantly higher than its state averages: The threshold for POC and limited English proficiency status is 40%, compared with statewide averages of 18.66% and 1.51%, respectively.⁴⁷

Relationship between identified EJ communities and protected communities

The extent of EJ communities identified from the quantitative criteria is tied to the extent of protection they provide, but this relationship is not straightforward due to variations in policy design. For instance, some policies allow communities to self-designate as EJ areas, potentially expanding the scope of protection.⁴⁸ Other policies

use geographic parameters, such as specified radii around facilities, to extend protection beyond the boundaries of designated EJ communities.⁴⁹ These measures may help ensure that facilities affecting EJ communities are subject to CI requirements. However, policies can also impose filters that constrain their protective scope. A notable example is MN, whose policy uses a statewide EJ community definition but limits the CI permitting requirements to specific counties and cities of a certain size.

CI assessment methodologies

For the 19 states in our database, we found that many of the policies did not yet lay out a CI assessment methodology because the policy had not passed and/or rulemaking was still pending. To help contextualize policymaking and glean insight into where future rulemaking might head, we gathered CI assessment methodologies contained in any existing state mapping tool, even if such a tool was not explicitly referenced yet by the policy.⁵⁰ Our review of all methodologies together surfaced several observations.

First, there are two general methodologies for assessing CI. One is what has been termed in the literature as a “Single Scoring Method,” which calculates an index score from environmental and social vulnerability indicators and determines a threshold score that designates an area as experiencing CI burdens.⁵¹ This methodology requires several key considerations, including how to weigh each indicator and whether to multiply or add indicator scores together when calculating the score.⁵²

The second method for assessing CI is referred to as the “Matrix Method” or “NJ Method,” which evaluates environmental and social vulnerability indicators (or “stressors”) individually.⁵³ Each stressor in the EJ community is analyzed in comparison to the same stressor from a geographic point of comparison (GPC) to determine if the stressor is adversely affecting the community.⁵⁴ If the stressor value in the EJ community is higher

designation as an EJ area.” S.2535, 2024 Gen. Assemb., Jan. Sess. (R.I. 2024).

⁴⁹RI and DE use a half-mile radius, while MA applies a 5-mile radius for major sources and a 1-mile radius for other sources; MN similarly adopts a 1-mile radius.

⁵⁰Other articles have focused on reviewing the landscape of all state mapping tools, as detailed in the Discussion.

⁵¹Paul Mohai et al., “Environmental Justice, Cumulative Impacts and Environmental Decision-Making: Challenges and Progress” (The Center for Community Engagement, Environmental Justice, and Health, September 11, 2024), <https://www.youtube.com/watch?v=Xw7pdQ4GcoM>.

⁵²California's CalEnviroScreen tool exemplifies this approach by using 21 indicators to calculate a composite percentile score relative to the rest of the state's CTs. The tool half-weights environmental effects indicators in comparison to environmental exposure indicators and multiplies overall pollution burden average scores by population characteristic scores.

⁵³Mohai et al., “Environmental Justice, Cumulative Impacts and Environmental Decision-Making: Challenges and Progress.”

⁵⁴For example, NJ's CI rule makes the comparison to the median value of non-EJ communities in the state or county—whichever comparison ends up being more protective for the EJ community in question. N.J. Admin. Code § 7:1C:-2.2 (2023).

⁴⁷The differences between VT and WI are visualized in Fig. 1 of the Supplemental Information, showing the distributions of POC and linguistic isolation shares compared to the state's thresholds for indicators.

⁴⁸Five states included provisions in their policies that allow for communities to be designated as EJ communities based on factors outside of the quantitative calculations. For instance, Colorado's CI law states that, in addition to quantitative calculations, “a state agency can identify or approve any other [EJ community] if: the community has a history of environmental racism perpetuated through redlining, anti-indigenous, anti-immigrant, anti-hispanic, or anti-Black laws,” among other factors. Colo. Rev. Stat. § 24-4-109 (2021). Other states allow community members to petition or self-designate their community as an EJ community. Rhode Island's bill allows consideration of petitions of at least 10 residents that provide “a detailed statement explaining why the area was not initially included and provide justification for its

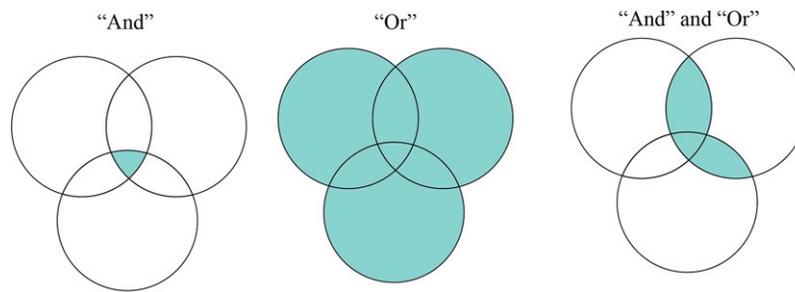


FIG. 2. Conjunctive (“And”; left panel), disjunctive (“Or”; center panel), and mixed approaches (right panel) for EJ community definition indicators visualized as Venn diagrams.

than its GPC, it is considered “adverse.” If the total number of adverse stressors in the EJ community is higher than that of its GPC, the community is considered to experience CI.⁵⁵

Whether the first or second method is used, the setting of the threshold CI score or the GPCs, respectively, is key to determining how readily the course of action (denying a permit or conditioning a permit, for example) is triggered. (However, since rulemaking for many state policies is still pending, most states do not yet have explicit CI thresholds for action.) In any case, the majority of the indicators used fell into similar categories, including environmental exposures and pollution, environmental effects and public health impacts, sensitive populations, and socioeconomic factors. Climate hazards rarely appeared as indicators among the methodologies in our sample.

DISCUSSION

The development of CI permitting policies has marked an important step toward addressing environmental injustice, allowing an opportunity to disrupt entrenched practices of unequal siting of environmental burdens in low-income communities and communities of color. Our research underscores the fact that this type of CI policy intervention extends beyond (and is at times independent of) the creation of tools and methodologies, requiring the establishment of robust legal frameworks, enforcement mechanisms, and community-centered processes.

⁵⁵Massachusetts’ is an example of a regulation that does not fall into either CI methodology outlined above. Rather, it requires the applicant to submit a qualitative “cumulative impacts analysis” that considers environmental, health, and socioeconomic factors of the surrounding community, as well as a quantitative risk characterization of toxic air pollutants. Notably, the plan or permit may only be denied if the air pollutant risk characterization analysis shows that “any cumulative cancer [or non-cancer] risk calculated [exceeds] the cumulative cancer [or non-cancer] risk limit” outlined in 310 CMR 7.02. The regulation does not specify that a plan can be denied based on the cumulative impacts analysis itself. 310 Mass. Code Regs. 7.02(14) (2024).

This article thus contributes to the body of CI research by taking a policy-focused approach. Prior research has highlighted the health considerations and motivations of addressing CI, the development of state-specific mapping tools, and the methodologies behind quantifying CI.^{56,57,58,59} Our goal here was not to systematically review all mapping tools. Besse and Rojas-Rueda recently provided such an overview, comparing the scope, breadth, and geographic resolution of tools across 25 states.⁶⁰ Compared with Besse and Rojas-Rueda and earlier reviews such as Balakrishnan et al.⁶¹ and Konisky et al.,⁶² the database resource we have created emphasizes passed and proposed laws, responding to a need for policy ideas and “proofs of concept” that EJ advocates can bring to local policymakers. While much previous research and attention around the

⁵⁶Morello-Frosch et al., “Understanding The Cumulative Impacts Of Inequalities In Environmental Health.”; Mohai et al., “Environmental Justice, Cumulative Impacts and Environmental Decision-Making: Challenges and Progress.”; Lee, “Another Game Changer in the Making? Lessons from States Advancing Environmental Justice Through Mapping and Cumulative Impact Strategies”.

⁵⁷James L. Sadd et al., “Playing It Safe: Assessing Cumulative Impact and Social Vulnerability through an Environmental Justice Screening Method in the South Coast Air Basin, California,” *International Journal of Environmental Research and Public Health* 8 (May 2011): 1441–59, <https://doi.org/10.3390/ijerph8051441>.

⁵⁸Vivek Ravichandran et al., “Utilization of MD EJSCREEN to Assess Health Outcomes in Baltimore, Maryland,” *Environmental Justice*, May 8, 2024, <https://doi.org/10.1089/env.2022.0039>.

⁵⁹Esther Min et al., “Quantifying the Distribution of Environmental Health Threats and Hazards in Washington State Using a Cumulative Environmental Inequality Index,” *Environmental Justice (Print)* 14 (August 1, 2021): 298–314, <https://doi.org/10.1089/env.2021.0021>.

⁶⁰Hannah Besse and David Rojas-Rueda, “Environmental Justice Mapping Tools in the United States: A Review of National and State Tools,” *The Science of the Total Environment* 962 (January 25, 2025), <https://doi.org/10.1016/j.scitotenv.2025.178449>.

⁶¹Chitra Balakrishnan et al., “Screening for Environmental Justice: A Framework for Comparing National, State, and Local Data Tools” (Urban Institute, November 2022), <https://www.urban.org/research/publication/screening-environmental-justice-framework-comparing-national-state-and-local>.

⁶²David Konisky, Daniel Gonzalez, and Kelly Leatherman, “Mapping for Environmental Justice: An Analysis of State Level Tools” (Indiana University Environmental Resilience Institute, July 1, 2021), <https://hdl.handle.net/2022/29445>.

TABLE 3. OVERVIEW OF COVERAGE IN THE STATE BASED ON POLICY’S EJ COMMUNITY DEFINITION

State	Percent of state CT/CBGs (number out of total) covered by definition	Percent of state population covered by designation
Delaware	75.35% (532 of 706)	78.40%
Colorado	71.17% (2888 of 4058)	70.90%
Georgia	65.59% (4884 of 7446)	63.92%
Vermont	58.88% (325 of 552)	59.80%
New Jersey	47.63% (3143 of 6599)	49.17%
Massachusetts ^a	46.68% (2388 of 5116)	45.58%
Arizona	33.33% (574 of 1722)	29.43%
Rhode Island	31.44% (249 of 792)	29.59%
Minnesota ^b	20.29% (955 of 4706)	19.61%
Michigan ^b	19.95% (1673 of 8386)	18.16%
Wisconsin	6.97% (327 of 4692)	5.54%

^aAs explained in the Methodology section, we have used the readily available CBG indicators in the ACS, which do not exclude populations in dormitories, custody, or prison, as per Massachusetts’ “neighborhood” definition. Our estimate therefore approximates the true statewide coverage.

^bThese states’ CI definition includes a dummy variable for American Indian land, which is not part of the quantitative analysis. Hence, the respective calculations represent a lower bound of the scope of the coverage by the definition, as detailed in the Methods.

topic of CI has focused on CI mapping tools and methodologies, we have surfaced many examples of CI policies arising prior to the existence of—or without explicit reference to—official CI mapping tools or methodologies in the same jurisdiction.

Our results have highlighted the implications of policy design choices pertaining to topics like scope, mandatory versus discretionary authority, loopholes and exceptions, as well as quantitative and qualitative aspects of EJ community definitions. We observe how these choices may influence the coverage and efficacy of protections and, consequently, the experiences of EJ communities. The policy decision points are reflected by the columns in the database and arise in the context of lawmaking as well as rulemaking.

Within these decision points, arguably the most critical is whether permit denials are obligated, at least under some circumstances. It was perhaps surprising to find a number of proposed and even passed policies where denial is always discretionary, never required. Among the other decision points, we observed many ways in which even a strong legal mandate can be diluted. For example, there can be a weaker standard for certain types of permits, or there can be exceptions to the mandate based on “public interest,” mitigating actions, or CBAs. The use of CBAs, particularly in EJ communities, has been criticized due to concerns about representation (i.e., who speaks for the community), pressure on already marginalized communities, and unfairness in asking EJ communities to compromise essential rights, like health and clean air, for social and economic goods that more

privileged communities readily access.^{63,64,65} Moreover, there can be a narrow universe of covered facilities or a restrictive definition of communities to be protected, or places where the policy applies. In moving from designating EJ communities to identifying communities benefiting from CI permitting scrutiny, divergent approaches are seen, some of which can broaden protections (e.g., through additional self-designation mechanisms or radii), but others of which can narrow them (e.g., limiting the policy to EJ communities in specific localities). A narrower scope would suggest a less protective policy overall; however, the relationship may not be straightforward in cases where there may have been a trade-off (in political terms) between the breadth of application and the strength of protection, or in situations where an overly broad EJ community definition dilutes the ability to focus on the most underserved or disadvantaged communities.⁶⁶ Understanding the strategic decisions of EJ advocates in various jurisdictions is beyond the scope of this research but would be a worthwhile objective of future research.

Another key takeaway deriving from the myriad decision points is that there is ample opportunity to cater to local context, even while new policies may look to existing policies as models. For example, the universe of facility types covered by a policy is one arena in which EJ advocates can cater their legislation to the polluting activities of their local context. The designation of EJ communities is another policy component where tailoring can happen and where we in fact observed substantial variation. States relying on sociodemographic indicators often draw on similar indicators (particularly race, income, and English proficiency); however, established thresholds yield a wide range in the proportion of the state’s population that is considered an EJ community. Thresholds are sometimes set close to state averages, but not always. A number of policies utilize other approaches to designate EJ communities, such as incorporating environmental indicators and/or composite indices that may have been created specifically for the state.

A final takeaway is that implementing rules and regulations is a critical component of the legislation, needed not

⁶³Vicki Been, “Community Benefits Agreements: A New Local Government Tool or Another Variation on the Exactions Theme?,” *University of Chicago Law Review* 77 (January 1, 2010): 21–25, <https://chicagounbound.uchicago.edu/uclrev/vol77/iss1/2>.

⁶⁴Seema Kakade, “A Contractual Relationship with Environmental Justice,” *American University Law Review* 73 (2023): 343.

⁶⁵Alex Geisinger, “The Benefits of Development and Environmental Injustice,” *Columbia Journal of Environmental Law* 37 (2019), <https://doi.org/10.7916/cjel.v37i2.3475>.

⁶⁶We want to note, however, that defining EJ communities for purposes of applying CI permitting protections is very different from defining EJ communities for purposes of resource allocation. In the latter case, where there are limited resources to allocate, it may make more sense to focus on tier communities based on levels of vulnerability. In the case of protecting communities from environmental harm, a broader scope may be more justifiable.

just for the practical effect of making implementation possible but also for knowing the ultimate strength of the policy. There are fewer cases of completed rulemaking. However, examples suggest that rulemaking not only has the ability to undercut some of the legislation's protections, but sometimes it can be used strategically to improve weaknesses in the law (for example, restricting what falls under a "compelling public interest" exception). Rulemaking can also be highly technical, as it will be the likely domain where the CI methodology—including quantitative thresholds for triggering a course of action—is determined. For both reasons, EJ advocates and the technical allies should expect to follow rulemaking closely.

LIMITATIONS

For the state CI policies collected, a separate thorough analysis of public participation requirements would be useful, especially given their potential to entrench or improve long-standing challenges of community access in environmental permitting.⁶⁷ In addition, as detailed in the Methods, our calculation of state coverage of EJ definitions is approximate for some states and was also not conducted for every state. We may also have missed a relevant state law or bill, though we will include additional policies as we receive feedback and refine the database. At a more local level, municipal CI policies have also been on the rise, and we hope to include an analysis of such policies in future work. Last, but not least of all, this research would be illuminated greatly by qualitative information from local EJ advocates, who can elucidate the decision-making behind policies, as well as the status of implementation.

CONCLUSION

Our research and database highlight the significant advancement in CI policy over the past five years. While much research and attention around the topic of CI has previously focused on CI mapping tools and methodologies, we have now seen many examples of CI policies arising prior to the existence of an official mapping tool or methodology in the same jurisdiction. CI permitting protections are a policy innovation that continues to gain traction, bringing both enormous potential and pitfalls. As the federal landscape for achieving environmental justice is threatened, local policies such as those detailed here are all the more critical, and it is our hope that this work contributes to their development.

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AUTHORS' CONTRIBUTIONS

A.I.B. contributed to project conceptualization, methodology, data analysis, and writing (editing). Y.L. contributed to project conceptualization, methodology, data collection, data analysis, writing (original draft and editing), and project supervision. A.Y. contributed to project conceptualization, methodology, data collection, data analysis, writing (original draft and editing), and project administration. M.K. contributed to methodology, data collection, data analysis, and writing (original draft and editing). C.S.B. contributed to methodology, data collection, data analysis, and writing (original draft and editing).

AUTHOR DISCLOSURE STATEMENT

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Supplementary Material

Supplementary Figure S1
Supplementary Table S1
Supplementary Table S2

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⁶⁷Other researchers may have already examined this issue; for example, Aresha Nadeem et al., "A Review of Public Participation in State Legislation on Cumulative Risk or Cumulative Impacts," *American Public Health Association Annual Meeting*, Minneapolis, MN, October 29, 2024.