THE NEW SCHOOL

Tishman Environment and Design Center

UNDERSTANDING THE EVOLUTION OF

CUMULATIVE IMPACTS

DEFINITIONS AND POLICIES IN THE U.S.

ACKNOWLEDGEMENTS

This report was prepared by Ana Isabel Baptista, Ph.D., Adrienne Perovich, MPA, and research assistants Maria Fernanda Pulido-Velosa, Enrique Valencia, Marisa Valdez, and Jennifer Ventrella, who are part of the research team at Tishman Environment and Design Center at The New School.

Advisor to the project:
Nicky Sheats, Esq., Ph.D.
Director, Center for the Urban Environment,
John S. Watson Institute for Public Policy at Thomas Edison State College
New Jersey Environmental Justice Alliance

For more information contact:
Tishman Environment and Design Center
tedc@newschool.edu
tishmancenter.org

Released in August, 2022

TABLE OF CONTENTS

Introduction..... 3

Methodology..... 4

Results

- CI Mapping Tools and Enacted Legislation..... 5
- Purpose of CI Policies and Reports..... 7
- Indicators..... 8
- Methodologies for Calculating Thresholds and Cumulative Scores..... 10

Conclusion..... 12

INTRODUCTION

The issue of cumulative impacts (CI) has been a central focus of the environmental justice (EJ) movement for decades. Understanding cumulative impacts requires consideration of the complex interplay between socio-demographic, environmental, and public health factors that impact EJ communities. These communities are both more likely to be overburdened with pollution (higher vulnerability) and more likely to suffer severe impacts from pollution (higher susceptibility)[1]. Yet advancing actions that address cumulative impacts in EJ communities has been challenging for a variety of reasons. One of the key barriers to addressing CI in environmental decision-making is the narrow focus of existing environmental regulations that do not include an explicit mandate to consider multiple pollutants from multiple sources. There are gaps in our knowledge about how multiple pollutants interact with each other and impact public health under different conditions; and most environmental laws do not consider the socio-demographic and health disparities that impact EJ communities[2]. Finally, one of the biggest obstacles to implementing a proactive approach to addressing CI has been the lack of political will to limit the activity of industry in EJ communities where cumulative impacts have traditionally been concentrated.

Nevertheless, in the past decade, EJ advocacy has pushed for increasing attention to CI in federal and state policies. During this time, a variety of CI definitions and methodologies evolved for application in agency guidance, public policies, and academic research. Furthermore, in recent years, various CI screening tools have been developed with the collaboration of diverse stakeholders, including EJ leaders, EJ scholars, and public sector researchers. These advancements have created momentum throughout the US to address the issue of cumulative impacts. This research is aimed at supporting EJ movement stakeholders and policymakers with a searchable tool of definitions, indicators, thresholds, and benefits in the various CI policies developed to date.

METHODOLOGY

The tool summarizes definitions of relevant cumulative impact terms (such as "cumulative effects" and "cumulative risks") from federal and state policies, both enacted and proposed legislation, government agency guidance documents, and selected journal articles from the academic literature. The tool also contains information about the methodologies, indicators, and thresholds used for determining cumulative impacts. In the case of policies and agency guidance documents, the tool contains information on the main purpose of the CI definition or guidance. The tool includes web links to the source legislation and documents, along with supporting tables and images (if available).

The entries in this tool were sourced through online searches of policies containing the keywords "cumulative impacts," "cumulative risks," and "cumulative effects." The search specifically focused on cumulative impacts within environmental justice policy-making contexts, including bills, agency guidance documents, and government reports. The search employed researcher knowledge of emerging legislative initiatives in various states. It also included a review of state legislative archives, USEPA archives, newspaper articles, and peer-reviewed journals, and used researcher knowledge of emerging legislative initiatives in various states related to CI. The summary is not exhaustive and thus is not representative of all possible definitions or methodologies related to cumulative impacts in use today or previously proposed. This data is meant as a representative snapshot of cumulative impacts, definitions, and methodologies in wide circulation.

RESULTS

CI Mapping Tools and Enacted Legislation

Thirteen states (CA, HI ,IL, MA, MD, MI, MN, NJ, NM, NY, OR, VT, WA) were identified that have legislation, mapping tools, and/or agency guidance documents that include consideration of CI. Four of these 13 states (CA, MN, NY, WA) have developed, or are currently developing, geo-spatial mapping tools for expressing CI. There are also mapping tools intended for identifying EJ communities; more information about these mapping tools can be found in this Mapping for Environmental Justice Report. These tools have evolved to include an increasing number of indicators and advanced mapping methods, but not all of them include methods for how to calculate a cumulative impact score or threshold. For example, although the recently released US EPA EJScreen has a number of environmental and socio-demographic indicators, it does not have a method for adding or expressing these indicators in a cumulative manner.

There are several state-level CI mapping tools that bring together socio-demographic, health, and environmental information to illustrate the relative CI levels across diverse geographic areas. These mapping tools can help advocates to develop legislation by revealing important patterns and identifying priority areas for protection or investment[3]. However, the presence of CI tools or maps alone does not necessarily lead to proactive CI policies to address cumulative impacts. EJ advocates are increasingly seeking the enactment of EJ laws that substantively address cumulative impacts in environmental decision making rather than for informational purposes. While the development of CI tools has increased in the last decade, the application of these tools to environmental decision making, such as permitting, has been less prevalent.

Similar bills that focus on CI in permitting have been introduced in the last few years in Hawaii, Minnesota, Illinois, and Maryland, but none have been adopted. Many of these proposed bills focus on the implementation of CI tools and on restricting permitting on the basis of cumulative impact analyses. In Maryland, for example, three cumulative impact bills were introduced between 2014 and 2016[4], but none were adopted. For instance, the Maryland Act Concerning Environment, Permit Determinations and Cumulative Impact Assessments (introduced in 2014) included language to require the Department of the Environment to solicit Cumulative Impact Assessments from permit seekers.

This year, SB. 528 The Climate Solutions Now Act of 2022 passed in Maryland. This act is primarily targeted at greenhouse gas emissions reduction but includes provisions to reduce impacts on overburdened communities, starting with the development of methodologies that include CI analyses to identify "disproportionately affected" communities. An unpassed policy worth highlighting is the Act Relating to Environmental Justice Mapping introduced in Hawaii in 2021. This act specifically calls for the identification of a methodology to measure the cumulative impacts of all indicators selected by the EJ mapping task force, but points out that methodologies should "account for conditions that are not captured by the quantitative data used to develop maps and environmental justice scores by developing and executing a plan to perform outreach to relevant communities; and establishing a mechanism by which communities can self-identify as environmental justice communities in the tool and that may include citing qualitative data on conditions for which quantitative data are lacking, such as cultural loss in native Hawaiian communities."[5] This last point is pertinent given that EJ communities and activists have highlighted the importance of difficult-to-quantify indicators for inclusion in cumulative impacts policies.

At the federal level, several environmental justice laws have recently been proposed that include CI considerations. These bills were introduced between 2020 and 2022, but thus far none have passed. The Environmental Justice Act of 2021, for instance, amends the Federal Water Pollution Control Act and the Clean Air Act to require submission of CI analyses when applying for or renewing a permit. The Environmental Justice Legacy Pollution Cleanup Act of 2020 also amends the Clean Air Act to place restrictions on permitting in overburdened communities and includes appropriations for environmental cleanup and remediation of threats to public health. These bills were introduced and then referred to the Committee on Environment and Public Works and the Committee on Appropriations respectively, but no further actions have been taken. In addition to these legislative proposals, there are also several guidance documents and reports from the US EPA addressing CI. Recently, the US EPA's Office of Research and Development (ORD) released a white paper recommending ways to strengthen the scientific foundation for assessing cumulative impacts within the Office's Strategic Research Action Plans.

Purpose of CI Policies and Reports

The data collected also includes the intent of the CI policies, reports, tools, and a review of the substantive purpose of each. The intent of the legislation, reports, and tools were summarized into categories following Ringquist's policy typologies [6] (see Table 1). These typologies classify items broadly as (1) redistributive, (2) protective, and (3) environmental/analytical. These typologies are a simplification of complex policies that can have multiple or overlapping purposes. The categories serve as a very general way to group policies for summary purposes according to their most prominent features. For policies and reports where more than one typology was applicable, we noted each typology in the table.

The majority of the dataset in the CI table is composed of reports and guidance documents. Most of these reports were developed for informational purposes intended to guide agency policy or future research in the area. Most of the policies in the datasets aim to enhance the participation of stakeholders in decision-making processes, provide greater clarity, or provide information about the impacts faced by EJ communities. These types of policies can be classified as "protective" but only in so much as they provide enhanced access to information rather than greater protection from the impacts per se. In some instances, bills include requirements that directly restrict permitting, as in the cases of the New Jersey and New York bills mentioned in the previous section. These bills are protective in a regulatory context by using CI information to make decisions about permitting. Protective policies substantially change the approach to regulating industries in EJ communities and can face greater opposition from regulated industries. Many of the CI bills that have been proposed in recent years in the states of Massachusetts, Minnesota, and Maryland restrict permitting and reflect this more substantive regulatory approach. They have not been passed.

Recent proposed bills at the federal level (not yet enacted) have both protective and redistributive goals, such as the establishment of grant programs intended to benefit EJ communities (S.2630 and HR.2021 - Environmental Justice Act). At the state level, California and New York have enacted legislation targeted at redistribution. California Assembly Bill 1550[7], passed in 2016, requires that 25% of revenue generated by the State's cap-and-trade program be invested in disadvantaged communities. CalEPA released a list of disadvantaged communities, defined as census tracts, that score at the top 25% on indices of social and environmental indicators according to CalEnviroScreen, for the purposes of compliance with AB 1550. While AB 1550 promises redistribution to benefit the most pollution-burdened communities, scholars and activists question the degree to which funds managed by local governments are being spent within these communities [8]. Additionally, California is prioritizing disadvantaged communities in land use planning. Senate Bill 1000, passed in 2016, requires that cities and counties include environmental justice strategies when updating general plans–either through stand-alone environmental justice elements or through policies embedded in other elements–and these must address the needs of disadvantaged communities. SB1000 also requires the engagement of disadvantaged communities in the development of general plans.

Table 1. Policy Goal Categories and Total Policies/Reports/Guidance/ Tools in Each Category

Typology (Ringquist)	Goal Type	Total CI Policies/ Reports/Guidance/Tools
Redistributive	Goal is to target investments, resources (e.g. enforcement actions, funding, etc.)	10
Protective/ Regulatory	Goal is to enact new or added protections through decision-making powers of agencies (e.g. enhanced public participation, regulatory permitting, siting, etc.)	36
Environmental/ Analytical	Goal is to promote further studies, increase analytic understanding of EJ related issues or concerns (e.g. mapping or modeling of risk, etc.)	15

Indicators

Of all the reports and policies identified, thirty-two mention indicators for measuring CI. Of these , we compiled eleven policies that include specific sets of indicators that can be examined more closely for comparative purposes. For ease of comparison across policies, each policy's indicators were placed in a matrix adapted from a CI indicator developed by Indiana University researchers. This matrix includes separate sheets for environmental and demographic indicators [9] and arranges the sources by column. Indicators and indicator categories are organized by row.

The CalEnviroScreen 4.0 tool is among the longest standing and most robust CI tools currently in use. It was developed over a decade ago and has gone through several iterations via peer review and ground truthing by EJ activists in the state .[10] The CalEnviroScreen 4.0 (CES 4.0) tool and indicators are being used in other states like Michigan as a model. One notable omission from the CalEnviroScreen tool is that it does not include a "race/ethnicity" indicator [11] . When developing CalEnviroScreen, the California Office of Health Hazard Assessment decided not to include race to make the tool more suitable to agencies barred from using race in decision-making[12]. Seven out of the eleven CI tools or guidance documents reviewed included race as an indicator. The issue of whether or not to include race as an indicator for any CI analysis is a topic of intense debate. While race has been empirically shown to be highly correlated with many indicators of burden, the legal barriers to using race have increased. This is because a conservative court system is challenging the use of race in a wide range of affirmative action cases that also threaten the legality of race considerations in federal and state policies.

Analysis of the eleven sources shows that the social vulnerability indicators that are most commonly included in CI analyses are "poverty"--often measured as the percent of the population living below two times the federal poverty level–and "housing," which is measured by age of housing and housing cost burden. The health indicators that are most frequently considered are "asthma-related hospitalizations/ER visits" and "rates of cardiovascular disease." Finally, the analysis found that "Particulate Matter" (e.g., PM 2.5 concentration) and "traffic density" are the indicators of exposure to environmental contaminants that are most often mentioned.

Another important finding was that many proposed indicators are rooted in specific state and local contexts. For instance, the New York Department of Environmental Conservation considers CI indicators such as "population density," "visual and aesthetic resources," and "ambient sound level," which are specific to places like New York City and similar urban geographies. Similarly, the Hawai'i Environmental Justice Initiative Report published in 2008 includes indicators of importance to Indigenous communities facing gentrification and displacement related to the tourism economy, such as "low wages from tourist industry" and "housing affordability." Additionally, a 2009 report by the New Jersey Department Environmental Protection includes expansive indicators developed by scholars to account for both individual and community stressors and buffers–and how these relate to environmental hazards. These unique indicators point to the need to critically examine how cumulative impacts are measured as they could be omitting significant data points. For instance, the Washington Environmental Health Disparities Map Project includes "transportation expense," which opens up a broader analysis of economic equity beyond focusing on standard indicators such as poverty, income, and unemployment. Additionally, the inclusion of civic engagement indicators, such as "voter turnout" and "political empowerment," in guidance reports (NJ, CA) illustrate CI analyses can include critical governance issues. Local indicators point to the need for more expansive CI indicators that are based on the feedback of impacted communities and are constantly evolving to address their needs. In the absence of high quality indicators or data availability constraints, ground truthing and increased local data collection can be critical for the development of CI tools.

There is also a wide range of data coverage, quality, and availability across different states–and even more so nationally. For example, some of the indicators in the CES 4.0, are simply not available or relevant in other states. California also likely has environmental monitoring and data collection capabilities beyond what many states currently have. Some of the indicators that are included in the CES tool but not found in many other of the eleven tools examined include "total pounds of active pesticide ingredients used in production-agriculture" and "impared water bodies."

Furthermore, climate vulnerability indicators, such as "flood risk" were only present in the recently released NY Disadvantaged Communities Criteria and the latest update to EJScreen (2.0). Climate-related indicators can include both projected risks and historic data such as Urban Heat Island projections, flood risks, and historic flood maps. Currently, many of the CI policies do not incorporate these climate-related indicators, but these may become increasingly significant additions to any CI tool. The federal Council on Environmental Quality recently released a beta version of the Climate and Economic Justice Screening tool which includes two climate-related indicators derived from FEMA datasets. [13]

Lastly, it is important to mention that various reports and guidance documents provide very general frameworks for CI analysis and do not specify data sources for CI indicators, nor specific thresholds for the indicators, which can create challenges at the implementation stage.

Methodologies for Calculating Thresholds and Cumulative Scores

Very few reports and policies mention specific thresholds and methodologies that can be used to make a determination of whether or how much "cumulative" impacts exist. While various tools have been developed for mapping and identifying EJ communities, only a few include a calculation or description of cumulative impacts or analysis. CalEnviroScreen is one of the first tools that developed an explicit methodology for determining cumulative impacts using a scoring method. Since the release of the first version of the tool in 2013, more cumulative impact analysis methodologies have been developed in other states. Table 2 summarizes methods that calculate indicator thresholds and cumulative scores.

It is important to highlight that the determination of thresholds and methodologies for calculating cumulative impacts are normative questions subject to contestation about what exactly constitutes an "unreasonable," "significant," or even "cumulative" harm. These terms can be interpreted as relative and intersectional concepts and need to be considered in the context of a legacy of environmental injustice that permeates complex economic, social, and environmental conditions. The interplay of these systems is not easily reducible to a formula or a threshold without careful consideration of what is deemed just or fair in each policy's context. For this reason, it is imperative that EJ communities are part of the process of determining what are appropriate thresholds and how they should be calculated. This has been the case for the development of methodologies in California and New Jersey, which came out of iterative processes with EJ stakeholders.

Table 2. Examples of Methodologies to Calculate Thresholds and Cumulative Scores

Policy/Tool	Cumulative Score Methodology
CalEnviroScreen 4.0 (California, 2021. First version released in 2013)	CalEPA designates the highest scoring 25% of census tracts from CalEnviroScreen as disadvantaged communities based on the calculation and rankings of cumulative totals. Additionally, 22 census tracts that score in the highest 5% of CalEnviroScreen's Pollution Burden, but do not have an overall CalEnviroScreen score because of unreliable socioeconomic or health data, are also designated as disadvantaged communities. For the process of ranking cumulative totals, each indicator is scored separately. The overall CalEnviroScreen score (cumulative) is calculated by multiplying the Pollution Burden and Population Characteristics scores. Pollution Burden is determined using Average of Exposures and Environmental Effects Indicators and Population characteristics is determined using Average of Sensitive Populations and Socioeconomic Factors Indicators. Details on how the scores are derived can be found in the CalEnviroScreen 4.0 report, pages 12-15.
An Act concerning environmental permits in certain areas, and supplementing Title 13 of the Revised Statutes (New Jersey, 2020)	The proposed rule requires the Department to determine whether environmental or public health stressors are "higher than" those borne by other communities within a geographic unit of analysis, as determined by the department. To set the level at which "higher than" threshold is met, NJDEP proposes: First, determine if each stressor in an Overburdened Block Group (OBC) is higher than the most protective geographic point of comparison. "Higher than" means greater than the 50th percentile. Then, sum the number of stressors higher than geographic comparison for an OBC for the Combined stressor total (CST). Next, determine if OBC's CST is higher than the most protective geographic point of comparison at the 50th percentile (second level of statistical analysis). (Slide 50 in NJDEP presentation on proposed rule)
Definition and Mapping of 'Disadvantaged Communities' (New York, 2022) Climate Justice Group and New York State Agencies, Response to Bill S6599.	A tract is designated as a Disadvantaged Community (DAC) if its Combined Score Percentile Rank (cumulative) is greater than 73.6. The percentile ranks of each indicator for each census tract is combined to produce a value that measures a census tract's score relative to the level of Environmental Burdens and Climate Change Risks as well as Population Characteristics and Health Vulnerabilities relative to other tracts. Tracts with higher scores relative to (a) other tracts in the State or (b) their region (NYC or Rest of State) were identified as DACs. Census tracts must rank relatively high in terms of both "Environmental and Climate Change Burdens and Risks" and "Population Characteristics and Health Vulnerabilities" (or very high on one of these) to be identified as a DAC. See page 21 of Technical Documentation for more details.

CONCLUSION

The tool summarizing the evolution of Cumulative Impacts (CI) definitions, policies and measurement methodologies shows that the definitions of CI have expanded to include more health disparities and socio-economic indicators, and that an increasing number of CI analysis reports, mapping tools, and policies have been released in the last decade. Most of these policies, tools, and agency guidance are intended to provide enhanced information and participation in decision-making processes. Some policies use these tools to allocate resources (such as funding or increased enforcement), while only a handful of policies aim to mitigate cumulative impacts through permitting.

The comparison of various frameworks used to measure CI shows that mapping tools such as CES 4.0 are being implemented across various states. Most of the tools use some combination of socio-demographic datasets (i.e. census) as well as environmental exposure and burden data that is widely available at the state and national levels (e.g. NATA data, traffic proximity, etc.). Less frequently used are those indicators that take into consideration local stressors such as impacts to indigenous communities, disparities generated by tourism economies, and high population density in cities–as these are only seen in a few states (HI, NY, NJ). Since cumulative impacts can vary greatly across geographies, and the availability and quality of data can also diverge significantly, CI tools developed in different contexts must consider these divergences. There is high value to the inclusion of locally specific indicators, as well as indicators that capture critical elements related to EJ, such as race, civic engagement, and climate change vulnerabilities.

In terms of legislation, CI bills have been enacted in California, New York, New Jersey, and Washington since 2012. However, the progress on the enactment of legislation has not been as rapid as the development of mapping tools and the increasing comprehensiveness of indicators. Various substantive and protective CI bills have been introduced in states and at the federal level, but have not yet passed. The enactment of protective legislation that addresses regulatory reform and substantive decision-making processes of the state are necessary for addressing the legacy of cumulative impacts–yet these policies face significant legal and industry opposition. Key to the success of these policies is the leadership of EJ communities in the development of tools and legislation, including the processes for determining CI indicators and methodologies specific to their communities. It is our hope that the CI chart can support EJ movement stakeholders and policymakers in further advancing CI policies and implementation efforts.

BIBLIOGRAPHY

1 Morello-Frosch, R., Zuk, M., Jerrett, M., Shamasunder, B., & Kyle, A. D. (2011). Understanding the cumulative impacts of inequalities in environmental health: implications for policy. Health affairs, 30(5), 879-887.

2 Sheats, Nicky (2013). Cumulative Impacts and the Permitting Process, NJEJA. https://njeja.org/wp-content/uploads/2021/08/NJEJA-Statewide-Cumulative-Impacts-Policy_2019.pdf

3 Zrzavy, A., Blondell, M., Kobayashi, W., Redden,B. & Mohai, P. (2022). Addressing Cumulative Impacts: Lessons From Environmental Justice Screening Tool Development and Resistance. Envtl. L. Rep.

4 Payne-Sturges, D. C., Sangaramoorthy, T., & Mittmann, H. (2021). Framing Environmental Health Decision-Making: The Struggle over Cumulative Impacts Policy. International journal of environmental research and public health, 18(8), 3947.

5 SB.1277 – State of Hawaii Senate 31st Legislature (2021). A Bill for An Act Relating to Environmental Justice Mapping. https://www.capitol.hawaii.gov/session2021/bills/SB1277_.HTM

6 Ringquist, E. J., & Clark, D. H. (2002). Issue definition and the politics of state environmental justice policy adoption. International Journal of Public Administration, 25(2-3), 351-389.

7 California Office of Environmental Health Hazard Assessment. (2017). SB 535 Disadvantaged Communities. Oehha.ca.gov. Retrieved April 11, 2022, from https://oehha.ca.gov/calenviroscreen/sb535

8 Serrano, K. (2017). (rep.). (A. Reyes, Ed.)UCI Community Resilience. Retrieved April 11, 2022, from https://communityresilience.uci.edu/wp-content/uploads/2018/02/UCI-OC-GGRF-Report-FINAL-1.pdf.

9 Konisky, D., Gonzalez, D., & Leatherman, S. (2021). Mapping for Environmental Justice: An Analysis of State Level Tools. Environmental Resilience Institute, Indiana University.

10 Forman, F., Solomon, G., Morello-Frosch, R., & Pezzoli, K. (2016). Chapter 8. bending the curve and closing the gap: Climate Justice and Public Health. Collabra, 2(1). https://doi.org/10.1525/collabra.67

11 CalEnviroScreen 1.0 was developed in 2013, but for this analysis, we use version 4.0 released in 2021.

12 Liévanos, R. (2018). Retooling calenviroscreen: Cumulative pollution burden and race-based environmental health vulnerabilities in California. International Journal of Environmental Research and Public Health, 15(4), 762. https://doi.org/10.3390/ijerph15040762

13 Climate and Economic Justice Screening tool. https://screeningtool.geoplatform.gov/en/