Environmental Justice and Air Permitting in the United States

by Sonja Sax, Joseph Sabato, Tiffany Stefanescu, and Brian Holland

A look at available tools for evaluating potential adverse and disproportionate impacts on Environmental Justice communities, as well as case studies applying these tools for air permitting.

The origin of the Environmental Justice (EJ) movement is closely tied to the civil rights movement of the 1960s. It wasn't until 1994, with President Bill Clinton's Executive Order (EO) 12898,[1] that there was any specific guidance related to EJ in permitting and other federal programs. This EO required federal agencies to identify and address disproportionately adverse environmental effects of federal actions (e.g., air permits) on minority and low-income groups, but provided no specific tools.

In January 2021, President Joe Biden issued several EOs and memoranda signaling a clear emphasis on EJ. Setting the stage was EO 13990,[2] with the goals of ensuring access to clean air and water, holding polluters accountable, and highlighting impacts to EJ communities. These EOs also lacked specifics and guidance for EJ analyses.

Not until 2022, with the U.S. Environmental Protection Agency's (EPA) *Interim Environmental Justice and Civil Rights in Permitting Frequently Asked Questions (FAQs), was guidance available. In the FAQs,* EPA concedes, however, that there is no "one size fits all" approach because "permits vary widely in purpose and effect." An example supplied in the FAQs includes the use of a Health Impact Assessment to evaluate project-related impacts on EJ communities, which would require estimating project-related exposures (e.g., air modeling) and risk assessment methods to assess health impacts. Importantly, EPA notes that if there are any adverse and disproportionate impacts to EJ communities, then alternative siting or mitigation measures would be needed, often above and beyond normal requirements. Worst-case, the permits could be denied. There are many examples in the news today that highlight how EJ concerns can affect air permitting of major facilities.[3]

While at the federal level there is more limited guidance, several states have started developing their own guidance, including how EJ communities are defined, which varies with each state. In January 2022, the Massachusetts Environmental Policy Act (MEPA) office finalized its EJ protocols[4] that specify requirements for public involvement and analyses to be included in an Environmental Impact Report required for projects 1 to 5 miles from an EJ community. The analysis of project impacts on EJ populations includes the use of mapping tools to assess the location and demographic characteristics of EJ populations, vulnerabilities based on health statistics (e.g., heart attack hospitalizations, asthma hospitalizations, low birth weight, and blood lead levels), sources of environmental pollution and additional environmental indicators using EPA's EJScreen. These tools provide descriptive analyses to establish where EJ communities are located relative to the project and whether they are overburdened based on various health and environmental indicators. Beyond the descriptive statistics, however, MEPA requires that project impacts be quantified, including impacts from mobile sources, to assess any disproportionate adverse impacts on EJ communities. However, there is little guidance on how to do this type of analysis. In this article, we describe available tools for evaluating potential adverse and disproportionate impacts on EJ communities and provide case studies applying these tools for air permitting.

Tools for Evaluating EJ Community Impacts

EJ tools assist agencies, companies, and organizations with identifying socioeconomically disadvantaged communities that are most affected by pollution. There are a number of tools available for use in EJ assessments, and the decision to use one over another typically comes down to:

- What is the driving force for the EJ assessment (e.g., permitting, emission event/compliance,ESG, litigation)?;
- Is the initiative put forth by a state agency, federal agency, or other?;
- Who will receive the information (e.g., permit engineer, inspector, shareholders)?; and
- What is the goal of the assessment (e.g., community engagement, impact assessment)?

Several national-level tools that can be used for EJ assessments are highlighted below.

EJScreen

EJScreen (https://www.epa.gov/ejscreen) is EPA's web-based tool that screens for potential disproportionate environmental burdens and harms at the community level by estimating impacts from multiple facilities in a community through ambient monitoring, modeling, and publicly available reports. The EJ Index uses the concept of "excess risk" by looking at how far above the national average the block group demographics are. The program accesses the environmental and demographic information and compares against the rest of the state, EPA region, and the nation. Because EJScreen is a screening tool, it has some limitations that should be considered in the interpretation of results.

Climate & Economic Justice Screening Tool (CEJST)

CEJST (https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5) defines and maps disadvantaged communities for the purpose of informing how federal agencies guide the benefits of certain programs, including through the Justice40 initiative. To identify disadvantaged communities, CEJST uses eight categories of disadvantaged status indices, each of which has topical indicators that are considered disadvantaged.

Human Health Risk Assessment Protocol (HHRAP)/BREEZE Risk Analyst

Originally developed to evaluate the health risk associated with hazardous waste incinerators, EPA's HHRAP is used to conduct multi-pathway human health risk assessment and can be applied for EJ purposes. HHRAP uses air dispersion modeling data (e.g., AERMOD) as input, and provides

cancer risk and non-cancer health risk at specific locations as output. While HHRAP is provided by EPA as a lengthy technical document,[5] third-party utilities such as **Trinity Consultants' BREEZE Risk Analyst** (https://www.trinity-consultants.com/software/health-risk/risk-analyst Trinity Consultants) have converted the protocol into a software interface that streamlines the process and produces output in GIS formats, which allow the health risk data to easily be integrated with demographic data (e.g., U.S. census tract data), facilitating a variety of refined EJ analyses. A case study using HHRAP is provided later in this article.

Other noteworthy national-level EJ tools include:

- **EPA TRI Toxics Tracker** (https://edap.epa.gov/public/extensions/TRIToxicsTracker/TRIToxicsTracker.html)
- **EPA Risk Screening Environmental Indicators (RSEI) Model** (https://www.epa.gov/rsei)
- **EPA AirToxScreen** (https://www.epa.gov/AirToxScreen)

At the state-level, there are additional available tools that are used for EJ assessments:

- **CalEnviroScreen** (https://oehha.ca.gov/calenviroscreen)
- **Massachusetts Department of Public Health Environmental Justice Tool** (https://matracking.ehs.state.ma.us/Environmental-Data/ej-vulnerable-health/environmental-justice.html)
- **New Jersey Environmental Justice and Mapping Tool** (https://experience.arcgis.com/experience/548632a2351b41b8a0443cfc3a9f4ef6)

Case Studies

PSD Permit

This case study highlights a novel approach to address EJ concerns using air dispersion modeling for a central utilities plant at a university in greater Boston. The university was replacing an existing combined heat and power (CHP) system and making operational changes to become more energy efficient and resilient. These changes required a Prevention of Significant Deterioration (PSD) permit, which in Massachusetts triggers an enhanced analysis of impacts on EJ populations within five miles of the project. This university is located within five miles of 530 census block groups that met the EJ criteria.

An enhanced analysis includes an examination of the baseline health of EJ populations and quantifying potential disproportionate impacts from the project compared to non-EJ populations. The enhanced analysis also required community outreach including development of easy-to-understand fact sheets regarding the project impacts. For the CHP system, air dispersion modeling, using the AERMOD model, was performed to estimate air impacts for current operating conditions. The analysis was repeated, incorporating the planned operational changes, to show the reduction in air pollution concentrations because of these changes. This approach was used to demonstrate that the proposed operational changes would not adversely impact EJ populations.

The project's estimated air pollution concentrations were also put into context so a layperson could understand them by relating them to everyday air pollution exposures. For example, project-related peak concentrations were equivalent to 10 minutes cooking using a gas stove or an additional 5 minutes in traffic. These comparisons were included in project fact sheets and distributed to the public to frame the magnitude of the project impacts in a way that was relatable to the public. The approach was successful in securing approval from EPA and Massachusetts Department of Environmental Protection; the permit was issued, and the facility was built.

Health Risk Assessment and EJ Analysis

This case study highlights a methodology for explicitly quantifying EJ health impacts using a combination of air dispersion models, human health risk models, and GIS demographic data. This method can be used to predict whether an increase in cancer cases or the number of serious non-cancer health impacts can be expected from one or more sources of emissions. If health impacts are predicted, the methodology will indicate the exact locations of the expected impacts. Overlaying these results on GIS demographic data, EJ-specific data can be determined (e.g., the number of EJ members impacted, or the fraction of the health burden falling on EJ versus non-EJ communities).

In this case, the EJ impacts of a battery recycling facility with air toxics emissions (primarily lead and benzene) were evaluated. Stack testing results were used to determine actual emissions and stack parameters, which were input into EPA's AERMOD model to estimate both the airborne concentration and surface deposition of each modeled pollutant at each point of a grid (100-m spacing centered at the facility location). The results were then input into EPA's HHRAP model, using the BREEZE Risk Analyst software, which uses AERMOD output and other information (e.g., population exposure profiles), performs the health risk calculations, and outputs cancer and non-cancer results (i.e., by pollutant, emission source, and exposure pathway) in a GIS format. The HHRAP output was overlaid with block-level U.S. Census data to determine whether meaningful health impacts would be borne by EJ compared to non-EJ communities. Figure 1 shows one way that of these results can be presented; cancer risk increments from one modeled scenario overlaid on a map showing the percentage of the population in each census block that was defined as an EJ group for the study purposes.

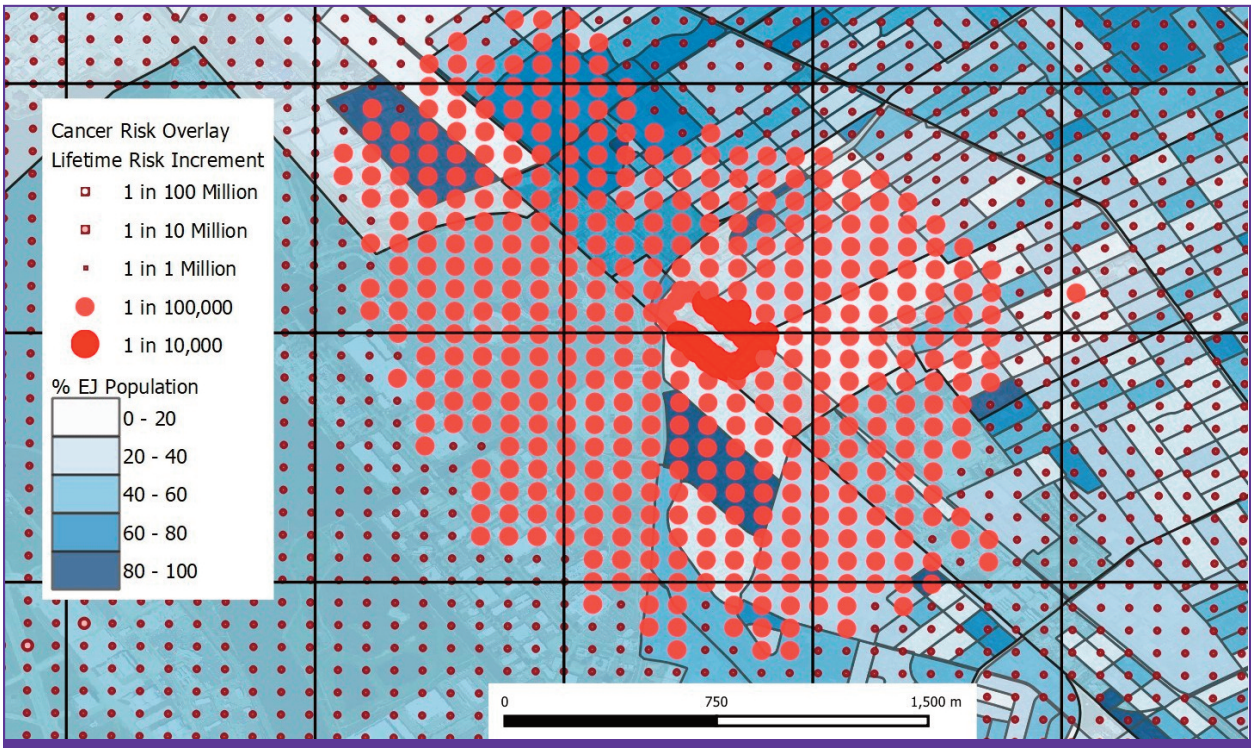

Figure 1. Percent EJ population (blue) for each census block and incremental lifetime cancer risk from the study facility (red).

Conclusion

EJ-related requirements are increasingly being implemented at the federal and state levels for permitting f projects of different sizes. However, these regulatory requirements are still only beginning to be fully developed and there is generally very little guidance regarding the methods and tools to address the requirements. We highlight several of the available tools and techniques that can be applied and have provided two case studies demonstrating how EJ assessments have been completed using some of the available tools. These case studies show that established tools, such as the AERMOD dispersion model and HHRAP risk model, can be used for refined EJ assessments that address regulatory requirements. These examples also underscore the importance of placing analysis results into a context that is understandable to the general public, such as comparing results to known exposures like spending time in traffic (the first case study) or presenting potential cancer/health risk increases (the second study), rather than simply presenting the results. **em**

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