INviroScreen Codebook

Indiana Environmental Justice Screening Tool

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INTRODUCTION

This data codebook provides information and definitions of the data used to generate the INviroScreen Environmental Justice (EJ) Mapping Tool for the State of Indiana. The data selected for the INviroScreen Mapping Tool represent four categories of indicators: environmental, climate, demographic, and health. Each of the indicators were selected after analyzing and interpreting a wide array of environmental justice literature, as well as examining and comparing state and national environmental justice indicator maps across the United States. Like other EJ mapping tools, the selected indicators are layered in an ArcGIS map to portray various overlapping effects. This effort constitutes the first EJ mapping demonstration for Indiana.

Select indicators also combine to generate the "INviroScreen EJ Score" for census tract regions across the state. The intended goal of the EJ Score is to demonstrate the cumulative impacts of overlapping environmental exposures, sensitive populations, and socioeconomic factors in a community in a single metric. The INviroScreen Score uses a functionally identical model to the methodology California's Office of Environmental and Health Hazard Assessment (OEHHA) developed for CES. INviroScreen has a few notable differences in terms of which indicators contribute to the final score, but otherwise follows the CES score updated in October 2021 (version 4.0). The INviroScreen Score combines four categories of indicators (i.e., environmental, climate, demographic, and health) into a single measure which is then converted into a state percentile to enable comparison of census tracts across Indiana.

The section following the codebook outlines community outreach work done to date, including highlights from interviews with key environmental groups in Indiana and future ideas for further community involvement as the tool progresses. The final product is a GIS map illustrating the scale of environmental harm throughout Indiana. The map makes the INviroScreen score more readily usable for and provides a highly interactive and visual demonstration of the selected indicators.

INDICATORS

INviroScreen builds on tools developed for other U.S. states as well as the U.S. Environmental Protection Agency's EJScreen tool which covers the entire country. Indicators were selected to capture important demographic and socioeconomic characteristics and environmental, health, and climate indicators. In general, INviroScreen includes indicators that are high quality from well-regarded sources, available statewide, and frequently updated such as that the tool can be updated. Each indicators is described below.

DEMOGRAPHIC

Less than high school education – Defined as the percentage of people aged 25 or older in a block group whose education is short of a high school diploma, using U.S. Census Bureau estimates from the 2020 American Community Survey obtained from the EPA's EJ Screening Tool. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

Limited English-speaking household – A "limited English-speaking household" is defined as a household in which no member 14 years old and over (1) speaks only English or (2) speaks a non-English language and speaks English "very well". In other words, all members 14 years old and over have at least some difficulties with English. Data are U.S. Census Bureau estimates from the 2020 American Community Survey obtained from the EPA's EJ Screening Tool. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

Low-income – Defined as the percentage of a block group's population in households where the household income is less than or equal to twice the federal "poverty level", using U.S. Census Bureau estimates from the 2020 American Community Survey obtained from the EPA's EJ Screening Tool. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

Over age 64 – Defined as the percentage of people in a block group over the age of 64, using U.S. Census Bureau estimates from the 2020 American Community Survey obtained from the EPA's EJ Screening Tool. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

People of color – Defined as the percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino, using U.S. Census Bureau estimates from the 2020 American Community Survey obtained from the EPA's EJ Screening Tool. This definition includes all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

Under age 5 – Defined as the percentage of people in a block group under the age of 5, using U.S. Census Bureau estimates from the 2020 American Community Survey obtained from the

EPA's EJ Screening Tool. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

Unemployment rate – Defined as the percent of a block group's population that are not in the labor force. Data are U.S. Census Bureau estimates from the 2015-2019 American Community Survey obtained from IPUMS. These data are available at the census tract level, statewide for Indiana. Original data are not modified.

All above indicator information obtained from EPA EJScreen.

Redlining (non-census) – The number of neighborhoods within a city that have historically been graded by the Homeowner Loan Corporation (HOLC) in the 1930s within 4 grades: "A, Best," "B, Still Desirable," "C, Definitely Declining," and "D, Hazardous." These data sets are available for 7 counties and retrieved from DSL Richmond.edu. Original data are not modified.

ENVIRONMENTAL

Authorized Operating Solid Waste Facilities – Coordinate level data showing the location of sites authorized by IDEM per EPA regulations for disposal, storage, and handling of solid and restricted waste. The data last updated in 2020, comes from IDEM and is available statewide for Indiana. The data is used to identify the number of Authorized Operating Solid Waste Facilities per Census tract. Original data are not modified.

Brownfields Sites – Brownfields sites are locations where the presence or potential presence of a hazardous substance, pollutant, or contaminant may complicate property, the expansion, redevelopment, or reuse of property, according to the EPA. These are coordinate level data of EPA-designated Brownfields sites, presented on Indiana Department of Environmental Management's Interactive Map from 2021. This data is for the state of Indiana as a whole. The data is used to identify the number of Brownfields sites per Census tract. Original data are not modified.

Impaired Waters – Indiana is required by the Clean Water Act Section 303(d) to provide a list of the state's impaired and threatened waters (stream/river segments, lakes, etc.). IDEM collects this data every two years for the entire state. This data is from 2016 found in the Indiana MAP produced by the Indiana Geological and Water Survey. Original data are not modified.

Landfill Boundaries – Areal extent data illustrating the boundaries for open dump sites, approved landfills, and permitted landfills in the state of Indiana. The data was published by personnel within the Office of Land Quality at the Indiana Department of Environmental Management. The data are not complete and were updated most recently in 2020. Data are available statewide. Original data are not modified.

Ozone – A criteria air pollutant regulated under the U.S. Clean Air Act. EJScreen measures this environmental indicator in parts per billion by county in Indiana. Original data are not modified.

Particulate Matter – A criteria air pollutant regulated under the U.S. Clean Air Act. EJScreen measures this environmental indicator in micrograms per cubic meter air (µg/m3) by county in Indiana. Original data are not modified.

Superfund Sites – Superfund sites are locations where hazardous waste has been dumped, left in the open, or otherwise improperly managed, according to the EPA. These are coordinate level data of EPA-designated Superfund sites, presented on Indiana Department of Environmental Management's Interactive Map from 2021. This data is for the state of Indiana as a whole. The data is used to identify the number of Superfund Sites per Census tract. Original data are not modified.

Toxics Release Inventory – The Toxics Release Inventory (TRI) tracks the management of certain toxic chemicals that potentially pose a threat to human health and the environment. Indiana reports that there are 885 of TRI facilities throughout the state as of 2021. The data that was taken includes the latitude and longitude of TRI facilities in the state. Original data are not modified.

Wastewater NPDES Facilities – National Pollutant Discharge Elimination System (NPDES) permits are permits provided to different facilities, such as wastewater treatment plants, that directly put effluent into the waters of the state. This data shows which sites have NPDES permits and their level of compliance with those permit limits throughout the entire state of Indiana. The data comes from the Indiana MAP produced by the Indiana Geological and Water Survey. Original data are not modified.

CLIMATE

Drought – Defined as the number of weeks that each county in Indiana has experienced drought on a scale from D0 – D4 from 2015 – 2023, updated weekly. The five classifications for this data are abnormally dry (D0), moderate drought (D1), severe drought (D2), extreme drought (D3), and exceptional drought (D4). Information collected from the U.S. Drought Monitor with no manipulation of original data

Extreme Precipitation/Flood Risk – Defined as the number of extreme precipitation days per year, using First Street Foundation data that projects flood factors based on flood risk data from 2022. This data is available at the county level for Indiana. Original data were modified to include only flood factor risks 7-10 (based on the percentage of properties within a county that are expected to flood) to represent extreme precipitation/flood risk.

Extreme Temperature (Heat) Days – Defined as the number of extreme temperature days (daily high temperature is 90 degrees Fahrenheit or greater) compared to a normal temperature per year, using Environmental Resilience Institute Data projections for 2050. These data are available at the county level statewide for Indiana. Original data was modified to only include total number of hot days and hot nights under two climate scenarios (RCP45 and RCP85). According to the IPCC, the Representative Concentration Pathways (RCPs) illustrate four scenarios "of greenhouse gas (GHG) emissions and atmospheric concentrations, air pollutant

emissions and land use." The climate projections are used to assess the impacts and adaptation of climate model "simulations to project their consequences for the climate system." Total_Hist represents the total sum of hot days, hot nights, and hot days/hot nights. The data included from the original form are: Total_Hist, Total_RCP45, and Total_RCP85.

GHG Emissions – Defined as the aggregate of various pollutants (VOCs, CO, NO2, SO2, PM10) per county as reported by facilities in 2020, collected from the Indiana Department of Environmental Management. This data is displayed on the county level, omitting Brown County, and updated yearly. Total GHG emissions are calculated as the sum of the pollutants reported to the state.

Impervious Surfaces – Defined as development of buildings, roads, housing, sidewalks and more in natural landscapes. It is also expressed as the percentage of impervious surfaces in the county. The data was retrieved from IU's Environmental Resilience Institute (ERI) using data from the Multi-Resolution Land Characteristics (MRLC) Consortium. The most recent data is from 2016 and it is unknown how often the data is updated.

Tree Canopy – Defined as the percentage of tree canopy coverage in a county, using IU's Environmental Resilience Institute (ERI) 2016 data from the Multi-Resolution Land Characteristics (MRLC) Consortium. These data are available at the county level for the state of Indiana. Original data are not modified.

HEALTH

Adult Asthma – Weighted number of respondents who answer "yes" both to both of the following questions: "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and the question "Do you still have asthma?" divided by total respondents. This data is available statewide and on the census tract level from 2020 by the CDC. Original data is not modified.

Cancer – Number of respondents 18 years or older who had been told by a medical professional they have cancer (besides skin cancer) divided by total respondents. This data is available statewide and on the census tract level from 2020 by the CDC. Original data is not modified.

Coronary Heart Disease – Number of respondents >=18yrs who had been told by a medical professional they have angina or coronary heart disease divided by total respondents. This data is statewide and available on the census tract level from 2020 by the CDC. Original data is not modified.

Diabetes – Number of respondents 18 years or older who had been told by a medical professional they have diabetes other than diabetes during pregnancy divided by total respondents. This data is statewide and available on the census tract level from 2020 by the CDC. Original data is not modified.

Food Desert Status – Low income and low access tract measured at 1/2 mile for urban areas and 10 miles for rural areas. This data is available statewide and on the census tract level from 2021 by USDA Economic Research Service last updated 2021.. Original data has a wide range of measurements for urban and rural areas that is not going to be included, but the data itself has not been modified.

High Blood Pressure – Number of respondents 18 or older who have been told by a medical health professional they have high blood pressure divided by total respondents (excludes women who may have high blood pressure due to pregnancy). This data is available statewide and on the census tract level from 2020 by the CDC. Original data is not modified.

High Cholesterol – Number of respondents 18 years or older who had been told by a medical professional they have high cholesterol divided by total respondents. This data is available statewide and on the census tract level from 2020 by the CDC. Original data is not modified.

Kidney Disease – Number of respondents 18 years or older who had been told by a medical professional they have kidney disease divided by total respondents. This data is statewide and available on the census tract level from 2020 by the CDC. Original data is not modified.

Lack of Health Insurance – Number of respondents ages 18-64 who report having no insurance coverage divided by total respondents. This data is available on the census tract level from 2020 by the CDC. Original data is not modified.

Life Expectancy – Life expectancy gathered between 2010-2015. This data is available statewide and on the census tract level from the CDC. Original data is not modified.

INviroScreen Indicators Scoring Methodology

Introduction

INviroScreen adapts the scoring methodology employed in CES 4.0 (CES) to calculate a single environmental justice score for each census tract in the state. In this section, we describe the CES 4.0 scoring methodology, as well as MiEJScreen 1.0 (MES) scoring methodology, which we also reviewed to design the INviroScreen scoring methodology.

CES is a well-established environmental justice screening and mapping tool with a highly-regarded methodology for combining population characteristics and pollution burden. MES shares a basic common methodology to CES with a couple of important differences. First, MES includes a measure of race as an indicator in the cumulative EJ indicator score, whereas CES does not include a measure of race. Second, MES uses a different weighting strategy to combine indicators.

General Calculation Overview

CES (and MES by association) uses the following general methodology:

1. Generate a percentile score for each raw indicator and group the percentiles into four categories: Environmental Exposures, Exposure to Pollutants, Sensitive Populations, and Socioeconomic Factors;
2. Generate a weighted mean score for each grouped set of indicators, then group the four weighted means into two categories: Pollution Burden (comprised of Environmental Exposures and Exposure to Pollutants) and Population Characteristics (comprised of Sensitive Populations and Socioeconomic Factors);
3. Generate weighted mean scores for both sub-scores and then re-scale each to a ten-point scale;
    a. CalEnviroScreen treats as null any census tracts with fewer than 50 people living in group quarters or fewer than 50 people. The tool also drops any census tracts that are missing or do not report data for four or more of the eight population characteristic indicators. MiEJScreen does not appear to address these tracts in its scoring methodology.
4. Multiply the two sub-scores to create a final cumulative EJ score out of 100 points possible (10*10) and generate a percentile score for the resulting measure.

INviroScreen functionally replicates the CES methodology, including the treatment for missing census tracts. MiEJScreen uses a different weighted mean strategy, addressed in better detail in Appendix D, which causes a different distribution of the weighting in the final EJ score.

INviroScreen currently displays two EJ composite scores: a “full” model and a “trimmed” model. The calculation methodology does not differ, but the full model includes a total of 27 indicators, as opposed to the trimmed model which attempts to more closely model the CES indicator selection (e.g., not including a minority population indicator) and includes only 16 indicators. Table 1 illustrates these differences, as well as the categories, weights, and sub groupings.

Table 1. Comparison of Full and Trimmed INviroScreen Models

Final Score	*Sub Score*	*Categories [Weights]*	*"Full Model"*	*"Trimmed Model"*
INviroScreen Score = Population Characteristics x Pollution Burden	**Pollution Burden**	*Environmental Effects* [*0.5]	• Brownfields • Proximity to TSDF facilities • Proximity to NPL sites • Proximity to RMP facilities • Risk of drought • Risk of floods • TRI facility count • Superfund Cleanup Sites • Solid waste treatment facilities • Extreme temperature heat days	• Proximity to TSDF facilities • Superfund sites • Solid waste treatment facilities
		Exposure to Pollutants [*1.0]	• Pct pre-1960 housing lead paint • Air toxics cancer risk • Respiratory hazard index • Diesel PM level in air • GHG level in air • NPDES water pollution permits • Ozone level in air • Direct discharges into water • Traffic proximity and volume • PM2.5 level in air	• Pct pre-1960 housing lead paint • Diesel PM level in air • NPDES water pollution permits • Ozone level in air • Direct discharges into water • Traffic proximity and volume • PM2.5 level in air
	Population Characteristics	*Sensitive Populations* [*1.0]	• % adults with asthma • % adults with cancer • % adults with coronary heart disease • % adults with diabetes • % adults with kidney disease • % adults with high cholesterol • Adult life expectancy	• % adults with asthma • % adults with coronary heart disease
		Socioeconomic Factors [*1.0]	• Less than high school degree • Low-income • Adults without health insurance • Limited English-speaking household • Unemployment rate • People of Color • Age under 5 • Age over 64	• Less than high school degree • Low-income • Limited English-speaking household • Unemployment rate

Recommendations for Engaging Stakeholders in Developing and Using the Tool

Overview

Environmental justice mapping tools attempt to capture environmental and social issues with various indicators based on quantitative data. However, these data often do not capture granular community details to fully identify the localized harms relevant for environmental justice. In this way, these tools can sometimes overlook communities experiencing smaller scale environmental harms.

Community engagement is a key aspect of developing and using these tools to ensure that they do not ignore communities experiencing environmental injustices. Community input can provide granular data needed to better reflect environmental harms as well as ensure perspectives and priorities of the community are reflected in the tools. Previously developed screening tools have used a range of community engagement activities from informing members about the tool to shared decision-making regarding inputs through community-based participatory research.

Hence, it is critical that before INviroScreen is used for any decision-making by the Indiana Department of Environmental Management (IDEM) or any other state or local agencies, that it more fully incorporates community feedback. This section identifies recommendations for ways that IDEM in particular can engage communities in developing and using the tool.

Data Used to Inform Recommendations

The team performed one form of community outreach to create the current version of the screening tool. The team completed six informational interviews with environmental justice and protection organizations around the state of Indiana. The content of these interviews is summarized in Appendix A. These interviews were useful in further understanding the need for community interactions with the tool.

In addition to these interviews, the team researched the community engagement methods used by other states and environmental justice organizations, especially in relation to the development of screening tools. This research provided insights on best practices for pre- and post- tool development engagement opportunities. Both the interviews and the research informed the following recommendations.

Recommendations for Future Community Engagement Activities

The following recommendations for community engagement with the tool are split into two categories. The first category covers recommendations for future community outreach needed to further develop the screening tool. These recommendations cover the additional stakeholders needed to be engaged and how to engage them in the development of the tool. These recommendations will ensure that the tool more closely reflects community experiences and perceptions of environmental justice. The second category reviews additional resources and

elements to integrate into the web-based mapping application. These elements will ensure the tool is accessible and usable for all types of stakeholders.

Future Community Outreach Needed

To ensure that community outreach is prioritized and executed directly, IDEM should collaborate with communities that are directly affected by environmental justice issues. These include communities identified by the tool as "high risk." Because many of these communities are low income, low educated, etc. officials must be sure that their community outreach plans involve simple easy to understand language that does not intimidate or make the tool hard for individuals to understand. IDEM can provide online or in-person training sessions, walking individuals through why the tool is needed and what the tool can be used for. Helping individuals understand the need for the tool and how it can be used to benefit community members personally is imperative for the tool to succeed.

Using community engagement strategies such as outreach, consultation, involvement, shared leadership, and community-driven activities will help ensure the tool is used in the most effective way possible. Groups recommended holding listening and informational gathering sessions in each region of the state to advance the development of the tool. Once the tool is completed, holding tool demonstrations with communities to explain how the tool is used could be very beneficial to increase community involvement.

Many lessons can be learned from examining other states' environmental justice screening and mapping tools. For instance, CES has training videos readily available on the state government website with different modules explaining an overview of the tool, cumulative impacts, history, explanation of indicators, how a score was calculated, and how the mapping tool is currently being used. YouTube videos are great ways for people to get information quickly because they can be watched multiple times and are always there as a reminder when citizens need them. These videos along with the CES data are produced in both English and Spanish which allows the state to reach communities that are not English-speaking.

When Maryland developed their EJ screening tool "MD EJScreen" it collaborated with the National Center for Smart Growth's mapping activities and the Maryland Environmental Health Network. This allowed the team to have access to health data across the state and made sure both health and environmental impacts were being assessed. The tool was vetted and used before releasing in Bladensburg, Maryland with help from local community activists. The MD EJScreen team also did stress-testing and received feedback from multiple different environmental justice groups before releasing the tool while also hearing from citizens during various Maryland town hall meetings. Currently, the Maryland Department of Natural Resources updates and improves the tool by finding new ways to analyze and input data.

Another program developed by a state was Michigan's MiEJScreen tool. To make sure community members were involved in the tool creation, community advisory groups were created to provide feedback during the development of the tool. Such an advisory groups would allow IDEM to receive specific and direct feedback from communities across the state.

For IDEM to effectively communicate how the tool works and the benefits of this tool to local communities, they engage with local environmental justice organizations about the tool's function to best determine how the tool may serve local communities (See Appendix A). Many of the main strategies local organizations mentioned during our interviews emphasized convening events in easily accessible local spaces such as libraries and churches. Moreover, IDEM could facilitate participation by providing childcare and food at meetings. Having a trusted representative from each community available to speak to community members will also help communities use and trust the tool much quicker (see Appendix A).

Needed Inputs and Resources Associated with the Tool

The following is a list of additional elements that should be incorporated into the web-based application of the tool. These elements will make the tool more accessible and functional for its users.

1. **Introduction Section** – Several environmental justice mapping tools include an introductory section that contains several elements: 1) the description, purpose, and target audience of the tool; 2) a background on environmental justice-related policy actions or other events that led to the tools creation; 3) the timeline of the tools creations; 4) a definition or explanation of environmental justice; 5) a summary of the methods for creating the tool; and 6) a summary of community comments received on the tool and an explanation of how they were incorporated. Two tools exemplify different ways of displaying this introduction section. The New Jersey's Department of Environmental Protection Environmental Justice Mapping, Assessment and Protection Tool (EJMAP) provides this section through an ArcGIS story map. The North Carolina's Department of Environmental Quality Community Mapping System and Environmental Justice Tool provides this information through an attached online PDF.

2. **User Guide Section** – Almost all the tools we reviewed include an explanation of how to use and navigate the tool's interface. This section of the tool either provides a high-level overview of using the tool or step-by-step instructions. High-level overviews typically consist of one or two paragraphs explaining the way to search different geographic areas and how to interpret that data (See the University of Michigan School for Environment and Sustainability's Screening Tool for Environmental Justice in Michigan second information widget box). Other examples of high-level overviews include information provided as part of Massachusetts's Executive Office of Energy and Environmental Affairs Environmental Justice Map Viewer) and the Minnesota Pollution Control Agencies Overview of areas of concern tool. The more detailed user guides are generally formatted as PDFs with screenshots of different widgets and views of the tool (See North Carolina's Department of Environmental Quality Community Mapping System and Environmental Justice Tool). Some of the tools had written user guides alongside training videos that walk users step by step through the process, such as the Environmental Protection Agency's EJScreen videos and the North Carolina's Department of Environmental Quality Community Mapping System and Environmental Justice Tool.

3. **Technical Manual** – Several tools provide technical documentation describing the data and methodologies that are incorporated in the tool. For instance, the CES 4.0 Tool's manual

fully describes the measurement of indicators in CES, as well as the full methodology for calculating its environmental justice score. The information we provide in the previous section of this document serves as a starting point for such a technical document.

4. **Frequently Asked Questions (FAQs)** – Several tools provide a frequently asked questions section. This section is useful to briefly explain aspects of the tool most important to users. Our team began the process of creating FAQs for INviroScreen (See Appendix B).

5. **Glossary of Terms** – Another type of information that helps users understand environmental justice mapping tools are glossary of terms. A good illustration is that glossary of terms and definitions provided with the North Carolina Department of Environmental Quality Community Mapping System and Environmental Justice Tool, which explains the details of specific items part of the datasets.

6. **Community Data Sharing Mechanisms** – Environmental justice mapping tools generally use quantitative datasets from governmental or research organizations, but these tools can also create opportunities for community members to share other information that can be incorporated into the tool. To facilitate community data sharing, it is necessary to develop a mechanism for the collection of new information. The INviroScreen tool can also serve an informational purpose of identifying environmental organizations or agencies that could help communities that are experiencing environmental justice issues. The current version of the tool does not incorporate this type of information, but it is something that future versions might include.

7. **Feedback Mechanism** – Several online data tools related to environmental justice provide a section to collect feedback on the tool and the way it is being used. The Washington Tracking Network's Community Report Tool included a Department of Health email for users to provide feedback, which is a helpful way to make sure that the tool meets the needs communities. Additionally, North Carolina's Department of Environmental Quality Community Mapping System has a survey on its website to collect feedback from stakeholders. This survey ends with a question about further contacting the stakeholder during the development and update processes.

8. **Staff Contact Information** – All tools provide contact information for staff members. This contact information is useful to answer questions or receive feedback on the structure and functionality of the tool. It may be useful for IDEM to designate several staff members to oversee questions, feedback, and data-sharing mechanisms. Moreover, contact information for regional staff and offices could be useful to better coordinate assistance with communities across the state. Pennsylvania's Department of Environmental Protection listed regional staff information as part of its Environmental Justice Areas mapping tool.

9. **Provide resources in translated languages**. – It is important to make sure the materials on the web-based application are provided multiple languages to ensure equal accessibility for non-English speakers.

10. **Provide a breakdown of the information by county or municipality**. – It is important environmental justice mapping tools provide usable data information for decision-makers in

accessible formats. One way to do this is to provide documents that break down environmental justice population numbers by different levels of government. For instance, the Massachusetts Executive Office of Energy and Environmental Affairs produces a list of Massachusetts Cities and Towns with environmental justice populations. IDEM could produce similar products to make the data easier to understand and interpret.

APPENDICES

APPENDIX A: SUMMARY OF INFORMATIONAL INTERVIEWS

Introduction

As a community outreach team, we have completed our deliverables and conducted interviews with multiple different local environmental justice organizations. As previously discussed in our memorandum, we emailed 14 organizations requesting interviews and we completed six interviews. In our previous memorandum, we had plans to make a directory of environmental justice organizations in Indiana. After speaking with a professor at IU whose focus is in nonprofits, we decided that we did not have enough resources available to complete this part of our project. In this data report, we will summarize our notes from interviews with environmental justice organizations and conclude with recommendations for the class tool based on these interviews.

Organization A

Organization A is an environmental justice group based out of northwest Indiana with the goal of transitioning from a carbon-based economy into a regenerative economy. This organization is looking to provide northwest Indiana with a plan to address the impacts of fossil fuels on workers and communities. They also look to educate citizens on environmental justice initiatives and funding available for environmental justice issues.

We spoke with two directors at organization A that were both well-versed in EJ screening tools and used them periodically when connecting with individuals in the community. The interviewee mentioned how helpful this tool will be when looking at policy initiatives. Once Indiana has specific data on communities susceptible to air pollution, superfund sites, public health issues, etc. Environmentally focused organizations such as Organization A can use the data to help lobby the government or acquire funding through grants for their programs. They noted how helpful this tool would be when writing grants because they would have easy access to specific data. They also noted how great this tool would be to be able to translate information to communities as a visual aid is always useful to have.

When asked about indicators, both directors asked if we could include the cumulative impacts and burdens of our indicators. This meant making sure to note hazardous waste, oil, etc to show the overall impact of how these problems can affect citizens at large. One of the directors also mentioned a money desert indicator to identify low-income communities. One of the main questions we had as a class was whether we should use race this tool as an indicator. One of the directors specifically spoke up during this question and cautioned against using race due to the political backlash the tool could receive. They reinforced that statement by saying that at every level, we must protect this tool from political agendas.

In terms of engagement tactics and strategies an agency can use to promote this to the public, this organization recommended a lot of grassroots door-to-door campaigning and engaging with the local public. This can be done by partnering with local EJ groups or regional federal agency offices. A big place to hold meetings and information sessions on a tool like this was a public

library because many people have easy access to the library through city buses and libraries do offer free internet. Incentivizing citizens to come to these events could also be seen as a barrier to entry, so offering things like food and drinks is always a good thing to think about.

The main limitations this group foresaw with an EJ screen tool were problems with technology access as new technology can be difficult for people to use and a barrier to entry. To combat this issue, the tool must be designed to be user-friendly and easy to access. Both directors also mentioned having an IDEM representative in regional offices in Indiana facilitating the tool in different communities who are able to answer questions and report back to IDEM on if the tool is being implemented successfully.

Indiana Department of Environmental Management (IDEM)

Because this tool is specifically meant to be facilitated by IDEM, our team was looking to get their feedback before we published the tool. Currently, IDEM relies on the Climate and Economic Justice tool when writing grants and partaking in community outreach and is looking for something more specific to Indiana that they can pull data from directly and use when talking to disadvantaged groups.

When looking at potential challenges for implementing the tool, IDEM had concerns about having the resources or bandwidth to keep the tool running and maintaining it long-term. The main area of concern here was making sure the data was able to stay updated and finding a person within the organization responsible for this task. Being able to figure out overall usability was also a major concern for IDEM as the tool needs to be user-friendly. This means the tool needs to have clickable layers that do not make the tool too busy.

In terms of data sourcing, IDEM was hoping to see data taken from the county level or lower so the tools measurements could be more accurate to the state of Indiana. This is also useful when presenting to EJ groups or within communities. IDEM was also very interested in our health impact data as the EPA is putting a large emphasis on the health impacts of environmental justice initiative's. Currently, there is no place to go for both EJ data and public health data so having a tool that incorporates both is very useful. They recommended having the health indicators group look at the health impact criteria the EPA has available and make their indicators congruent with EPA standards.

The EPA also puts large stock in understanding why communities are disadvantaged. In a practical sense, if our tool can label a disadvantaged community and note why it is disadvantaged this would be a major help in making the tool more accessible and user friendly for low income and low educated communities. Being able to easily access data from the tool is another step that would make the tool more user friendly for different state organizations and interest groups. This would also help state and local agencies with grant writing and securing money for other EJ initiatives.

Finally, when asked about specific indicators, the IDEM team mentioned that keeping a race indicator out of our tool was the easiest way to stay out of the political weeds. They were pleased that redlining is currently an indicator in the tool as this layer has a direct relationship to disadvantaged minority communities.

Organization B

Two representatives were interviewed from Organization B. Neither interviewee is familiar with environmental justice screening tools. However, after discussing its purpose, both interviewees recognized its usefulness. The interviewees believed the tool could be useful in their outreach efforts for the various waste management programs they provide for the community. They also noted that the tool would be a way for them to gather more information to improve their program in the future.

The representatives were in support of incorporating socioeconomic indicators that included racial and ethnic characteristics. Additionally, they suggested that future iterations of the tool should integrate distanced based measurements of how far communities are from their waste sites. They also mentioned that this tool could be more useful if it was an open data portal that local government entities could edit and incorporate with information that better fits their needs.

The representatives suggested several avenues for promoting the tool including social media, email lists, and connections with professional associations. They also warned that the state should be careful of using the terms “environmental”, “climate change”, or “justice” in the naming of the tool or its messaging. They also provided numerous organizations, including solid waste entities, water-focused nonprofits, and northeastern environmental organizations, that IDEM should partner with in developing future iterations of the tool.

Organization C

The interviewee is familiar with environmental justice screening tools. They perceive these tools as useful and expressed interest in a statewide tool for Indiana. However, this usefulness was conditioned on whether the tool is user-friendly, and whether the data can be downscaled at a level not currently captured by the Climate and Economic Justice Screening Tool or the EJ Screen Tool.

For Organization C, this tool could be useful as they train communities in resiliency programming. Additionally, it could help them further support communities in accessing and applying for federal funding opportunities. Moreover, this tool will be useful as local governments move from the climate planning phase toward the implementation phase. Using both vulnerability and greenhouse gas data alongside environmental justice data would help local governments pinpoint where to target their resources and budget.

When asked about indicator data to include in the tool, the interviewee suggested several broad metrics that could be considered in future iterations of the tool. For instance, the interviewee identified energy burden measurements and housing quality metrics as important for better understanding socioeconomic statuses and correlations with environmental justice factors. They suggested health data on heart disease, asthma, and maternal mortality would be good to include in the tool. Maternal mortality is especially important to the state legislature and administration. Suggestions for other environmental data to integrate into the tool include the distance of environmental justice communities to brownfield sites and the size of the brownfield sites. Other

suggestions they provided included data on lead-level impacts on young kids, exposure or risk of exposure data to vehicle exhaust, and the age of vehicles owned in the community.

The interviewee suggested that messaging and branding for the tool need to focus on its use as a way for local governments to unlock resources and funding opportunities at the federal level while also using public dollars efficiently and effectively. They recommended that training and explanations of the tool's features should be provided alongside the interface so that it makes it more user-friendly. The interviewee offered to introduce the tool and software to its network of stakeholders. They also provided several organizations, including professional associations and regional entities, that may be useful for engaging in developing the tool further as well as distributing and promoting the tool.

Organization D

The interviewee is familiar with environmental justice screening tools. They have used the Climate and Economic Justice Screening Tool to gather important data for their work in their City. They were not aware that there is more granular data that would make a state tool worth the effort of data collection. They are fully supportive of this tool and see it as a useful resource for their department's work. They believe a statewide tool would be useful for their sustainability plan implementation and the work of different departments as they provide services to the public. In regard to the sustainability plan, this tool would be helpful for them to update their vulnerability assessment. Additionally, the engineering division in Public Works is an example of an agency that could tie equity in the way they provide services such as grants, utilities, and improvement projects. Nonetheless, they did express concerns that the tool may be limited in its benefits if it is not accessible or cannot be easily or frequently updated.

Two types of indicators that the interviewee noted as important to include were vulnerability indicators such as those included in the social vulnerability index and socioeconomic indicators. These socioeconomic indicators could include non-native English speakers and those without a high school diploma. They also suggested climate indicator data on urban tree canopy and urban heat island effect would be useful for their purposes. Lastly, they did not have specific suggestions about health indicators. However, they did mention that health departments are key to including in the outreach aspects of the tool because they have a lot of available data, and many departments are working to improve communication efforts for public health impacts.

They suggested that the messaging for this tool should balance its ability to align local efforts with federal priorities as well as connect Hoosiers to relevant data on impacts that they experience every day. They also warned that messaging needs to be careful not to stigmatize communities that are labeled as environmental justice communities. Furthermore, the tool should emphasize that identifying these areas does not absolve decision-makers from communicating or engaging with the public further. They suggested health departments and the Environmental Resilience Institute to further communicate this tool to the public or include it future development phases of the tool.

Organization E

Two Directors from Organization E were interviewed. Both directors are familiar with Environmental Justice tools and their benefits for a better understanding of the environmental challenges under-resourced communities face. Both interviewees described the usefulness of a tool like this in their work. One works with elementary schools, where they spearhead sustainability practices through grants such as the Indiana Thriving School Challenge and the new School Garden Liaison Initiative. One director said this tool would be useful to their resilience coordination program by providing asset mappings, such as food deserts and food access. Both interviewees also described the urgency of a tool like this in Indiana because soon, the state will dispense funds for environmental causes and is not bound by Justice40. Therefore, this tool will be a good resource that will indicate where there is the most need for resources in the state.

According to Organization E, important indicators to measure in Indiana for a tool like this would include Demographics/ Equity indicators, including free and reduced lunch for students, ability to be in different languages, and utility access data. They mentioned that utility access data is important to include in environmental justice tools but is very difficult to find and map. Their second suggestion of indicators focused on climate indicators, including heat island pressures, high heat events, flooding, and higher precipitation over time. The third suggestion of indicators focused on health indicators, including emergency room admittance data, Lyme disease, and cardiovascular diseases. For cardiovascular diseases, they specifically mentioned Asthma and the importance of segmenting the data by age.

Tactics the agency can use to promote the tool to the public is to define what environmental justice is and who the tool is permanent to; for example, is it for coalition building, the public, or government agencies? It is important to outline a specific audience. A limitation they see with this tool is the lack of available data there is for all regions of Indiana. Both interviewees mentioned the difficulty they have accessing data outside of Marion County. A solution they proposed is to create a forum on the tool where agencies, NGOs, and constituents can submit data they may have that is relevant to the EJ tool. One important highlight mentioned was the importance of information not captured by data and how this information can drastically view how we interpret our results and how this information can fill the gaps data can't map. Finally, they mentioned Kheprw Institute- Democratizing Data and Just Transition -Northwest Indiana as useful organizations our class could turn to for more information for our project.

Main Takeaways and Recommendations

- Most organizations interviewed were familiar with an environmental justice screening tool, but some needed clarification on the purpose of an environmental justice screening tool.

    → Recommendation: Education, outreach, and training will be critical to get organizations to use this tool.

- Many groups also had questions on why Indiana should have a statewide tool as opposed to the national tools already publicly available. These concerns were met with explanations of how a statewide tool allows for data that is personalized to local counties and allows local organizations to have easier access to data.

→ Recommendation: Provide clarity on how this tool differs from the national screening tools and will be useful in addition to these tools.

- Many organizations noted multiple benefits of having the tool available. Almost all noted that this tool would be useful for grant writing and environmental justice education initiatives. Some also noted that it would provide an opportunity for their organization to prioritize and connect with at-risk communities. Local government organizations emphasized the usefulness of this tool to implement helpful environmental policies and present data to constituents.

  → Recommendation: To make this tool more useful, it will be important to show how it can be used for community outreach. Some ways to get the public to engage with the tool include social media posts, library visits, and community information sessions with incentives for citizens to attend.

- Organizations had a few suggestions regarding additional data to include in the tool either now or in future iteration.

  → Recommendation: Include health metrics such as high asthma rates, pregnancy mortality rates, and overall mortality rates. IDEM specifically noted that including health indicators in the tool would be one of the biggest benefits when writing grants and applying for funding through the EPA.

  → Recommendation: Most organizations advised to stay as politically neutral as possible. This means keeping indicators, such as race, out of the tool to protect it from political backlash.

- While there are many benefits to the tool, organizations expressed several concerns, including:

  (1) The access disadvantaged communities have to technology.

  → Recommendation: Organizations suggested holding events at local libraries or places where Wi-Fi is free and accessible.

  (2) Maintaining current and relevant data.

  → Recommendation: Make sure the data is something that IDEM can easily update, maintain, and track over time.

  (3) User-friendly and accessible platform.

  → Recommendation: Make sure the layers and indicators are easy to read and that the platform lays out directions and interpretations of the data clearly.

  (4) Getting the word out and promoting the tool

→ Recommendation: To better promote the tool, IDEM can pair with environmental justice, local government, and other organizations listed throughout this report and noted in the interviews.

→ Recommendation: IDEM can hold educational and training sessions on how communities can take advantage of this tool.

APPENDIX B: INTERVIEW QUESTIONS

1. Are you familiar with environmental justice screening tools?
2. Do you think a tool like this will be useful for your community?
3. How do you think this tool will be helpful to your organization and environmental justice efforts across the state?
4. What do you think are important indicators regarding demographics, health, environment, and climate that would make this tool useful and more accurate in identifying environmental justice communities?
5. What important messaging and engagement tactics can the agency use to promote this tool to the public?
6. Do you foresee any limitations with this tool? Or do you have any concerns about this type of exercise?
7. (optional) Are there other organizations we should reach out to in Northeast or Southwest Indiana?

APPENDIX C: DRAFT FREQUENTLY ASKED QUESTIONS FOR THE TOOL

1. What is an Environmental Justice tool?
2. Who created this Environmental Justice tool?
3. Who is the intended audience for this tool? Is the tool user-friendly?
4. What benefit does an Environmental Justice tool bring to the State of Indiana?
5. Do other Environmental Justice tools exist?
6. Where was the data collected from?
7. I notice that some of the data for all the state is not there, why is that?
8. How does the tool work?
9. How did you determine the index number in the tool?
10. How often will the tool be updated?
11. Why is race incorporated into this tool and not in other Environmental Justice tools?
12. Is there someone I can contact for more information about this tool?

APPENDIX D. DETAILED SCORING CALCULATION REVIEW

This appendix outlines the INviroScreen mean weighting and percentile scoring methodology as adapted from the CalEnviroScreen 4.0 (CES), and compared against the MiEJScreen 1.0 (MES). In specific, treatment of missing values constitutes a key difference between CES and MES.

CES treats zeros as zero and excludes nulls from its percentile calculation; the absence of sites near a populated area of a census tract is considered a zero contribution towards that indicator score. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) does not deliberately treat missing values as zero. For example, consider three indicators in the Environmental Effects category (Proximity to TSDF facilities, Superfund sites, and Solid waste treatment facilities). The total environmental effect is equal to the sum of the parts divided by the count of the parts.

General: ***Environmental Effects = (TSDF + Super + SW) / Count (TSDF, Super, SW)***

CES and MES differ when a given tract *i* has missing values, e.g., if tract *i* only has data on solid waste facilities, CES removes the missing values from the mean weight, while MES does not.

"For example, in a given census tract … would be assigned a percentile score based on the data value that geographical location has compared to all other census tracts in the state. These indicator percentile scores, which would include …[three indicators], would be added together and divided by the number of indicators or in this case, [three]. This gives the average percentile score for all … indicators compared to those in other Michigan census tracts. The same procedure is done for each category." - MiEJScreen 1.0 Report, p. 10.

CES: ***Environmental Effects = (NA + NA + 30) / Count (SW = 1) = 30***
MES: ***Environmental Effects = (NA + NA + 30) / 3 = 10***

By extension, calculation of percentiles including (excluding) missing values also differs between the tools.

"When a geographic area has no indicator value (for example, the census tract has no hazardous waste generators or facilities), it is excluded from the percentile calculation and assigned a score of zero for that indicator. When data are unreliable or missing for a geographic area, such as census data with large uncertainties, it is excluded from the percentile calculation and is not assigned any score for that indicator. Thus the percentile score can be thought of as a comparison of one geographic area to other localities in the state where the hazard effect or population characteristic is present." - CalEnviroScreen 4.0 Report, p. 21

INviroScreen implements a functionally equivalent variation of the CES percentile calculation methodology (IES significantly improves the calculation speed). To demonstrate the percentile calculation for given raw value, consider the following mathematical set description:

For any given interval $I = \{0 < x \leq x + \varepsilon, \forall X \notin \backslash varnothing\}$, where x is a given tract value in the raw indicator X, then $L = \text{count}\{x|x > 0|\}$, excluding empty tracts, as detailed previously.

Thus, the percentile calculation $P = \frac{I}{L} \cdot 100$. This has a simple interpretation. Let indicator $X = \{0,1,2,3, NA\}$;

for $x = 0$, $I = 0 < 0 \leq 0 + \varepsilon = 0$, $L = \text{count}\{0|x > 0|\} = 3$, $P(0) = \frac{0}{3} \cdot 100 = 0$;

for $x = 1$, $P(1) = \frac{1}{3} \cdot 100 = 33.33$;

for $x = 2$, $P(2) = \frac{2}{3} \cdot 100 = 66.66$;

for $x = 3$, $P(3) = 100$;

for $x = NA$, $P(NA) = NA$.

Thus, for the set, $X, P(X) = \{0, 33.33, 66.66, 100.00, NA\}$. OEHHA implements this calculation without using a set theory approach, which requires approximately 1,000x the computational time.